

**I**n its general meaning, liability driven investing (LDI) refers to an investment strategy that is aligned with the liabilities of an investor and explicitly considers their stochastic nature. LDI topics are therefore primarily discussed in the context of pension investing with its long term retirement provisions, and in connection with the life insurance business holding rather complex liability structures.

The need and reasoning of aligning asset investing with liability obligations, known as asset liability management, is therefore not new in these businesses. What is new is the framework of new accounting and regulatory standards in which these institutions invest.

This article mainly focuses on companies that follow a market orientated strategy which is induced, for example, by these altered financial reporting standards.

### Accounting boosts LDI

We can identify the growing focus of international accounting rules on market values for both liabilities and assets (see IAS19 or FR517) as one of the main drivers for LDI. This greater accounting transparency came hand in hand with a new risk scenario in recent years due to adverse developments in interest rate and stock markets. Some pension funds, with strong sensitivity to changes in interest rates and inflation, and with a profound exposure to biometric risks, have come under intense pressure.

The decreasing interest rates have seen the market value of liabilities soar. Inflation typically affects the value of the liabilities two fold – once through indexing pension payments during the retirement phase and also through higher salary payments in high inflationary environments during the accrual phase.

If these rather complex effects are not taken into account properly when setting up investment plans, mismatch risks can put pension funds in trouble.

Considering the market developments in recent years, the shortcomings of purely asset-driven investment strategies became obvious. And due to the problems of underfunding, regulatory requirements for pension funds, retirement funds, superannuation funds and insurance companies in nearly all western countries were tightened. The current discussion about Solvency II indicates a further trend in this direction and underscores a growing demand for new solutions.

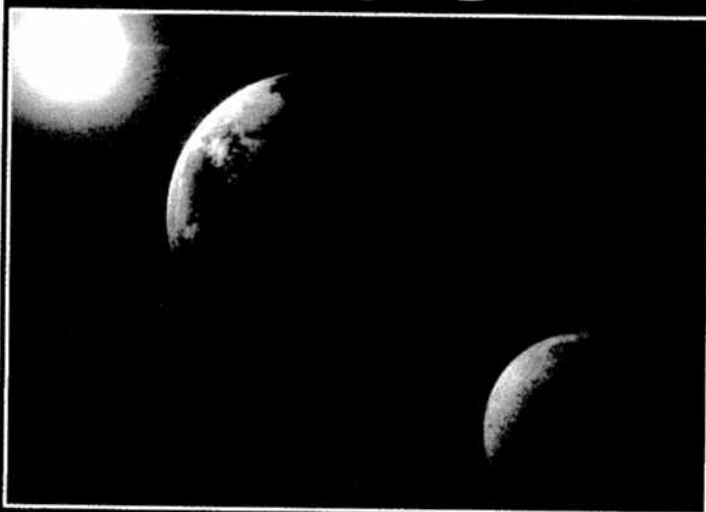
In practice we find different LDI approaches to model the pension funds' individual situation. Figure 1 shows three concepts which depend mainly on the accounting and regulatory context with different approaches to model liabilities and assets. It considers different investment policies and applies different views for the optimisation problem regarding the fund's goals and risk constraints.

(a) In the context of HGB-Accounting for example, the characteristics of the stochastic liabilities can often be reduced to a simple target return level describing the average growth rate of (book) liabilities. With this, we can set this specific return requirement as the target level for the assets. Thus the LDI problem is reduced to an "absolute return" investment task, which can be solved applying intelligent dynamic asset strategies focusing on asset return and asset risk profiles.

(b) The traditional approach of "surplus optimisation" aims to optimise the asset portfolio relative to the liabilities, where the relation is typically expressed in terms of a funding level or the surplus of assets over liabilities.

With that, the basic idea of LDI is addressed rather explicitly. In most cases, the liabilities are modelled simply as deterministic cash flows of expected future pension payments as they are provided by the actuarial report. Based on expected cash flow projections, market values of the

# Aligning contrary goals



In this tighter regulatory environment, Reinhold Hafner and Gerhard Scheuenstuhl claim dynamic LDI strategies can bring pension funds' long term investment perspective in line with short term risk control

obligations can also be calculated and stochastic influences of discount rates can be integrated. In combination with a stochastic modelling of assets, a static portfolio allocation is optimised with respect to investors' preferences on "surplus return" and "surplus risk" regarding the behaviour of the funding level as the relevant decision figure. Interactions of assets and liabilities, scenario-specific cash flows over time, or conditional dynamic investment behaviour are usually not taken into consideration within this approach.

(c) The integrated ALM fully reflects the concept of LDI. It offers an extended holistic investment approach to provide a broader and business oriented perspective on investment and risk management.

The systematic LDI process starts with a thorough assessment of the stochastic characteristics of the underlying liabilities and their sensitivity to all relevant risk factors. These risk factors, like inflation, the term structure of interest rate, and the growth rates of salaries need to be modelled individually and consistently.

Based on a set of different scenarios of possible future economic environments a consistent stochastic description of liabilities will be given. This stochastic modelling of liability behaviour goes far beyond the traditional actuarial modelling with its deterministic (expected) cash flows. The subsequent identification of a liability benchmark serves as a first indication of the characteristics needed on the asset side.

On the return side a sponsor might want to minimise the net financing cost of the given obligations. Including effects on profit & loss statements, balance sheet ratios or liquidity status requires the explicit consideration of accounting rules (like IFRS) and solvency requirements possibly imposed by regulators.

The scenario projection of key decision variables over a multi-period investment horizon then shows a realistic impact of an investment decision in the investor's individual setting.

The integrated modelling approach enables

identification of different efficient liability orientated investment portfolios.

### Bespoke solutions

Choosing the "liability matching portfolio" reflects the attitude of a strongly risk averse investor. It embodies an immunisation strategy with respect to the liabilities in order to avoid any financial risk in the pension fund.

This view is often expressed following the argument that in order to maximise shareholder value, a company should assume only risk related to their operative core business and not in connection with pension investing because the required risk capital to cover financial risks can be used more efficiently in the operative part.

Depending on the desired hedging intensity, different strategies and related products are available including pooled LDI funds to enable duration-matching and the construction of a direct "cash flow matching" portfolio. Long term and inflation linked bonds are likely chosen as risk minimising vehicles for the asset allocation. In this context LDI is called "long duration investment strategy". Unfortunately, the possibilities to construct an efficient hedge to net off mortality risk are rather limited.

Only a few and not very liquid "longevity bonds" are offered in the market and in most cases they embody a high basis risk related to the individual mortality exposure. Thus, perfect liability matching is not achievable under practical conditions.

A reasonable approximation under realistic conditions is what we call the "liability defensive portfolio". This portfolio exhibits a reasonably small amount of tracking error relative to liabilities.

The "liability balanced portfolio" would be preferred by a fund that wants to limit liability risks but also intends to generate additional investment return through its asset portfolio in order to reduce, for example, the financing costs of its promised obligations or to provide the necessary services to be successful in a competitive business environment.

Depending on its risk preference and risk capabilities, the fund will choose either a balanced investment portfolio with moderate risks or a more aggressive investment portfolio with higher risks but higher return expectations.

Finally, new accounting and regulatory standards demand sufficient capital to cover all liabilities on an ongoing basis. With that, the inherent long term investment perspective of the underlying pension obligations is practically substituted by a short term risk view. This forces the pension fund to keep the difference between asset and liability values low to minimise short term fluctuations in the funding level.

A static investment strategy has to be very defensive if it wants to be risk adequate under all probable market movements. The price will be foregoing opportunities for return. Dynamic LDI strategies can provide a solution for this trade-off dilemma: Depending on the available risk budget, the asset allocation is dynamically adjusted so that different portfolios along the efficient frontier are conditionally chosen over time.

The DSP-LDI strategy, for example, which we developed for this particular situation, allows the investor to react dynamically in different market environments and provides, in times when risk budgets are low, a near-perfect hedge of liability risks by holding a portfolio with matching characteristics. When risk budgets are high it provides return chances by holding a portfolio with liability opportunity characteristics. In total, it combines the return advantages of an aggressive static asset allocation with the risk advantages of a liability matching strategy.

Summing up the new trend of LDI, we find that in the new regulatory context, an integrated asset liability optimisation approach tends to become the necessary framework for comprehensive decision-making.

This is especially relevant in the rather complex world of pension investing with pronounced changes in (book and market) values and many interdependencies between assets and liabilities. Moreover, dynamic LDI strategies are an efficient and flexible tool to control market value risks over time and bring the long term investment perspective practically in line with short term risk control.

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Figure 1: Different LDI modelling approaches

Approach	Liability-Side	Asset-Side	Investment Policies	Portfolio Optimisation Risk Return Trade Off
Absolute Return	Deterministic (define a target return level)	Stochastic	Static / Dynamic	Asset: Return and Asset Duration Probability
Traditional Surplus Optimisation	Deterministic (expected cash flow stream of future pension payments)	Stochastic	Static	"Surplus Return" and "Surplus Volatility"
Integrated Asset Liability Optimisation	Stochastic (depending on market risk factors)	Stochastic (depending on market risk factors)	Dynamic and contingent strategies	"Surplus Liability" and "Surplus Risk Constancy"

Source: Allianz Global Investor