

INVESTMENT POLICY AND ASSET MIX FOR PENSION FUNDS

by

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I – INTRODUCTION

Much lip service is paid to the concept that the actuarial and investment functions related to pension plans should be co-ordinated, but rarely is this co-ordination successfully achieved. This paper puts forward the approach that at any given time there are three sets of conditions that influence the formulation and execution of investment policy:

- (a) the unique characteristics of the plan being considered – for it is necessary to understand the nature of the liabilities before the most suitable investment portfolio can be selected;
- (b) the requirements of the plan sponsor - covering both his attitude towards the various risks that may be incurred by different investment policies, and the funding constraints imposed by his business;
- (c) the current investment outlook, both short-term and long-term, for the different asset categories available.

Out of (a) and (b), a rational investment policy is arrived at, consisting of a main objective, which is subject to several constraints. This investment policy does not change unless (a) or (b) changes. Then (c) is used to determine the best current asset mix to achieve the objective, without violating the constraints.

As the market outlook changes, the asset mix can be changed appropriately. Thus although investment policy remains stable, its execution is always sensitive to changing market conditions.

It is impossible to deal adequately with all the ramifications of the subject without stretching this paper to inordinate length, so my purpose here is simply to present the logic of the approach, with a greatly simplified example illustrating how it works in practice. Space does not permit a description of the monitoring process, an interesting subject in its own right.

This paper falls naturally into six sections:

- I Introduction
- II The Inadequacies of Popular Approaches
- III The Rationale of the Proposed Approach
- IV Further Details on Actuarial and Investment Characteristics
- V A Simplified Example
- VI Final Comments

II – THE INADEQUACIES OF POPULAR APPROACHES

Just suppose this were to happen.

A pension plan sponsor designs and installs his plan, and asks an actuary to estimate the contributions the sponsor needs to make. Without bothering to find out the type of plan or other relevant details, the actuary discourses impressively on his forecast for investment

returns and salary increases in the coming year, and winds up with a statement to this effect: "Because salary increases may well outstrip investment returns in the next year, I would recommend that your contribution rate be on the high side. Other sponsors I know of are contributing anything from 3% to 15% of their payrolls, with an average around 6%. For you I would recommend something in the 7% to 9% range."

Of course, it couldn't happen – or could it? It would be astonishing (and totally unprofessional) if an actuary were to decide on a contribution rate after only a qualitative discussion of the factors that influence it. In the hypothetical situation, the actuary suggested the range 7% to 9%. There is an air of precision about this – why not 6%, or 10%? How, indeed, can any number be justified, unless the actuary makes a numerical evaluation of how the plan's characteristics interact with his assumptions about the future?

And yet that hypothetical situation, with one small variation, occurs all too frequently in Canada (and I am sure Canada is not unique in that regard). The small variation is achieved by substituting, in place of the actuary assessing the contribution rate, the investment manager advising on asset mix.

Typically, there is no useful statement of investment policy to help determine the asset mix. Generally this decision is made by the investment manager, with the acquiescence of the plan sponsor, after a discussion of the economic outlook for the following year. If the actuary is present (which is not always the case), his expertise rarely extends to a sufficient knowledge of economics to enable him to make useful comments on that subject. The actuarial characteristics of the plan are rarely discussed. And so the asset mix decision is made – perhaps along these lines: "Because the outlook for equities appears more favourable than for fixed income securities in the next year, I would recommend that your asset mix be shifted slightly in favour of equities. Most of our other clients keep in the 40% to 60% range, averaging about 50/50 because of the uncertainties of prediction. For you I would recommend something on the high side of that range for equities." No real justification is offered as to why the ranges should be what they are – why not 20%, or 75%, in equities for the time being?

The whole process seems to depend on the seat of the investment manager's pants. No doubt some investment managers and plan sponsors feel substantially in contact with reality, and are very comfortable in whatever investment posture they have selected; but it is still true that an essentially numerical decision has been made without a logical sequence from initial discussion to final answer.

At the other extreme is the highly sophisticated approach of investment simulation. In some of the models used with this approach, a single set of projections is made of benefit outgo, and the plan is valued at

several points in the future. Several simulations of investment performance are made, showing how the required contributions vary with investment results. The plan sponsor then selects the long-term asset mix by considering how much variation he can stand in future contribution levels.

I see two flaws in this approach. First, the investment simulations reflect different economic patterns, which must surely have corresponding effects on the plan's liabilities; but the liabilities are usually not subjected to the same simulation process. Thus the overall results influencing the asset mix decision are usually based on the application of inconsistent economic scenarios to the assets and liabilities! Second, even if investment simulations were to be combined with consistent liability simulations, the results are essentially long-term and influence only the long-term asset mix decision, without being of any help in showing how current market conditions should influence the short-term asset mix.

There is a much simpler approach to investment policy and asset mix (which are not the same thing) than the complex and involved method of investment simulation. The idea is not my own; when I came across it, it was being extensively used by Toronto Investment Management Inc., who have developed it into a comprehensive discipline that has been practised for several years, and my contribution to it lies in the actuarial, rather than the investment, side; and indeed elementary variations of the idea can be found in operational research text-books.

III — THE RATIONALE OF THE PROPOSED APPROACH

Imagine the perfect investment!

Among other desirable qualities, it would provide the best possible return, both short-term and long-term; there would be no doubt that the return would be achieved; there would be great potential for capital appreciation, but no risk of a decline in value; and so on.

Unfortunately, no such investment exists — or could exist. For if one did exist, it would be in greater demand than any other, and this would push up its price until the return became consistent with the market's evaluation of the investment's future prospects. In turn, this increase in price would reduce the potential future capital appreciation, and open the door to the possibility of a future decline in value.

This idea of compromise — giving up one desirable quality to get more of another — is intrinsic to investment thought. Many types of investment are available, all with different characteristics. Logically, therefore, the selection of a suitable portfolio for a pension fund depends on an assessment (a constantly changing assessment) of the characteristics of the available investments, together with a knowledge of the relative importance placed on these characteristics by the plan sponsor, or the person or committee to whom the investment responsibility has been delegated.

More precisely, the following elements are involved:

- (a) the unique characteristics of the plan being considered — an essential ingredient is to understand the

nature of the plan's liabilities before the most suitable investment portfolio can be selected, because it is necessary to know the general purpose that the portfolio is meant to achieve;

- (b) the requirements of the plan sponsor — covering both his attitude to the various risks that may be incurred by different investment policies, and the funding constraints imposed by his business.

As a result of (a) and (b), a rational investment policy is arrived at. Inevitably, it consists of more than one statement. The ideal is to have a main investment objective, subject to several constraints. Investment policy tends to remain stable: it does not fluctuate with every change in the market, even though a changing market may well justify or require a change in the portfolio.

Formulating investment policy is the sole prerogative of the plan sponsor. It is through the investment policy that the plan sponsor provides the investment manager with his mandate.

It is then the job of the investment manager to assess, from time to time:

- (c) the current characteristics of the investment market — the relative attractiveness of the different types of investment, and their potential risks, both short-term and long-term.

Knowing the investment objective and constraints, as well as the current market characteristics, it is possible to determine the optimum portfolio mix at any given time: the mix which best achieves the objective, without violating any of the constraints. Linear programming techniques are used for this purpose. These techniques permit a ready check on the rationality of the investment policy — are the objective and constraints compatible, or does the policy need re-thinking? They also enable many different mixes to be quickly evaluated and can be used to show, in each case, the relationships between risk and return: how much potential return is being sacrificed in order to reduce the risks that may be involved.

Once the current optimum mix has been determined, it is the investment manager's job to perform a systematic search for the best individual securities within each class of asset. Linear programming and other techniques are available in this process, but that is beyond the scope of this paper.

In addition to being logical and disciplined, this approach offers the following advantages:

- It is comprehensive. It recognizes that investments have many characteristics, and therefore avoids one-dimensional statements of policy such as "achieve a return of 8%" or "stay in the top quartile of some performance measurement service".
- It avoids the "motherhood" type of objective, that is, the sort of general statement that nobody can quarrel with, but which is of no practical help. By requiring an explicit statement of the objective and constraints, it avoids statements on objective such as "maximize the long-term return on the fund without over-exposure to risk".

- It distinguishes between a statement on policy and a statement on asset mix. Too often investment policy is stated along the lines of “maintain a 50/50 mix of equities and fixed income investments” or “limit equities to a maximum of 30% of the portfolio”. Logically, such statements should not constitute policy, but should be the result of combining the policy statement with current market conditions. After all, there must be some reason (for example, a philosophy of risk-aversion, or a desire for a high income yield) for limiting equities to 30%. That reason should constitute the investment policy, and the 30% limit should follow naturally from current market conditions. Then, when market conditions change, the asset mix can be made to change without any change in the underlying reason.
 - It shows clearly that investment policy tends to remain stable, whereas asset mix is much more changeable. Investment policy changes only when caused by a change in the actuarial characteristics of the plan or a change in the sponsor’s attitude towards the various risks that may be incurred. Asset mix responds to both changes in investment policy and changes in the characteristics of the investments themselves.
 - It clearly defines the areas of responsibility. The specific responsibilities delegated by the sponsor to the investment manager and others are easily and clearly definable and thus the process is uninterrupted by confusion over accountabilities.
 - It gives the sponsor and the investment manager a clear statement of what is to be achieved and how the fund’s performance is to be judged. Thus if the objective has been achieved, two questions must be discussed:
 1. Is the objective too low?
 2. Are the constraints still appropriate?
 While if the objective has not been achieved, what must be debated is:
 3. Is the statement of policy realistic?
 4. Is the investment management adequate?
 5. Are the forecasts of asset characteristics persistently erroneous?
- (c) cash flow considerations;
 - (d) the “duration” of the accrued liabilities (actuaries tend to use the words “mean term” instead of “duration” in immunization parlance) – the difference between the durations of the assets and the liabilities gives a measure of the extent to which reinvestment of asset proceeds will be necessary. In the usual situation where liabilities are much longer than assets, the anticipation of worsening reinvestment conditions in the long term suggests a narrowing of the gap between the durations (thus reducing the importance of reinvestment); if reinvestment conditions are expected to improve in the long term, a widening of the gap is desirable;
 - (e) the method of funding – there is often a large surplus concealed in the method of valuing liabilities and the pace at which the plan is funded, and such a surplus should provide a greater amount of investment freedom because of the greater ability to absorb the potential adverse effects of risk;
 - (f) the valuation of assets – the extent of the market value decline that can be tolerated depends on the extent to which the asset valuation method reflects the decline; this can then be translated into the effect a decline has on the sponsor’s contributions. It is also important to determine whether the asset valuation method is so rigid that it inhibits sensible investment transactions;
 - (g) the purchase of annuities – purchasing annuities from life insurance companies represents the only available method of managing the plan’s liabilities: purchases shorten the duration of the liabilities.

With regard to the evaluation of asset characteristics, the following constitutes a partial list of characteristics that are considered, over whatever time-periods are relevant:

- (a) expected return
- (b) probability of a given return being achieved
- (c) maximum market value decline possible under normal conditions (this is not a forecast! – it could be defined as the decline that has no more than a 25% chance of occurring)
- (d) degree of marketability
- (e) degree of inflation protection
- (f) duration.

IV – FURTHER DETAILS OF ACTUARIAL AND INVESTMENT CHARACTERISTICS

In addition to characteristics which are unique to the operation of the pension plan under consideration, the following typify the actuarial characteristics:

- (a) The type of plan – final average, career average and flat benefit, and money purchase and profit-sharing plans imply different degrees of commitment to, and different amounts of flexibility in, keeping pace with future economic conditions;
- (b) the maturity of the plan – by which is meant the extent to which the age-distribution of the plan’s accrued liabilities has stabilized. Often in the early years of a plan full credit is not given for all past service, so the older age-groups represent a smaller share of the liabilities than they ultimately will;

V – A SIMPLIFIED EXAMPLE

Background

The ABC Co. Ltd. has a career average type of pension plan, to which its employees contribute. The salary base for calculating pensions in respect of accrued service has just been updated to the current year; this has created a large new unfunded liability, to be liquidated over the next 15 years. The next update is probably some years in the future.

The plan is valued actuarially every three years, and the most recent valuation has just been completed. The “unit credit” method of funding is used; this means that each year’s contributions, by the company and the employees together, are just sufficient to pay for the

benefits accruing in that year, and there has been no accelerated funding in the past. Indeed, because of the new unfunded liability, and business pressures, the company is keen to keep its total contributions as low as possible for the next few years.

The assets have traditionally been brought into the Valuation Balance Sheet at book value (that is, cost price) adjusted by a moving average of the ratio of market value to book value. In this way the asset value is stabilized, while still reflecting market value changes.

Development of Investment Policy

Because the company's contribution rate should not increase, it is highly desirable for the next plan valuation to show a surplus. Therefore the investment objective decided by the company is to maximize the return on the fund's investments over the three-year period to the next valuation date. This investment return is to be measured on market values.

Because of the method of asset valuation, not all declines in market value are immediately reflected in the Valuation Balance Sheet. By considering the increase in contributions resulting from the recognition of a decline, the company has decided that a maximum market decline of 10% under normal economic conditions can be endured in the next three years.

The company has been crediting interest on employees' contributions at a rate reflecting the fund's return on book values. For psychological reasons it does not want this to fall below 6%. Thus, even though a three-year viewpoint can be taken on the market return and on market declines, the company has imposed the constraint that the one-year return on book values must exceed 6%.

Brief cash flow projections show that no assets need to be realized for benefit purposes for several years, so

benefit considerations impose no constraints on the liquidity or marketability of the assets. The portfolio needs marketability only to the extent of being able to change its composition periodically to reflect changing market conditions. It is decided, arbitrarily, that this means that the fund must be at least 70% marketable.

At any time, the pension fund must meet the excess of accrued liabilities over amortization payments. The assets have a duration of under 10 years, while the duration of the liabilities, less amortization payments, is well over 20 years. Interest rates are expected to fall in the long term; to guard against this, it is decided that the assets should have a duration of at least 10 years. The effects of a really severe fall in interest rates can also be lessened by annuity purchases.

To sum up, the investment policy consists of the following statements:

Objective: Maximize the three-year investment return, based on market values.

- Constraints:**
- Maximum market decline of 10% in the next 3 years.
 - The one-year book value return must be at least 6%.
 - Marketability must be at least 70%.
 - The duration of the assets must be at least 10 years.

Asset Characteristics

At the time this policy was formulated, the relevant asset characteristics were evaluated as follows (for convenience, only a partial list of assets is shown):

Asset Category	Expected 3-Year Market Return	Potential 3-Year Market Decline	1-Year Book Return	Market-ability	Duration
Money market	7.5%	Nil	7.4%	100%	0.25 yrs.
Short prov. bonds	9.0%	5%	8.25%	80%	4.2
Short Can. bonds	8.75%	5%	8.0%	100%	4.2
Mortgages	10.93%	5%	10.5%	10%	3.9
Term loans	10.25%	Nil	10.25%	Nil	4.0
Long corp. bonds	11.0%	20%	9.5%	50%	8.3
Long Can. bonds	11.0%	20%	9.0%	100%	9.6
Can. equities	15.0%	15%	5.0%	50%	21.0
U.S. equities	15.0%	20%	5.0%	75%	20.9

Optimum Asset Mix

Based on the stated policy and the then current asset characteristics, the optimum asset mix turned out to be:

- 58% in Canadian equities
- 26% in money market securities
- 13% in short Canadian bonds
- 3% in U.S. equities

This overall portfolio had the following characteristics:

- Expected 3-year market return: 12.2%
- Potential 3-year market decline: 10%
- 1-year book return: 6.0%
- Marketability: 70%
- Duration: 13.4 years

Any other asset mix can be tested, but it will be found that no asset mix gives a higher expected 3-year market return while still satisfying all the constraints. In addition, it is virtually impossible to predict that this will currently be the optimum asset mix if the seat of one's pants is all one has to go by!

It will be observed that this asset mix pushes three of the four constraints to their limit. This implies that relaxing any of these three constraints will result in a different asset mix with a higher expected 3-year market return. One of the constraints, on marketability, was arbitrarily set at 70%. It was decided to test the effect of relaxing the marketability requirement to 50%.

Surprising, this totally transformed the optimum current mix to the following:

- 66% in Canadian equities
- 17% in money market securities
- 17% in term loans (i.e., loans with a variable interest rate)

with the following characteristics:

Expected 3-year market return:	12.9%
Potential 3-year market decline:	10%
1-year book return:	6.3%
Marketability:	50%
Duration:	14.6 years

This was the mix adopted, since it was decided that the additional rewards (higher expected return, higher book yield, longer duration) were enough to compensate for the risk of holding a slightly less marketable portfolio.

VI – FINAL COMMENTS

There are remarkable similarities between the

proposed method for investment policy and asset mix decisions, and the method used by actuaries for determining contributions required for a pension plan. In each case, the process consists of making assumptions about the future with regard to the relevant factors that affect the result; these assumptions, applied to the plan's benefits or investment policy, result in numerical values for required contributions or asset mix, values that could not possibly be justified in any other way.

Because there is obviously some uncertainty that the future will unfold as projected, the assumptions can, if necessary, be varied to test the sensitivity of the results to specific assumptions. In the case of determining required contributions, if there is great uncertainty about a particular factor, the usual approach is to make a very cautious assumption about it: the same approach can be used in the case of determining optimum asset mix. Alternatively, that asset characteristic can be omitted from the objective and constraints; it can then be monitored, but will not directly affect the asset mix.

The actuarial method of making assumptions and evaluating their effects is accepted as a sensible, indeed probably the only sensible, method for determining contributions to pension plans, and any other method would be unthinkable. Why, then, should not the same apply to the proposed method for proceeding from investment policy to asset mix?