

Perspective



Managing an unwanted risk for defined benefit pension funds

By Mick Moloney

It might surprise you, but the typical investment strategies pursued by defined benefit (DB) pension funds bear a striking resemblance to those used in long-short hedge funds. So how does this happen, and does it matter?

A typical DB fund has a set of liabilities that behave like a mixture of inflation-linked and nominal bonds. The assets it will typically hold, however, rarely consist entirely of bonds designed to match the underlying liability. Most often, assets consist of some combination of equities and a broad range of actively managed bonds. In other words, the fund has a “short” position in long-dated bonds and is “long” in a set of unrelated assets. As a result, the fund and its sponsor are exposed to financial market volatility from two sources:

1. fluctuations in the value of its asset portfolio driven by movements in investment markets; and
2. changes in the value of liabilities driven by movements in yield curves.

This typical strategic position may well have evolved from an expectation that the non-bond assets will outperform bonds, resulting in an excess return. The added return brings with it the acknowledged volatility inherent in these typical asset values. Liability volatility, on the other hand, is often poorly understood, largely unmonitored (with the exception of triennial actuarial reviews or perhaps consideration of annual accounting disclosures), and has rarely been actively managed. Historically, this has largely been the case because few tools were available to mitigate risk. But explosive growth in interest rate swap and derivative markets proves this no longer true.

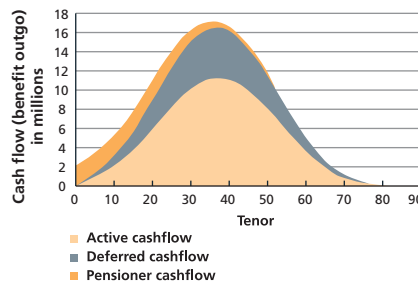
“Going short” or “shorting,” means selling a security you don’t hold by borrowing shares from a broker on the expectation that its price will fall. By contrast, “going long” means holding or buying more shares of a given security on the expectation that its price will rise, resulting in a profit once sold. A hedge fund is a type of investment fund that seeks to generate returns by using non-traditional investment strategies, often implemented through use of derivative contracts. A “long-short” hedge fund is one comprised of both long and short positions in the same asset class or market.

This article considers the issues underlying active management of pension fund interest rate exposure and offers practical ways of adopting some of the solutions now available.

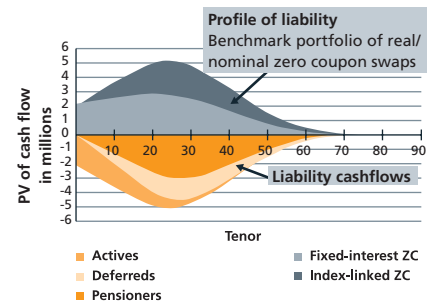
The nature of interest rate exposure – A hedging strategy

The chart on the left below shows a typical profile of projected cashflows from a DB pension fund. While many details of these cashflows are unknown, the closest available hedging asset will be a portfolio of zero coupon real and nominal bonds. The chart on the right illustrates such a portfolio, where the present value of liability cashflows is shown as a short (or negative) position and the hedge portfolio is shown as a set of positive zero coupon bond redemptions. Cashflows have been discounted for this purpose based on an appropriate zero coupon yield curve. As this yield curve moves, liability values will move accordingly. If liabilities have been hedged, then assets will move in line with changes in the discount rate used to value liabilities, and funding will be stable.

Profile of projected future cashflows

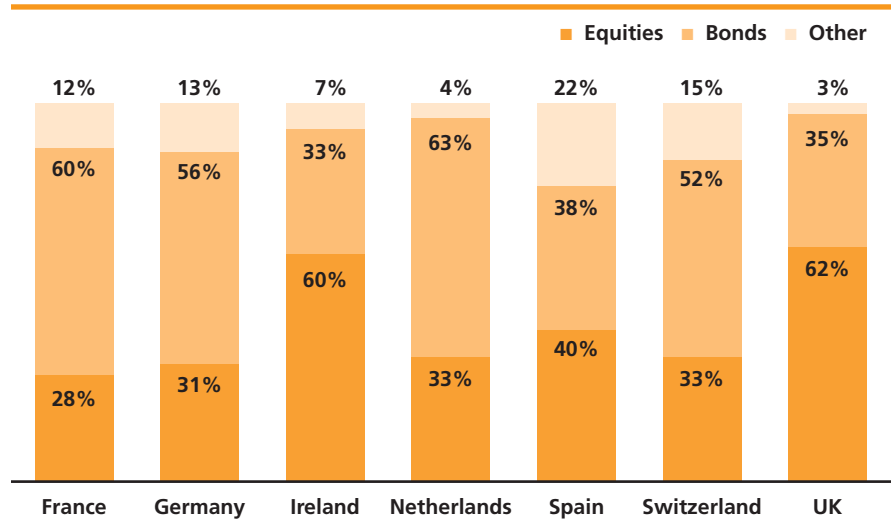


Derivation of implied hedge portfolio



Are funds typically pursuing such a hedging strategy?

This table sets out some European data on asset allocation.



Source: Mercer Investment Consulting European institutional market place overview 2006

"... investment in equities provides little direct protection against changes in interest rates and inflation..."

This recent [survey](#) of 574 of our European institutional pension fund clients (see chart above) suggests that the answer to this question varies by country, but that pension funds continue to hold significant positions in equity markets.

A closer look at the issue of interest rate risk

For funds with unhedged positions, interest rate risk (real or nominal) arises from three sources:

■ A large allocation to equities

Theoretically, the price of equities is derived from discounting future expected dividend payments, which implies a relationship between equity prices and the level of interest rates (or more precisely the level of real interest rates). Theorizing a positive correlation between equities and bonds seems reasonable, considering the impact of interest rates on corporate financial expenses.

But a correlation of around 0.2 to 0.3 between equities and medium-dated fixed interest bonds of major developed markets, rather than a correlation of 1, would be consistent with past observations (correlations between equities and index-linked bonds have tended to be even lower). Moreover, this correlation is very volatile, depending on the particular observation periods chosen.

Hence, investment in equities provides little direct protection against changes in interest rates and inflation, and therefore leads to interest rate risk.

■ A mismatch between the duration of bond assets held and liabilities

Bond assets held by pension plans typically have a significantly shorter duration than underlying liabilities, for the following reasons:

- There's been a low supply of bond issues at long maturities.
- This strategy has been used as a protection against potentially rising yields.
- The shape of the yield curve leads, on average, to a low premium for holding very long-term bonds.
- Out-performance is often expected, over time, from active management of portfolios of short- to medium-term corporate bonds.

■ Pension deficits, where they exist, are also a source of risk in that any shortfall effectively behaves as debt on the sponsor's balance sheet, which is not being matched by a corresponding asset

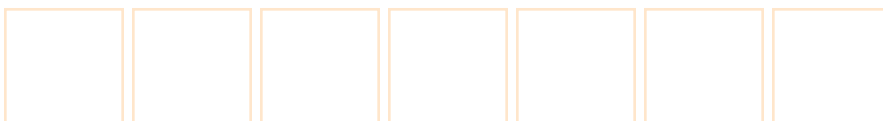
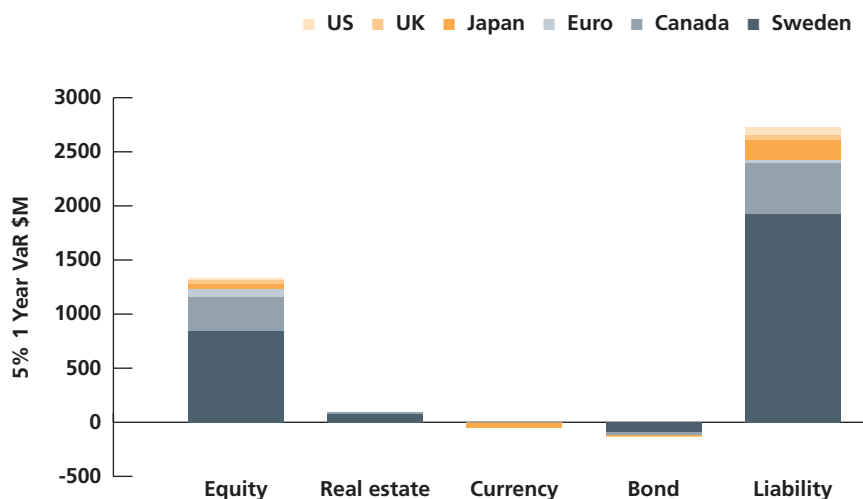
Even if the asset portfolio is invested in the correct proportions between the appropriate conventional and index-linked assets, there is still an interest rate exposure to the extent that the assets are less than the liabilities.

Value-at-Risk (VaR) methods measure how the value of a portfolio can vary due to the effects of key parameters over a specified period for a given level of probability. For example, a VaR exposure of \$100M on a portfolio over one year would indicate a 1 in 20 chance that the portfolio would fall in value by more than \$100M over a year.

What is the relative size of these exposures?

It is possible to compare the potential impact of interest rate movements on funding with the corresponding exposure to equity and other financial market movements using Value-at-Risk methodologies. As an example, the following chart shows a combined global risk view for a representative multinational client.

The figures show a 1-year downside exposure by risk source in US\$ at a 5 percent risk level. In other words, the bars represent the downside exposure in funding with a 1-in-20 chance. As you can see, in this case the overall exposure (the sum of all the bars) amounted to US\$3.9 billion. The largest single exposure was interest rate exposure on US pension liabilities, which accounted for almost US\$2 billion of this total.



“Lengthening bond duration, in simple terms, involves reviewing the structure of the existing bond benchmark to ensure that interest rate sensitivity is appropriate to the corresponding liabilities.”

What can be done to mitigate this interest rate exposure?

Several alternative approaches are available as shown below.

Approach	Expected return impact
1. Do nothing	No change
2. Increase bond content	Reduced
3. Lengthen bond duration	Minimal although may have tactical view on long-term interest rates
4. Overlay swaps directly	Minimal although may have tactical view on long-term interest rates
5. Buy swaption protection	Depends

However, given constraints on expected returns, a majority of funds typically choose to focus on Approaches 3 and 4.

Lengthening bond duration, in simple terms, involves reviewing the structure of the existing bond benchmark to ensure that interest rate sensitivity is appropriate to the corresponding liabilities. Put differently, are the fund’s bonds behaving appropriately as a hedge for its liabilities and, if not, how can this be addressed?

Approach 3 can go a long way toward addressing interest rate exposure for funds that are both well funded on an accounting basis and substantially (40 percent or more) invested in bonds; for other funds, the overall impact is relatively minor.

For funds that do not meet these conditions, Approach 4 represents the best alternative for risk reduction. Under this approach, swaps are used in some form to hedge interest rate sensitivity.



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What does Approach 4 look like?

We have highlighted the three main approaches being used.

Direct swap overlay

- Requires ISDA and collateral agreements
- Swaps structured to achieve customised duration extension and income stream
- Direct control of leverage and duration position
- Requirement for ongoing monitoring

Bond manager

- Ability to implement customised benchmark more closely reflecting plan liabilities
- Existing assets can be used as basis for overall duration extension with swap overlay
- Retention of active management
- Can use master swap agreement

Duration or annuity “bucket” funds

- Unitised funds provided by managers
- Fund wraps up bonds plus swaps to achieve pre-defined annuity income with fixed duration
- Combination of funds used to approximate profile of liabilities
- Some availability of leveraged funds

The first approach is for a fund to enter directly into one or more swap agreements with a counterparty, most probably an investment bank. This will allow a fully tailored solution, but at the cost of substantial work on the part of the trustees or fiduciaries. Funds will need to check their powers and then enter into an International Swaps and Derivatives Association (“ISDA”) “Master Agreement” with any all intended swap counterparties. They will then need to enter into a collateral agreement with counterparties, so that both sides can be secure if the value of the swap becomes significantly different to its nominal value over time (that is, marking-to-market).

Those funds that have adopted this approach often find the effort worthwhile, and, it is not as difficult as it sounds, as long as it is dealt with properly and managed appropriately.

- The second approach is to appoint a bond manager as an intermediary to enter into swaps on behalf of the fund, possibly in addition to the more normal role of simply investing in fixed income securities. There may still be some extra paperwork in appointing a fund manager for a traditional bond mandate, but this is much less than if implementing directly with an investment bank. Managers appointed to this role may also be able to add value by advising on the timing of adding swaps to a bond portfolio. This alternative can make a lot of sense if one can identify a suitably qualified bond manager, but this is not always an easy task.

A swap spread is the difference between the bid and asked interest rates at which a bank will enter into or redeem a swap contract. Swap spreads work very much in the same way as yield spreads on bonds, and, in a similar way, can be converted into an equivalent spread in terms of the bond price. For example, a 5 basis point spread on a 10-year zero coupon bond trading at par would be equivalent to a 0.5 percent in price.

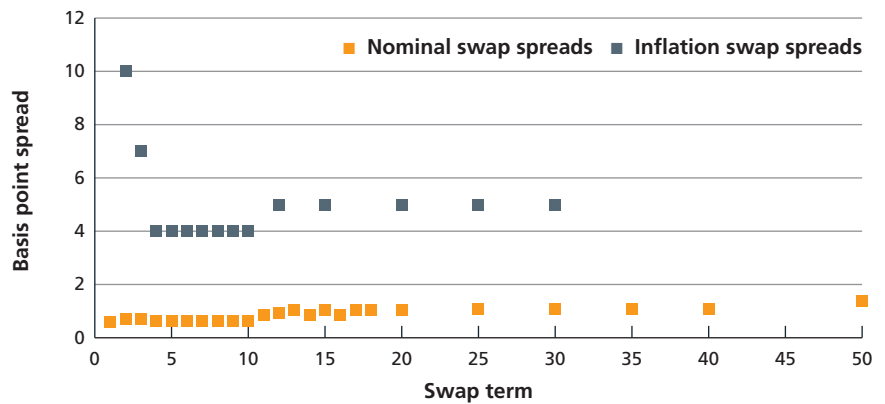
- The third alternative, which may be most attractive to mid-sized and smaller clients, is to transfer bond assets into one or more duration “bucket” funds. These are unitised funds set up by an investment manager that wrap a combination of physical bonds and swaps to achieve a series of fixed, targeted durations. Clients can then invest in a series of such funds in appropriate percentages that match the duration profile of their own liabilities. These funds are simple to understand, operate and track; we see these funds becoming a key catalyst to making interest rate risk management available for all.

What costs are involved?

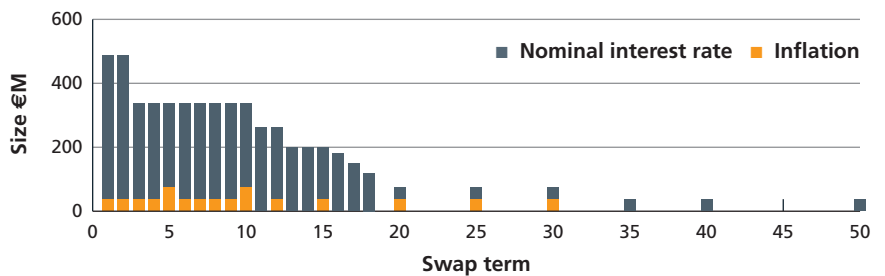
Swaps have seen explosive growth in use in recent years. The total outstanding on currency and interest rate swaps in mid 2005 stood at \$201 trillion – up from \$60 trillion five years earlier – a compound growth of approximately 30 percent per annum.

Interest rate and inflation swaps for both the Eurozone and UK are available from a variety of well-known investment banks (for example, 12 banks currently maintain swap-pricing screens on Bloomberg).

Representative Eurozone nominal and inflation swap spreads



Comparison of typically quoted deal size on nominal and inflation swaps



“To replicate the equivalent of an inflation-linked bond, one must combine nominal and inflation swaps...”

Swap spreads have fallen significantly in recent years. Plain vanilla interest rate swaps are extremely liquid and have very low trading costs. Spreads vary by bank and by timing, but the graphs on the previous page are based on illustrative swap pricing for Eurozone nominal and inflation swaps as of late May 2006; the pricing of sterling swaps is very similar.

Things to note from the graph are:

- Nominal swaps are available out to 50 years without too much trouble; 60 years is possible, if a series of swaps, some of a shorter date, are being transacted with a single counterparty.
- Swap spreads tend to increase with duration, with spreads on nominal swaps shown here running from half a basis point to 1.4 basis points. Clearly these are very small spreads.
- Standard inflation swaps are available only up to 30 or 40 years and have much higher spreads, as you can see from the graph, running at an average of 5 basis points – 5 to 6 times the nominal equivalent.

To replicate the equivalent of an inflation-linked bond, one must combine nominal and inflation swaps, which means that a fund has to double up on spreads. For example, to obtain 30-year real interest rate protection, a fund will have to pay a total spread of approximately 6 basis points. This 6 basis point spread on a 30-year real bond might equate to an initial cost of around 1.2 percent of the corresponding nominal bond.

Another important point to note is the difference in liquidity, or standard contract size, available between the nominal and inflation swap markets. The grey bars in the bottom chart show standard contract sizes available for each market. As you can see, the nominal swap market is very liquid, with quotes available for €500M at fine terms. You will notice that liquidity decreases with term.

More importantly, however, you will notice that inflation-linked contract availability is much lower than the nominal-contract availability, with standard contract sizes of €50M across most maturities and very limited availability beyond about 30 years.

So what are the key messages?

- Trading costs for plain vanilla interest rate swaps are extremely low.
- If you are responsible for a fund with little or no inflation exposure, hedging will be straightforward and inexpensive.
- Costs for inflation protection are higher, but still quite small.
- As with any investment strategy, the total cost of a swap strategy needs to be factored into decisions around the best hedging structure and how much should be hedged.

"If you must play, decide upon three things at the start: the rules of the game, the stakes, and the quitting time."

Chinese Proverb

Making the hedging decision

Against the background of our cost profile and current bond market conditions, what kind of framework would be required to make a decision about hedging? Perhaps one of the most important first steps involves a mindset shift. We believe that the starting point for deliberations should be a fully hedged position (that is, investing all assets in a portfolio that most closely matches liabilities). Only by starting from this position can all risks be identified, understood, and assessed relative to other possibilities.

Next, be clear on the total amount of risk being taken and its relative size. This consideration involves acknowledging that a material interest rate bet is being taken and that this negative bet involves quite a concentrated exposure to a single market call (that long bond yields will fall). This compares with allocation of asset risk across a large number of independent bets (market, company, active/passive and so on). At this stage, it is usually evident that interest rate risk is so much greater than the run of other smaller and more independent risks that it should be the first candidate for active management

After that comes an interesting stage, at which you say: "OK, I'm convinced about the need to remove interest rate risk, but is now the right time?" This becomes a platform for conversation about one's conviction about interest rates relative to expected returns on other asset classes, and about diversification. It would be difficult to assert a diversified strategy if risk is being concentrated on interest rate exposure. But evaluating the total picture should help most funds understand the strategic issues and support a partial hedge exposure.

When the strategic approach to start moving has been taken, your active bond manager may be useful in handling the all-important timing decisions.

This hedging approach might be different, but it makes it possible to mitigate what is a very significant risk exposure for the typical DB pension fund.

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