



OVERVIEW

Trustees of pension plans have one goal: to ensure that all payments promised to plan beneficiaries can be made. A combination of regulations and accounting rules enacted over the past two decades has resulted in many pension plan sponsors either freezing their plans or moving in the direction of doing so. As part of this process, many plan sponsors have adopted an investment approach known as Liability Driven Investing.

Liability Driven Investing (“LDI”) attempts to match a defined benefit plan’s current assets to the present value of future liabilities. It is utilized mainly by “frozen” pension plans (those closed to new entrants and contributions) to reduce the volatility of future contributions to the pension plan.

This paper provides an overview of LDI, including an assessment of where and why it is used, how it can be implemented, and its benefits and disadvantages.

WHO USES LDI?

LDI reduces the unpredictability of contributions to a defined benefit plan resulting from market fluctuations. LDI is therefore appealing to corporate plan sponsors, as it reduces or mitigates the impact of market fluctuations on closely followed metrics of corporate health, such as earnings and cash flow.

Single employer pension plans are ideal candidates for LDI, in particular corporate plans subject to Financial Accounting Standard (“FAS”) 158, an accounting rule that requires the calculation of future liabilities based on current interest rates.

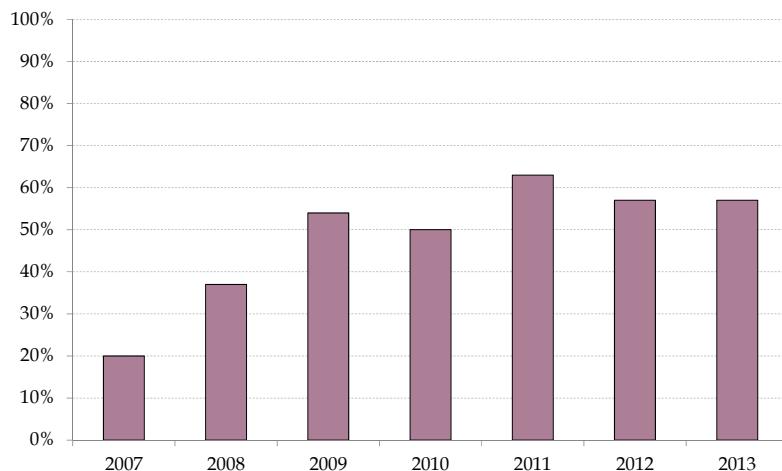
Additionally, single employer plans are required to recognize the impact of market movements on their funding ratios immediately, whereas multi-employer plans are typically allowed to smooth any loss or gain over a period of years. This requirement provides a further incentive for single employer plans to choose an approach which minimizes gains or losses in market value (i.e., by investing in less volatile asset classes). For this reason, an LDI strategy calls primarily for investments in bonds.

LDI is especially appealing to plan sponsors who do not expect their pension plans to operate indefinitely, that is, plans that are not expected to be a “going concern.” This is the case when a traditional pension plan is frozen (and often replaced by a defined contribution plan). In such cases, the plan sponsor usually seeks to make a one-time, up-front contribution that allows them to fully fund the plan and, ideally, not have to make any future contributions.

LDI may be less useful to multiemployer and public funds for both accounting and administrative reasons. Such plans typically utilize a specialized “hurdle rate” that is less sensitive to interest rate movements, reducing the appeal of LDI. Additionally, such plans may “smooth” losses over long periods, lessening the immediate impact of deterioration in a plan’s funded ratio.

Overall, an increasing number of plans are adopting some form of LDI. At the end of 2013, a global Quick Poll conducted by Milliman found that the use of LDI had been adopted by 58% of pension plan sponsors, and that a majority of these plans were using long-term bonds to implement their LDI approach. An SEI survey shows that, since 2009, more than half of U.S. corporate pension plans have used LDI strategies (see the following chart).

Corporate Pension Funds Using LDI



P&I Online: SEI Survey Data (December 2013)

THE IMPLEMENTATION OF LDI

Implementing LDI involves matching the interest rate sensitivity (i.e., duration) of a plan's assets to that of its liabilities, determined by an actuary. Because liabilities are often long-term in nature, the best way to offset their interest-rate sensitivity is by investing plan assets in a portfolio of long-duration bonds.

Plan sponsors can implement liability driven investing through many vehicles. For example, plans can invest in long-term bonds by using a passive (indexed) investment strategy, such as a long-term Treasury index commingled fund or exchanged traded fund ("ETF"). This approach enables a plan to increase duration in a straightforward and inexpensive manner. Alternatively, plan sponsors may employ customized separate accounts run by investment managers. A customized portfolio will enable a plan to more closely match their assets with their specific liability profile.

Alternatively, a plan sponsor may utilize derivatives to implement an "overlay strategy." A derivative overlay can be used to maintain a desired duration while using less of a plan's "capital" (e.g., 25% to 30%). While a derivative overlay approach provides investors with considerable flexibility in design, it should be monitored carefully, as it introduces other operational and investment risks associated specifically with derivatives (e.g., counter-party and mark-to-market risks).

An additional implementation consideration concerns the types of bonds to use. Government bonds are the most widely used securities, as they provide nearly "pure"



interest rate exposure. However, the yield on government bonds is the lowest among fixed income securities, and in recent years that yield has been low in absolute terms, as well. In contrast, corporate bonds have offered higher yields, and thus a higher expected long-term return. Corporate bonds introduce credit risk, however, which must be measured and managed carefully.

THE GLIDE PATH APPROACH TO LDI

Typically, when a pension plan makes the decision to adopt an LDI approach, they implement it gradually. To make a smooth, deliberate transition, a plan may adopt a “glide path” that sets specific milestones for making changes to their portfolio.

The first step in glide path construction is often to increase the duration of the current fixed income investments. The next step will often be to reduce the equity exposure and offset this reduction with an increased exposure to longer duration fixed income investments. Implementation milestones or “trigger points” may be dependent upon market conditions (e.g., prevailing interest rates) or, more often, on a plan’s funding status. In the latter case, as the funded ratio increases, the plan gradually allocates more capital to longer-term fixed income securities. Hence, the reduction in the plan’s funded ratio volatility and expected return will occur gradually rather than all at once.

The following table provides an example of a glide path. In this example, the plan’s liabilities have an average duration of fourteen years. Hence, the asset allocation is designed to match this duration and thus strongly correlate the value of the plan’s assets with the value of its liabilities at every step.

Trigger Point	Step 1 80% Funding	Step 2 90% Funding	Step 3 100% Funding	Step 4 110% Funding
Equity	40%	30%	20%	10%
U.S. Equity	30	20	15	7
Foreign Equity	10	10	5	3
Fixed Income	60%	70%	80%	90%
Long-Term Corporate Bonds	50	62	71	80
TIPS	5	0	0	0
Treasury Zero Coupon Bonds	5	8	9	10
<i>Expected Return (%)</i>	6.7	6.5	6.2	6.0
<i>Std Deviation (%)</i>	10.3	10.2	10.0	10.0
<i>Average Bond Duration (years)</i>	13.1	14.2	14.1	14.1
<i>Average Portfolio Duration (years)</i>	7.9	9.9	11.3	12.7
<i>Correlation to Long-Term Bonds</i>	0.81	0.91	0.97	0.99

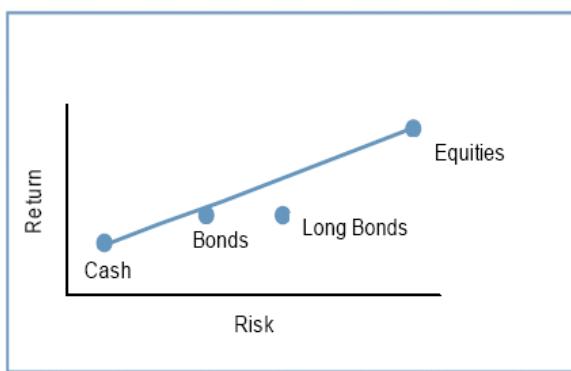
This approach has designated trigger points which represent various funding levels at which the plan shifts its asset allocation. The benefit of this gradual approach is that it maintains sufficient return potential to reach funding goals for underfunded plans, while also systematically increasing the match between the plan’s assets and its liabilities. The glide

path allows a plan sponsor to gradually move a pension plan to fully funded status rather than making a single, potentially large, initial contribution.

WHY LONG-TERM BONDS?

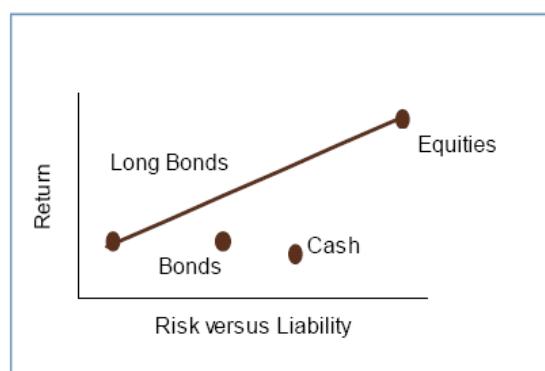
Because long-term bonds offer modest return potential but a high amount of volatility (due to their extended duration), they are often not included as optimal investments on the efficient frontier of assets. However, when comparing risk versus liabilities, they are the optimal investment for investors seeking to minimize the volatility of the difference between their assets and liabilities. The following two charts examine the volatility of long-term bonds from two perspectives.

Figure 1. Absolute-return efficient frontier



Source: Vanguard.

Figure 2. Liability-efficient frontier



Source: Vanguard.

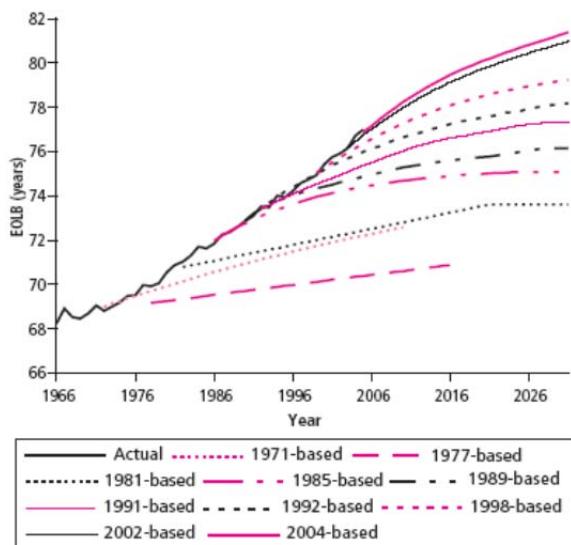
CONCERN WITH IMPLEMENTING LDI

The main drawback of an LDI strategy is opportunity cost. A pension plan that is invested primarily in bonds will have an expected return lower than a plan that invests much of its assets in equities. This cost can be significant (e.g., a long-term bond portfolio would give up an estimated 400 to 600 basis points per year relative to equities). Hence, over the long term, the LDI plan will likely require either higher contributions or lower benefits. These reasons are why LDI is adopted almost exclusively for pension plans that are no longer going concerns.

A gradual approach to LDI implementation will partly mitigate opportunity cost, and properly position a fund to survive market downturns. For this reason, it is important that the investment advisor work closely with a plan's actuary to determine the proper funding status at which to begin reducing equity exposure.

Another risk inherent in the LDI approach is the uncertainty surrounding liability calculations; there is potential for a large difference between the expected future liabilities and the actual future liabilities. Many factors go into the calculation of the estimated liabilities of a plan. Assumptions include life expectancy, retirement age, and inflation. Such numbers are estimates, which makes the matching of assets and actual liabilities difficult. In

the case of life expectancy, for example, the actuarial profession has systematically underestimated its growth in the past. A study conducted by David Blake, Director of Pensions Institute, in April 2010 demonstrates the historical inaccuracies in life expectancy estimates based on males living in the United Kingdom (see the following chart).



Notably, rising interest rates will have a much greater impact on an LDI fund than a conventionally managed fund. This is because when interest rates rise, bond prices fall, and longer duration bonds are far more sensitive to interest rate fluctuations. However, this may not be as significant a risk to a plan that is fully funded and fully immunized.

SUMMARY

LDI attempts to match a pension plan's current assets to the present value of its future liabilities. It is utilized mainly to reduce the volatility of future contributions to the pension plan. It is usually implemented through the use of long duration fixed income securities.

LDI is most appropriate for single-employer plan sponsors that are considering freezing or have already frozen their pension plans. If an LDI approach is implemented properly, it can provide defined benefit plans with a greater likelihood of paying all future liabilities to the plan's beneficiaries, primarily by matching the market risk of its assets to the market risk of its liabilities.

LDI is much less appealing for public or multi-employer plans. The different accounting rules that govern such plans - using an assumed rate of return as a discount rate and the ability to smooth market value gains and losses - give them greater flexibility. Therefore, switching to an LDI approach, with its lower expected return, would likely impact the plan in a way that most beneficiaries and sponsors of these plans would consider to be negative.