

Pension schemes buy and invest in assets in order to generate the income necessary to meet the current and future payments that the scheme has “promised” to its members. Asset management for pension funds is therefore different from simply managing a portfolio of assets to maximise the return on those assets over a specific period. This does not mean that achieving a high return on the assets under management is not one of the legitimate goals relating to the management of pension fund assets, but rather that the aim should be to maximise returns on those assets, while at the same time maximising the likelihood that the scheme will always have sufficient assets or cashflow, to meet its pension commitments. In this sense then assets need to be managed, along with the simultaneous consideration of the liabilities of the scheme, and any possible correlations between the assets and liabilities.

The notion of asset and liability management for pension schemes is related to the concept of “Liability Driven Investment” (LDI). LDI, as the name implies, involves making investment decisions with close reference to the associated liabilities, where in fact these liabilities become the fund’s benchmark. Although the phrase LDI, has entered the language of pension fund management over the last three to four years, its goals are virtually identical to those of pension managers in the 1950s and 1960s, where portfolios were designed to produce the cash flow necessary to meet the liabilities, usually via investment in government securities.

We have already dealt extensively with the asset side of pension fund management in other *Investment Tutor* guides (see for example, the Asset Classes and Asset Allocation guides). In this guide we will focus more attention on the liabilities that the asset cashflows are required to meet, and in particular the relationships between scheme assets and liabilities; relationships that naturally have an impact upon the asset mix.

How are defined benefit pension rights earned ?

There are three key components which go towards the calculation of a defined benefit pension plan member’s pension entitlement. The first is the length of service that a member has within the scheme. The second relates to the accrual rate of the scheme. While the final key element is the definition of the scheme member’s final salary. A member’s gross annual DB pension is basically calculated as follows:

Annual pensionable salary = years in scheme x accrual rate x final salary

Suppose a member has been part of a scheme for twenty years, and is about to retire at 65. Suppose also that the accrual rate is 1/80. This means that for every year in the scheme a member will earn 1/80 of one year’s worth of their final salary. Finally, suppose that the final salary is defined as the member’s average pensionable salary over the last five years of their service. In this case, let’s

assume that the average pensionable salary for this member is £25,000. Using the formula given above we can calculate the member’s annual pension entitlement as follows:

$$\text{Annual Pensionable salary} = 20 \times \frac{1}{80} \times £25,000 = £6,250$$

In this case the member would be entitled to a gross annual pension of £6,250, for the remainder of their life. Clearly individuals that are members of the scheme longer, or whose final salary is higher will earn a larger pension, other things being equal. Also, the larger the accrual rate, the larger the eventual pension, again, other things being equal

What sort of a risk does the pension pose to the scheme ?

The pension of £6,250 to which our hypothetical scheme member is entitled, now represents a commitment that must be met with a combination of the cashflows from the assets under management, the contributions of the scheme sponsor and the ongoing contributions of the remaining scheme members.

Inflation risk

Depending upon the details of the scheme, some or all of the pension entitlement can be “inflation proofed”. This means that the value of the pension will rise with inflation, a feature designed to ensure that at least some portion of the pension will be protected against inflation, where the inflation index used is the UK’s retail price index (RPI). However, rather than rising without limit, usually pension payments embody limited price indexing (LPI), where pension increases are limited to 5.0% per year (2.5% after 2005), but where the nominal value of the pension is also protected such that negative inflation (deflation) does not lead to a reduction in this nominal value. Pension promises of this kind are often referred to as LPI (0,5).

This means that, up to a certain extent, higher inflation can increase the size of a scheme’s liabilities. This will be a crucial element in the asset allocation decision process. If liabilities can potentially rise with higher inflation then holding assets whose cashflow might also rise with inflation would be one way of dealing with at least some portion of this risk. It is for this reason that many pension funds have sought to add index-linked bonds to their portfolios, since the payments of these bonds rise with inflation (see the *Investment Tutor* Bonds guide). An alternative may be to use inflation swaps to reduce the risk related to future inflation (see the *Investment Tutor* Swaps guide).

Interest rate risk

We can think of the projected liabilities of any pension scheme as being analogous to the projected payments of a bond. We saw in the *Investment Tutor* Bonds guide that to arrive at the present value of a bond, all that was required was to discount each of the bond's payments and then to add these discounted sums. This is essentially the approach that the accounting profession now recommends for the valuation of pension fund liabilities, so that this liability can be reported on the scheme sponsor's balance sheet (these accounting rules are referred to as FRS17, or IAS19). The discount rate that is recommended for FRS 17 is equivalent to the current yield on a AA-rated sterling corporate bond (or "high quality corporate bond" for IAS 19).

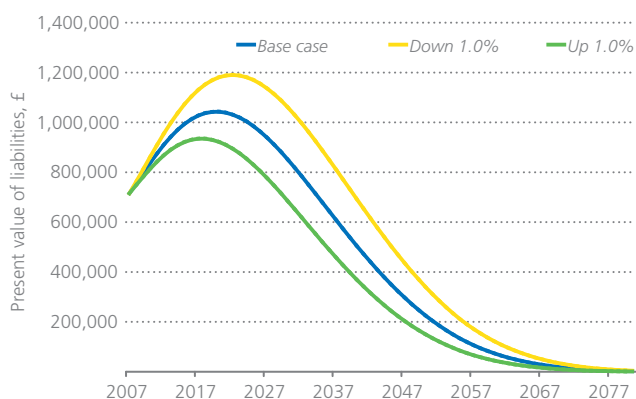
As we know from the Bond *Investment Tutor* guide, when the discount rate for a bond falls the bond's value rises and when the discount rate rises its present value falls. Using this approach to valuing liabilities means that the scheme's liabilities will also rise and fall with the discount rate.

If the yields on AA-rated sterling corporate bonds fall, the accounting-based value of liabilities rises. To help reduce the impact that this would have on any scheme's overall funding position, a pension fund could hold AA-rated sterling corporate bonds. In this case the rise in the value of the liabilities might be at least partially offset by the rise in the value of these bond holdings. Some schemes have sought to increase their exposure to this asset class for this reason.

But there is an additional aspect to this risk. Given that pension fund liabilities are very long-dated in nature, they have very high modified duration for the same reasons that a long-dated bond has high modified duration. The modified duration of the typical pension fund can be as high as 20 years. Therefore to "match" the interest rate risk to any significant degree would involve buying AA corporate bonds with very high duration. However, there are few bonds of this kind available in the market and it is for this reason that some pension schemes have sought to reduce this risk via the use of interest rate swaps (see the *Investment Tutor* Swaps guide).

To show how a change in interest rates can affect the value of scheme liabilities the blue line in Exhibit 1 represents the current, total liabilities of a typical pension scheme. The red line shows the present value of the same set of liabilities, but where the discount rate has fallen by 1.0%, while the green line shows the present value of the liabilities of the same scheme, but where the discount rate has risen by 1.0%.

Exhibit 1: Impact of changing discount rate on present value of DB scheme liabilities



Source: Fathom

As we can see from Exhibit 1 changes to the discount rate can have a large impact on the present value of scheme liabilities.

Scheme sponsor risk

Finally, a risk that receives relatively little attention relates to the financial strength of the scheme sponsor. Over the past five years scheme sponsors have increased their plan contributions significantly as scheme deficits became widespread in 2002 and 2003. This means that many DB schemes are very reliant on this income, and are therefore exposed to the risk that the scheme sponsor becomes bankrupt, or that the sponsor cannot afford to maintain the high levels of contribution.

To reduce this risk to some degree, it is possible to buy insurance to cover the prospect that the sponsor will become bankrupt. These insurance contracts are known as credit default swaps.

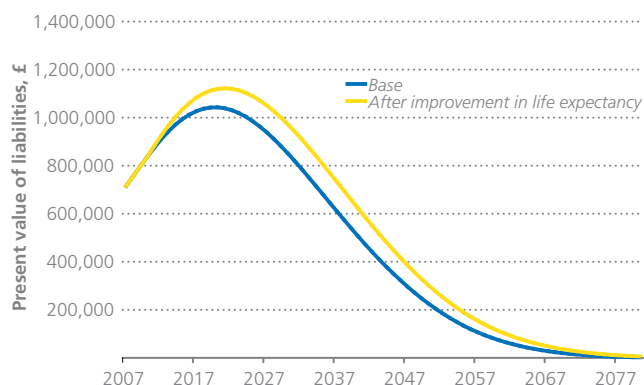
Mortality risk

Finally, perhaps the most obvious risk that a pension commitment poses to a scheme relates to longevity. The scheme is committed to make the pension payment for as long as the member continues to live. In addition, the scheme will quite often continue to make a reduced pension payment to the scheme member's spouse until they die too. Mortality risk then is one of the key risks that a scheme assumes.

In a well known paper published in *Science* magazine in 2002, Oeppen and Vaupel demonstrated that life expectancy has increased by between two to two and half years per decade for the last one hundred and fifty years or so in some developed economies. If successive generations continue to live longer and longer, then defined benefit pension fund liabilities will continue rise too.

To see the impact that changing life expectancy can have on the present value of a scheme's liabilities consider Exhibit 2. The blue line represents the same initial set of liabilities as used in Exhibit 1. The green line represents the new liabilities if we assume that life expectancy increases by around 2.5 years for scheme members. Overall this change would increase the present value of the scheme's liabilities by around 13%.

Exhibit 2: Impact of changing mortality assumptions on DB scheme liabilities



Source: Fathom

For the time being the real problem with this particular risk is that the financial markets do not offer standardised financial instruments to allow schemes to hedge it. Although mortality derivatives are beginning to develop along the lines required by

pension funds to hedge this risk, it is really only by entering a buy-out – where a third party effectively assumes ownership of the scheme’s assets and takes on its liabilities – that most scheme sponsors and trustees can avoid this risk. However, buyout specialists will usually require assets equivalent to around 120-140% of the present value of the liabilities in return for accepting all the risks that meeting a DB scheme’s liabilities entails.

Summary of asset and liability management

Asset and liability management for defined benefit pension schemes involves understanding the nature of the risks inherent in scheme liabilities, and then understanding which asset classes might be most appropriate to reduce or eliminate these risks, thereby reducing the likelihood that a scheme may run out of assets, before all of its liabilities have been met.

In an ideal world, pension funds would hold a portfolio of assets that protected their scheme from inflation risk, interest rate risk and mortality risk, and that would grow sufficiently to meet all liabilities when they fall due. In practice compromises have to be made and judgement has to be used to identify which are the most important liability risks to hedge or match, and the likely return and risks associated with each asset class.

But one way or another, decisions about pension assets should not be made without due and careful regard to the pension fund’s liabilities. This is the essence of good asset and liability management.

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