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Better Strategy for Defined Benefit Pension Plans

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Pension Investing Reality

Although it may seem counterintuitive, the real expected cost of funding a defined benefit pension plan is independent of the chosen investment strategy. Said another way, it is more appropriate to consider cost savings associated with investments in stocks as nothing more than compensation for taking on the increased risk that investing in stocks entails. It may, over time, actually turn out to be cheaper, or it may turn out to be more expensive. But on an expected ex ante market pricing basis, the law of one price prevails.

While pension costs *per se* can be considered independently of investment strategy, the volatility of costs cannot. Many defined benefit plan sponsors are acutely aware of this volatility and are freezing or terminating their defined benefit pension plans. This is a shame because costs for a defined benefit plan can be both affordable and predictable. But it requires an appropriate investment strategy, and a commitment to stick with it. Before freezing or terminating a pension plan there's another alternative to consider: restructuring the investment strategy to bring this cost volatility back under the plan sponsor's control.

Law of One Price

One of the tenets of modern market theory is that markets are reasonably efficient and at least "near" arbitrage-free. There are so many professional investors and money managers actively involved with financial markets that arbitrage opportunities are quickly exploited and priced away. In this near arbitrage-free environment two securities with identical future cash flows should have identical market prices, hence the law of one price. If they do not, arbitrageurs will buy the cheaper and sell the more expensive until prices converge.

Like other financial instruments that are assets to the purchaser and liabilities to the issuer, the liabilities of a defined benefit pension plan are simply future cash flows. Clearly these future cash flows can be uncertain, contingent on future events such as death, disability, early retirement, termination, etc. Nonetheless, we have many tools at our disposal today for pricing such uncertain cash flows, and Wall Street actively engages in pricing uncertain future cash flows every trading day.

Using modern pricing tools and techniques we can calculate the current market price of a defined benefit pension plan's liabilities. This market price not only reflects the current cost of the liabilities, it also reflects the lowest current cost of any portfolio of securities that will meet the future liability obligations when due. No other portfolio of securities can do that at a cheaper cost. If a cheaper portfolio exists, then arbitrage opportunities exist in the market.

Higher Expected Returns

It is perhaps common to believe that higher expected future returns for stocks imply lower expected current funding costs for liabilities. This is false. It is certainly true that $100 invested in the stock market today may be worth more, at some future time, than $100 invested in the bond market. And it is entirely consistent with arbitrage-free markets to expect that, on average, the future value of $100 invested in the stock market will be greater than the future value of $100 invested in the

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bond market. For example, we may expect stocks to return 10 percent and bonds to return 5 percent, hence we expect $100 invested in the stock market to be worth $110, and $100 invested in the bond market to be worth $105, in one year's time. With this perfectly reasonable market framework, let's say we borrow $100 in the bond market at a fixed interest rate of 5 percent, and invest this money in the stock market. We expect to earn 10 percent on our stocks, and hence expect to have a $5 profit at the end of the year. What is that $5 expected profit worth today?

One valuation approach could be to discount that $5 expected profit at the risk-free rate, in our example, 5 percent. On this basis the present value of our future expected profit is $4.76. Another approach is to discount the expected profit at the risky asset rate, *e.g.*, 10 percent. This leads to a present value of $4.54.

What present value does the market give to our expected future profit? Another way of asking this question is what does it cost today to replicate the exact payoff pattern given in our example? In this example we borrowed $100 in the bond market and invested $100 in the stock market, so our net cost today for our future expected profit is zero. Hence, on a market-pricing basis, the present value of that $5 expected profit is zero. If you are willing to pay more than zero today, then you are giving someone else the opportunity to arbitrage, to earn a risk-free profit.

	Current Cash Flow	Expected Future Cash Flow
Bond	+$100	-$105
Stock	-$100	+$110
Net	$0	+$5

Let's change our example slightly and assume that we have a liability of $105 due in one year's time. Is it cheaper to fund this future liability payment using stocks (*e.g.*, with $95.45 = $105/1.1) than using bonds (*e.g.*, $100 = $105/1.05)? There is clearly some probability that our stock investment will be worth less than $105. Assuming we are not allowed to default on our liability payment, then we will have to pay the difference from other funds. The present value of this future potential shortfall, on a market pricing basis, is identical to the price of a stock put option with the strike price set 10 percent higher than the current market price. Our real ex ante cost, then, of funding the future liability payment with stock is $95.45 plus the put price to cover the outcomes when stocks return less than 10 percent. The cost of this stock plus put option portfolio can readily be shown to be greater than $100, the cost of funding the liability with bonds. (For example, this put would cost $8.39 using the standard Black-Scholes option pricing formula with an assumed stock standard deviation of 15 percent.) What if we are willing to give up the potential stock upside? What if we are willing to sell a call option with the strike price set 10 percent higher than the current market price? In this case we have locked in our portfolio's payoff at $105, and as we know from the law of one price in arbitrage-free markets, our net cost for this portfolio today is $100.[1]

Pension Plans Today

Accounting rules clearly influence, and often govern, much of corporate behavior. For defined benefit pension plans the ability to discount future liabilities at non-market rates, using non-market methodologies, leads to incorrect estimates of present values of future cash flows, in effect to incorrect estimates of the current cost of a defined benefit pension plan. Discounting future liabilities and estimating future funding costs at expected portfolio returns also leads to a severely biased framework for designing investment portfolios. This biased framework has resulted in tremendous volatility in annual expense for many defined benefit pension plans. This volatility is proving to be unacceptable to many plan sponsors. It does not have to be this way. While ex ante cost is independent of investment strategy, the volatility of cost is clearly not. Portfolios can be designed to control the volatility of future funding costs, in effect to control the tracking error of the portfolio vis-à-vis the liabilities. The cost of providing a defined benefit pension plan may not seem as favorable on a real market pricing basis, but removing an accounting bias from the design of the plan's investment strategy can result in a defined benefit pension plan with a much more predictable, and bearable, expense. ◆

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[1] This can also be shown using the standard Put-Call Parity equation.