

## **Summary of the Report:**

### **Back Testing of Investment Performance by Asset Class**

This summary was prepared by a member of the  
Project Oversight Group

The report was sponsored by the  
Society of Actuaries' Pension Section and  
Pension Section Research Committee

## Back Testing of Investment Performance by Asset Class

Summary: Many actuaries now practice in the investment world, and many of the contemporary practices may be influenced by recent (2000 to the present) market performance. What would have happened if an investment actuary could have traveled in a time machine to 1974 and employed contemporary investment strategies in the past? To answer that question, the SOA Pension Section hired a research team to conduct a back testing exercise of several investment strategies over several past time periods (1974 -2010, 1974 -1994, 1980 -2000, 1985 -2005 and 1990 -2010). The researchers looked at open and closed plans. They also investigated scenarios where the plan started at 100 percent funding and perhaps more importantly for today, plans that were initially at 70 or 80 percent funding. They looked at the impact of rebalancing. Finally to compare the investment performance, the researchers present a number of summary statistics for the reader to make his or her own comparisons, including portfolio return, standard deviation of the portfolio return, average, maximum and minimum percent funding and the standard deviation of the funding levels. There is also a discussion about "efficiency". Efficiency is a measure of the degree of risk associated with the expected investment return. The ideal investment strategy maximizes returns with a minimum of risk. If there are two investment strategies, both with the same expected return, the investment strategy with the least risk is the more efficient strategy. The Sharpe ratio, which is one measure of efficiency, was defined and provided for each time period and investment period.

The paper has two audiences, the investment actuary, and the pension actuary. If you are an investment actuary, I urge you to read the paper. You can read the executive summary yourself with the paper's key findings.

I myself am the only member of the Project Oversight Committee who is not a practicing investment actuary. I think the paper is also valuable to traditional pension actuaries. While many actuaries work with larger pension plans that also work with investment actuaries or other investment professionals to manage risk, many smaller plans operate without the benefit of considering the risks inherent in their strategy. Their investment allocations may be based on common rules of thumb, (e.g. 60 percent equities, 40 percent bonds). They may even switch to a more aggressive investment strategy (increase the equity allocation from 60 to 70 percent) to justify the continued use of the current discount rate assumption without sufficiently considering the associated risk.

In such cases, if the pension actuary has some investment knowledge, he or she can recommend that the trustee consult with an investment professional or at least make the parties he has contact with aware of the possible impact of increased volatility on the Plan so that the Plan Sponsor should not unduly focus on expected return without considering the impact of volatility as well.

So if a 70/30 percent asset allocation has a greater expected return than a 60/40 percent asset allocation, why not go to the 70/30 allocation? First, the increased volatility needs to be considered, and that increased volatility may impact the accounting expense or the cash contributions under the Plan's funding policy. Most Plan Sponsors like stable results. Second, pension investment returns are asymmetric. What do I mean by that? While funding deficiencies cause headline risk and strain budgets, funding surpluses cannot be readily accessed by plan sponsors.

Consider the following results of the paper comparing the 25 percent equity allocation to the 100 percent equity allocation from 1990 -2010.

Percent Equity	Average Percent Funded	Std Dev of Funding Levels	Maximum Funding Percentage	Minimum Funding Percentage
25 percent	100%	10%	127%	86%
100 percent	121%	38%	232%	71%

The 100 percent equity allocation appears to be better because the plan is on average 121 percent funded while the 25 percent equity allocation is only on average 100 percent funded. While that is true, the Plan Sponsor can't readily access the 21 percent surplus any way. Furthermore, the price of the excess return was close to 4 times the volatility and in the worst year was only 71 percent funded, compared to 86 percent funded for the worst year under the 25 percent equity allocation. So speaking for myself only, I would prefer the 25 percent equity allocation over the 100 percent asset allocation.

I work with a number of public sector OPEB plans that weren't pre-funded until a few years ago. Their assets as a percent of the accrued liability can be expected to be small in the first few years and gradually increase over time. In the first years, the asymmetric nature of investment returns should be no concern. The Plan Sponsor may select an aggressive investment policy after being aware of the risks at that time. However as the plan becomes better funded the old investment policy may no longer be appropriate for the plan.

For example, let's say the plan has a choice of two investments. Under Investment A, over the next 3 years, there is a 50 year percent chance that the investment will increase 95 percent (25 percent per year), and 50 percent chance that the investment will lose 15 percent (minus 5 percent per year). The expected return is 10 percent per annum. Under Investment B, the plan will earn a guaranteed rate of 5 percent per year.

Let's say that the Plan is currently 30 percent funded, and let's leave aside the issue of accruals, future plan contributions and other plan experience. Under Investment A if the investment pans out, then after three years the Plan will be close to 60 percent funded, but if things do not work out the Plan will be about 25 percent funded. Under Investment B, the Plan will be 35 percent funded after three years. The Plan Sponsor could well decide that Investment A is a better Investment than Investment B.

Now let's look at the same choice for the same OPEB plan in the future when it is 85 percent funded. Under Investment A, if the investment pans out, then after three years the Plan will be over 165 percent funded, but if things do not work out the Plan will be about 73 percent funded. Under Investment B, the Plan will be 98 percent funded after three years. Investment B would appear to be the better option. Even if Investment A panned, out the extra overfunding may not be very useful to the Plan Sponsor. Indeed there could be pressure to improve benefits, and if the Plan stayed with Investment A and over the next three years the investment did not pan out, there could be future underfunding. While the choices are exaggerated, this did happen to some pension plans that enjoyed stellar returns in the 1990s, improved plan benefits and then experienced the poor returns of the 2000s.

The back-testing paper talks about an investment strategy where a Plan gradually invests more conservatively as the Plan becomes better funded. This kind of investment thinking is very useful to an OPEB Plan that is gradually becoming better funded, or perhaps a Pension Plan that is currently poorly funded and hopes to be better funded in the future.

In summary, I think this paper is also important for pension actuaries as well as investment actuaries.