Russell
Investments

Hedge long first

An alternative approach to LDI

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In this paper, we describe a new approach to liability-driven investing (LDI) and introduce a new term into the LDI lexicon: hedge long first. Hedge long first, or HLF, pays more attention to some liabilities than to others. Specifically, it concentrates on the longest-dated liability cash flows. To illustrate the impact of this approach, we will contrast it to an LDI approach which places equal weight on all liability cash flows, and which we will refer to as "liability-weighted" LDI, or LW for short.

The difference between the two approaches arises because most LDI portfolios are much smaller than the liabilities that drive them. For a fully funded plan, with a 100% allocation to LDI, the HLF portfolio would be the same as the LW portfolio; this might be thought of as the theoretical ideal hedging portfolio.

But there is a divergence between the two approaches if – as is almost always the case in practice – the assets that are devoted to LDI are less than the liabilities of the plan. The LW approach uses a scaled-down version of the theoretical ideal hedging portfolio. The hedge long first approach, in contrast, would retain in full the longest-dated holdings and retain fewer shorter-dated holdings. This approach results in a portfolio which has longer duration, i.e. is more sensitive to changes in interest rates.
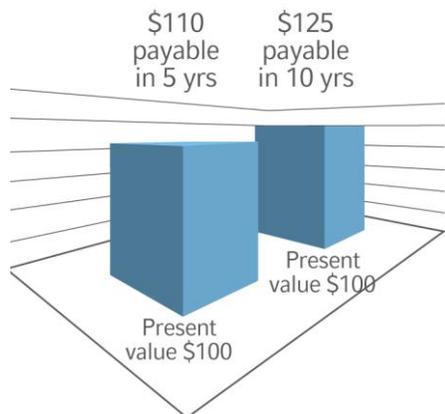
Illustrative example of HLF versus the LW approach

To reduce the concept to its simplest form, consider a pension plan which has liabilities consisting of just two benefit payments, $110 in five years and $125 in ten years. Suppose the discounted value of each of the two payments is $100, so that the present value of the total liability is $200.

Suppose, further, that two investments are available that exactly match the two benefit payments. If $200 were allocated to LDI, there would be no difference between the LW and HLF approaches: under either approach it would be possible to fully hedge the liabilities of the plan by investing $100 in a five-year zero-coupon bond (which would pay $110 in five years) and $100 in a ten-year zero-coupon bond (which would pay $125 in ten years.)
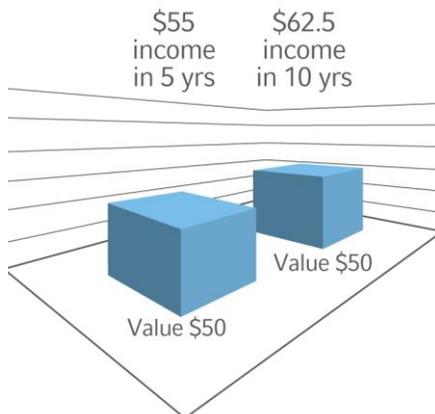
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But now suppose the LDI allocation is not $200, but $100. Under the LW approach, the portfolio would consist of $50 in the five-year bond and $50 in the ten-year bond. Under HLF, however, the $100 would be invested entirely in the ten-year bond.
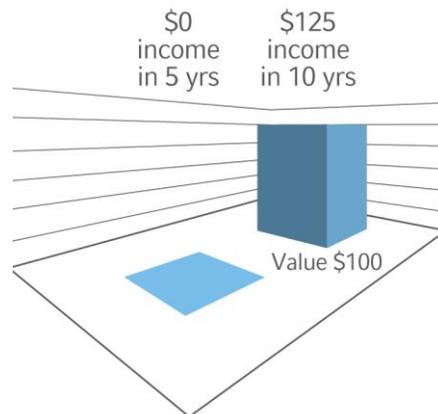
Liabilities

$110 payable in 5 yrs

$125 payable in 10 yrs

Present value $100

Present value $100

Assets (LW LDI)

$55 income in 5 yrs

$62.5 income in 10 yrs

Value $50

Value $50

Assets (hedge long first)

$0 income in 5 yrs

$125 income in 10 yrs
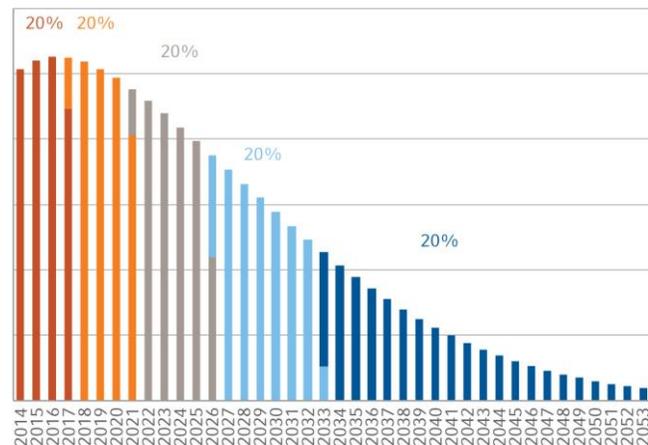
Value $100

The case for hedge long first

The case for HLF is based on the idea that not all liabilities are created equal: some represent more risk than others. In the simple example above, the five-year and ten-year benefit payment each represent 50% of the liability value, but the ten-year payment represents more than 50% of the total risk because its value is more volatile in the face of interest rate movements. For a parallel yield curve shift, the ten-year benefit payment would represent around two-thirds of the total risk in this example.

A more complex example is shown below[1]. This is a representative plan that has total liabilities of $1,000, and an average duration of 12 years. Each 20% of those liabilities is represented by a different color in the chart below: the cashflows in red are between 1 and 4 years, and represent a liability of $200 (with an average duration of roughly 2.4 years); in orange are cashflows between 4 and 8 years, again with a value of $200 (and average duration of around 6.1 years); the longest-dated liabilities (in blue) are those of 19 years and longer (these have an average duration of 25.8 years.)
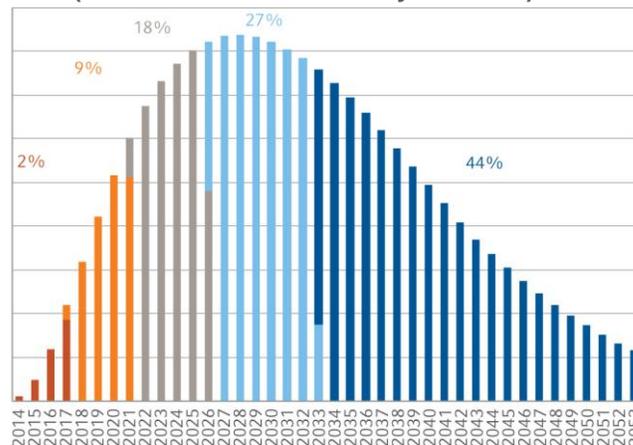
While each of the 5 subsets of the cashflows represents $200, or 20% of the total liability, they carry different levels of risk for the plan. The shortest-dated liabilities represent just 2% of the total variance of the liabilities. The longest-dated liabilities represent 44% of the total variance. The HLF approach begins by matching those liabilities that have the most potential impact on the plan sponsor's pocket.

> *The case for HLF is based on the idea that not all liabilities are created equal: some represent more risk than others.*

Liabilities

20% 20% 20% 20% 20%

2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053

Risk (i.e. contribution to liability variance)

2% 9% 18% 27% 44%

2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053

For a given allocation to LDI, HLF therefore offers the prospect of a greater reduction in surplus volatility (and a higher hedge ratio) than the LW approach. Alternatively, HLF offers the possibility of the same level of total plan surplus volatility with a smaller amount of LDI assets (i.e. more assets can be allocated to the return seeking portfolio). This application may appeal to investors who are unwilling to increase their hedge ratio given the current low level of interest rates.
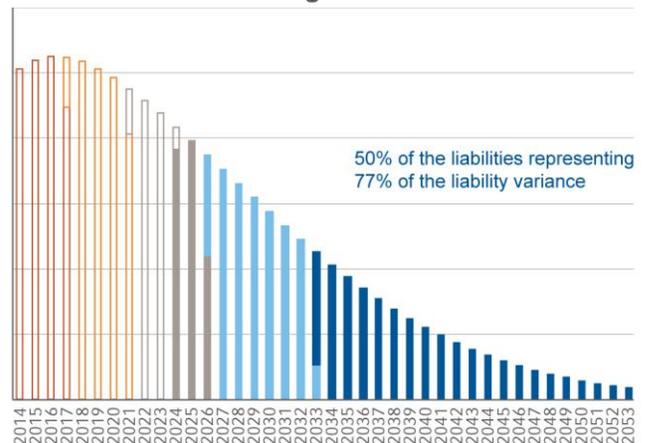
The HLF approach is described above in terms of which part of the theoretical ideal hedging portfolio is kept if less than 100% of the liabilities are hedged. It is also possible to think of it in terms of which part of the liabilities is being hedged: this is illustrated below.

Under the LW approach, liabilities of all durations are hedged pro-rata, so the chart fills from the bottom up. Under HLF, the longest liabilities are hedged first, so the chart fills from the right.

LW approach hedges part of the liabilities

50% of the liabilities representing
50% of the liability variance
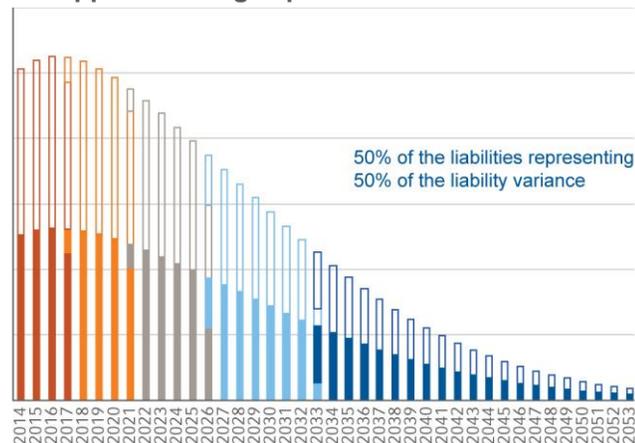
HLF focuses on the longest liabilities

50% of the liabilities representing
77% of the liability variance

The effect can be material. In the representative example shown above, we estimate that the volatility of the plan shortfall would be reduced by roughly 21% under the HLF approach. To achieve a similar reduction using the LW approach would require an extra allocation of slightly more than 10% to the LDI portfolio, raising the total LDI allocation above 60% and reducing the expected return on the portfolio by some 33 basis points.

Extended HLF

The single most important reason that HLF is more effective at reducing surplus volatility is that, for a given allocation to LDI, it has a longer duration than LW (i.e. greater sensitivity to changes in interest rates.) It is possible to extend duration even further by abandoning the link to the year-to-year liability cash flows and focusing instead on the broad liability characteristics – most notably duration. For example, in the illustrative example with which we started, the $100 asset portfolio could be invested entirely in a 15-year zero-coupon bond in order to give the asset portfolio the same dollar duration as the liability portfolio.

It is therefore possible in practice to broaden the concept of HLF into a wider category of extended duration strategies, offering even greater flexibility in the pursuit of LDI objectives.

Further considerations

While simple in concept, the HLF approach gives rise to a number of considerations. These include:

* The illustrative example above is highly simplified, concentrating on just one aspect of LDI portfolio management. Portfolio construction may be more challenging in an HLF context than under the LW approach. In particular, the availability of instruments to achieve an effective hedge is more limited at long durations and transactions costs need to be taken into account.[2]

In the representative example shown above, we estimate that the volatility of the plan shortfall would be reduced by roughly 21% under the HLF approach.

- HLF substitutes longer duration bonds for shorter duration bonds, and tactical considerations will come into play on the timing of this move to the extent that the investor has specific expectations regarding interest rate movements at different parts of the yield curve. In particular, investors seeking to position their portfolios for an increase in interest rates or a steepening of the yield curve[3] would not choose to lengthen duration.

- The longest dated investments in an LDI portfolio tend to be Treasury rather than credit. HLF therefore may have the side-effect of a lower exposure to credit and hence to the credit risk premium, although it is generally possible to compensate for this in the implementation of the strategy[4].

- Unlike the LW approach, HLF does not directly manage the tracking error of the LDI portfolio in isolation against the return on the liability. This may have implications for the benchmarking of portfolio performance.

- Finally, because HLF reduces the risk associated with "hibernating" the plan, it may make it easier to defer risk transfer activity (such as pension buyouts) and hence reduce the ultimate cost of this activity[5].

There are therefore a number of issues involved in the effective implementation of the HLF approach. Nonetheless, we believe that for plan sponsors eager to reduce the volatility of their pension funding without allocating additional assets to the LDI portfolio, it offers a potentially attractive new approach to LDI management.

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[1] This example is based on RiskMetrics data, as of June 30, 2014. This model includes allowance for the different volatility of long-term and short-term interest rates, and hence does not assume only parallel yield curve shifts. Liability cash flows were created using the SCG approach with parameters 11.3 and 0.4, giving an average duration of 12 years using the June 2014 Merrill Lynch A-AAA yield curve. See Collie (2012) "The SCG Standard Cashflow Generator: Parameterizing pension cashflow projections as the basis for LDI".

[2] Derivatives offer greater flexibility but raise other issues, and we have treated them as beyond the scope of this paper.

[3] That is to say: investors who expect increases or steepening greater than is priced in to the market. See Gannon (2013) "Rates rise, and you lose. Right?"

[4] Treasuries do, of course, offer greater flexibility and lower costs. We would also note that increased duration implies an increased scope to earn the term premium.

[5] See Gannon (2014) "Hibernation versus termination: Evaluating the choice for a frozen pension plan" for the considerations that apply to the timing of pension risk transfer activity.

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