Finance Theory and the Structure of Pension Obligations

By Harold Bierman, Jr., PhD

In 2011, the Journal of Investment Consulting devoted an entire issue (volume 12, number 2) to the global pension crisis. This article builds on that issue and looks at the basic way that pension plans are organized. Is it better for a pension sponsor to have a defined contribution or a defined benefit plan? A defined benefit plan can result in total liabilities exceeding the plan’s assets, with the plan’s sponsor not in a position to supply the additional assets necessary to keep the plan solvent.

Anson (2011b, 16) estimates the excess of liabilities to assets of public pension plans in the United States to be between $450 billion and $2 trillion. If these underwater contracts are enforced with no material increases in returns earned by the plan’s assets, the results could be extremely upsetting to the populations of those sponsoring the plans.

Around the world, countries, states, cities, corporations, and other entities have contracted with present and past employees to supply future pension benefits. In this article, we consider the logic of these pension obligations given what we know of finance. Finance theory tells us only a very small subset of investment assets will give a certain return over a period of time. The return from more than 99 percent of investments is uncertain, even with the best of strategies.

Two types of pension obligations are considered in this article: defined contribution plans and defined benefit plans. With defined contribution plans, assets are set aside and payments to participants depend on the amount earned by the fund’s assets, so pension payments vary accordingly. If the actual payout is less than the payout target, pensioners are out of luck. In the past, this model was widely rejected because it did not guarantee a cash flow that would enable the recipient to maintain a generously defined lifestyle.

The world has many variations of defined contribution plans; Ezra (2011) provides an excellent review of the alternatives in the contribution plan set.

The second type of pension fund is a defined benefit plan. The plan sets aside an investment fund planned to be sufficient in value to fund pension payments to all the recipients for as long as they live. The size of the fund necessary to achieve the objective depends on many assumptions, including lifestyle, expected lifespan, administration costs, and expected return.

Consider, for example, a fund that needs $100 10 years hence. Any finance practitioner can define the cash needed today to buy an investment with zero risk of default that will pay $100 in 10 years. But if cash receipts and payments between years zero and 10 do not add up to $100, then it is uncertain (i.e., the probability is not equal to 100 percent) that the fund will have $100 in year 10.

Also, if the fund manager thinks the sum needed now to have $100 at year 10 with probability equal to 100 percent is too large, the manager might turn to more-risky alternatives with higher expected returns. By definition, $100 might or might not be available at year 10. One does not earn a larger expected return than the default-free return without a probability that the actual return will be less than the default-free return. Anson (2011b) provides an excellent description of this tradeoff.

Many pension funds have total assets that are less than the sum of the present value of their obligations. Many cities and school districts today will not be able to pay future retired employees given the necessity of paying current employees. Pension promises were made assuming rates of return that have not been realized. Finance theory does not provide us with the ability to forecast actual future investment returns on assets with expected yields larger than the risk-free return on riskless assets.

To achieve 100-percent probability of being able to pay a pension obligation at a given future date, the fund can invest in a zero coupon bond that has 100-percent likelihood of payment, where the bond’s maturity value is equal to the amount needed by the pension fund.

If zero coupon bonds are not available, the fund can invest in a portfolio of securities that has the same duration as the duration of the pension liability. This financial strategy requires that the duration of the assets be equal to the duration of the liability through time. But for the future value of the assets to be equal to the future value of the pension liability, finance theory requires that all forward interest rate changes at a given time must be equal. This, of course, is unlikely.

Budget surpluses could be used to bail out underwater pension funds, but this also is unlikely given that the operating budget is already negative. Additional financial obligations cannot be accepted when current expenses cannot be funded.

Pension contracts written in the past by administrators who were too optimistic are too prevalent today. At a minimum, additional employees should not be admitted to the terms of these agreements. It makes no sense to promise pensions to employees when...
there is a large probability that the organization will not have the resources to make the payments. History shows that sometimes common stocks have zero or negative yields for periods of 10 years or longer. A pension fund cannot rely on the stock market to help it pay outsized pension obligations.

The defined benefit model is not based on good finance theory. No organization that does not print money can promise that it can come up with vast amounts of money for future pensioners. This is particularly relevant where the payments are promised in real purchasing power. Obviously, a defined benefit plan can survive if the people being promised payments in real purchasing power are a very small percentage of the population, and if the rest of the population is willing to subsidize the recipients. But such a system is not likely to be sustainable. People paying more into the plan likely will tire of supporting the group receiving pension payments.

What do I recommend be done with current pension contracts that are too costly for the parent entity? Courts must decide on the extent that past mistakes can be allowed to penalize pension-paying entities long after the original contract was agreed to. If no new employees are added to the pension list, at least this problem eventually will disappear. In the short run, a compromise where everyone is hurt a little is better than a solution where some innocent parties are hurt a great deal.

I am against making promises to pay out pension funds that are not currently possessed and may never be possessed. Defining the payments when the funds used to make the payments are uncertain is not a good financial arrangement.

Conclusions
To obtain a solution to the pension fund problem, we must return to the defined contribution plan. The amount to be contributed can be defined by contract. The future pension payments should depend on the contributions and the amounts earned. It would be nice to promise a large amount to each pensioner with the amount adjusted for inflation, but in the real world this arrangement is not always financially feasible. What might seem feasible and socially desirable today is likely to be impossible tomorrow. The limitations of finance theory prevent the successful execution of a defined benefit plan.

People have a responsibility to provide some of the financial resources for their own retirements. Public and private pension resources should be supplements to personal savings.

Replacing defined benefit plans with defined contribution plans does not solve all the problems of pension planning. Questions of how much to accumulate in pension funds and how much to withdraw and at what rate still remain, along with questions about the optimal mix of the investment portfolio. But agreeing on this fundamental shift from defining the benefits to defining the contributions would be a solid move in the right direction.

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References