

Liability Driven Investment





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Introduction

The purpose of a UK-defined benefit tax-approved pension scheme trust will be set out expressly in the terms of the trust deed (or can be deduced from the terms of the trust). But, in essence, the employer sets up such a trust to pay pensions for life to its employees and former employees on attaining retirement age. That is the trust which the trustee is to perform. The trust's activities are also limited to retirement benefit-related activities (broadly the provision of retirement benefits) by the Pensions Act 2004¹.

Those pensions will be financed by employer contributions and, if applicable, employee contributions and, importantly, the investment return on those contributions. The lower the investment return, the higher the contributions or the lower the benefits.

The powers of the trustee, however widely drawn in the trust deed, must be exercised for that purpose and within that limitation. That leads on to the primary duty of a pension scheme trustee, in performing the trust, which is to pay pensions as and when they fall due. But, insofar as the employer has, under the terms of the trust deed, unwisely relinquished its dual key power (on agreeing valuation assumptions, contribution rates and recovery plans²) to the trustee, the trustee will also owe some duties to the employer. But this paper is not about trustee duties to the employer in such a situation.

Instead, we examine the focus, driven by a combination of the accounting standards applicable to employer accounts, financial economic theory and Pensions Regulator pro-active engagement, on the short-term solvency of schemes at each triennial or interim valuation. This has resulted in an excessive focus on variations or changes in scheme surpluses and deficits due to valuations; from this, we have seen the emergence of liability-driven investment (LDI) to manage these perceived "risks".

Ultimately, the objective of these strategies is to lower the variability of the valuation date solvency position, to manage valuation deficits or surpluses rather than the ability to pay pensions from cash flows as and when they fall

¹ Section 255

² Under Part 3 of the Pensions Act 2004

due. The stated motivation, that this will reduce the impact of the scheme deficits or surpluses on the sponsor's accounts, is, and always was, weak. The sponsor may and must produce its own valuations in accordance with the prevailing corporate accounting standards, not the standards imposed by statute on DB pension schemes. Of course, the sponsor may choose to hedge the variability of these valuations and faces no constraints when doing so outside of the scheme.

We should also draw out an associated conflation. If the volatility of the market value of the scheme's assets as at valuation dates leads to deficits, those deficits lead to a recovery period to make good the deficit. The shorter the recovery period, the greater the pressure on the employer to pay deficit reduction contributions or to change future service benefits. That creates the feedback loop of seeking to reduce that outturn by hedging this risk, which, in turn, increases the cost of the benefit, which in turn leads to the outcome that the benefits become very poor value for money and are replaced, for future service, by money purchase benefits. In those money purchase benefits, the employee assumes investment risk and longevity risk and is given an annual statutory money purchase illustration which is based on a **best estimate** investment return assumption consistent, as required by regulations, with inflation of 2.5% pa and **gross** of expenses for the investment fund in question. By way of example, those used by the USS in 2021 for its default lifestyle funds are Growth Fund: 4.77% pa, Moderate Growth: 4.15% pa, and Cautious Growth Fund: 3.38% pa- more here: <https://www.uss.co.uk/-/media/project/ussmainsite/files/for-members/misc/assumptions-document.pdf>. In contrast, the 'prudent' discount rate used in the valuation of the DB benefits of the USS as of 31st March 2020, based on an inflation assumption of RPI of 2.8% pa/CPI of 2.1% pa, and a prudent investment return (**net** of investment management expenses) was 3.45% pa on the pre-retirement portfolio and 1.7% pa (i.e. a negative return after inflation) on the post-retirement portfolio³.

It could be said that we have here the perfect illustration of Goodhart's Law⁴ where the goal of providing the highest pension for the lowest cost with a high level of certainty has, in consequence of the accounting standards and the way the flexibility built into the statutory funding regime under Part 3 of the Pensions Act 2004, been interpreted by the Pensions Regulator and by some trustees and

³ <https://www.uss.co.uk/-/media/project/ussmainsite/files/about-us/our-valuation/actuarial-valuation---march-2020.pdf?rev=e3a0d251ee6945d7b0b1e8611a5fef83> . The investment return assumptions are the sum of the gilt yield assumption of 0.7% and the assumed return above the gilt yield assumption.

⁴ https://en.wikipedia.org/wiki/Goodhart%27s_law

their advisers, leading to the provision of the lowest pension at the highest cost in pursuit of the goal of avoiding deficits at valuation dates.

It should also be recognised that the risk management of the solvency position is not the same as the risk management of the pensions ultimately payable and may even have negative effects on the probability of fulfilling the trustee's primary duty, the payment of pensions when due. It is our contention that, unless these LDI strategy activities contribute to the fulfilment of the primary duty of the DB pension scheme – the payment of pensions when due, they carry a very real legal risk. That risk is of the trustee (and its LDI manager) being in breach of statutory restrictions on the use of derivatives and, in connection with using the repo market to obtain cash to post as collateral, on borrowing. There is also the further legal risk of buying index-linked gilts for asset-liability matching purposes if they do not achieve this matching, and more concerning still, if these index-linked gilts are bought at a price which locks into a guaranteed loss in real terms.⁵ This raises the issue of a potential breach of the prudent person rule and a potential breach of trust.

Given these potential risks, below we examine the principal elements of these strategies and their implementation using conventional or index-linked gilts or derivatives, and we explain how these risks could arise and crystallise.

There are three elements to most LDI strategies: the 'hedging' of discount rates, the 'hedging' of inflation, and the use of leverage.

Hedging of discount rates

For pensions hedging discount rates is irrelevant; they are not a factor in determining the amount or timing of any pension benefits. The use, therefore, of 'hedging' instruments, gilts or swaps, cannot be for the risk management of the payment of pensions.

Here, the "risk" being hedged against is of falling discount rates; it consists effectively of buying a fixed income conventional gilt, "going long" at the prevailing market price. This locks in gains should rates decline and losses should they rise. The Pensions Regulator has noted that schemes which were 'hedged'

⁵ You may as well give the money to the members now rather than save it up and pay out less in inflation adjusted terms than you put in. Such an exercise of the trustees' investment powers is intentionally destroying value on a grand scale.

have produced higher returns over the period in question than those which were not (unfortunately, apparently in support of the practice). This higher return is hardly surprising when the secular decline we have experienced over the past 40 years in interest rates, particularly with QE, is considered. However, it should raise an immediate concern. A 'hedge' should not produce such gains and such higher returns – you do not expect to profit from hedging, and it is a concern that The Pensions Regulator implies that hedging is profitable. Since the nadir of gilt yields in the summer of 2020, the increase in gilt yields since should have produced very substantial investment losses for the schemes 'hedged'. We examine this proposition empirically below.

Some Empirical Evidence on Leverage and Derivatives Usage

In December 2019 the Pensions Regulator published a survey-based study on the extent of derivatives and leverage usage by UK DB pension funds. This had been commissioned, in part, because the Bank of England was concerned that the extent of the use of derivatives and leverage by pension funds might have systemic significance for financial stability. The traditional view of DB pension schemes was that the long-term nature of their operations made them stabilisers of the financial system. The study was of responses from 137 large schemes, out of a total of 328 approached; in a sense, the respondents were self-selected. The characteristics of these schemes raise doubts as to the survey's representativeness and generalisability. For example, the respondents may well have been those schemes making most use of these strategies and instruments. The schemes were asked to declare data as of the 30th of June 2019. At this time, 34% of scheme assets were reported as being of this type. Investment consultants or LDI/Fiduciary Investment managers either completed or were consulted in the process of compiling the data for most schemes (62% and 63% respectively).

Schemes reported an average funding level of 96.5% on a technical provisions basis. These schemes reported total gross assets of £697 billion. Of these, there were £202.8 billion of ILGs and £78.7 billion of conventional government bonds, of which £47.4 and £17.1 billion were financed by repo borrowing. (we discuss later in this paper whether this is lawful). The notional value of derivatives held was £520.6 billion, of these £216 billion were interest rate swaps and £86.2 billion were inflation swaps. The present value of these derivatives, at that time, was surprisingly small; the listing of scheme assets shows an "other non-cash" item, which would include the value of derivatives held, of just £42.4 billion.

Another analysis provided a fair value, under FRS102, for all derivatives of £6.6 billion. We find this surprisingly low, given the low gilt yields and high ILG prices prevailing at that time.

The net assets of the reporting schemes appear to have been around £620 billion, some 41% of the estimate of the total net assets of all DB schemes, which was circa £1,500 billion. By most accounts, a large but non-random sample.

The survey reports some leverage limits, lying in the range of 1 - 7 times. We believe these should in fact be described as gearing ratios. We would also note that they do not reconcile with the fact that the notional amount of these derivatives is £520 billion which has a net market value of £6.6 billion by one analysis, and a maximum of £42.4 billion if all other non-cash items were derivatives – these are leverage ratios of between 12 and 78 times.

The study reports that £314 billion of the derivatives reference LIBOR; with repo exposures added to this, the total assets exposed to rising LIBOR rates is £378 billion. In the period since June 2019, six-month LIBOR has risen by 1.31% which leads to an increase in debt service cost of £4.95 billion. This is significant, as the total annual cash flow cost of the pensions paid by these schemes is some £21 billion annually.

While it is not possible to estimate the current position of these schemes due to the lack of information and data on interim developments, there is anecdotal suggestion, and some consultant survey evidence, of increasing use of leverage, LDI and ‘hedging’ over this period. However, we may consider an exercise in comparative statistics, that is, we may consider the performance of those historic allocations if they had been unchanged, but today’s prices and yields applied.

Over the period from June 30th 2019 to May 1st, 2022, world equities have risen by 18%, an increase of £13.5 billion in value. The discount rate (20-year gilt yield) has risen from 1.49% to 2.15%, an increase of 12.2% in discount function terms, leading to a fall in liabilities of £78 billion.

Over this period, index-linked gilts have fallen by 10.2% leading to declines in those asset values of £21 billion for securities and £9 billion for inflation derivatives. Conventional gilts would have fallen by a proportion similar to that of liabilities, a decline of £9.5 billion, and interest rate derivatives a decline of £26.3 billion. That suggests collateral calls totalling £35 billion, slightly over 150% of the cash demands on schemes needed to pay pensions. The other

conventional fixed interest instruments held, being shorter in duration, would have suffered losses of the order of £11.8 billion. In total these investment losses match the decline in present value of liabilities, leaving the scheme better off only by the equity gain £13.5 billion (101% funded). Had the scheme not hedged and operated a 60/40 balanced portfolio, it would have been £117 billion better off (117% funded) – a huge, missed opportunity.

These reporting schemes would conventionally be considered to have been 59% hedged against the interest rate sensitivity of their liabilities based upon the reported averages. With consultant surveys reporting interest coverage among schemes ranging from less than 10% to greater than 100%, the scope for disparate performance, including outright net losses, is extreme.

Hedging of inflation

In contrast to interest rate “risk”, inflation is a determinant of the pensions ultimately payable, albeit usually in a limited price format, with increases in pensions commonly limited to 2.5% or 5%. The most commonly used ‘hedge’ instruments are index-linked gilts (ILGs), and less commonly inflation swaps. There is the possibility of a significant mismatch between the inflation obligations of DB schemes and ILGs; ILGs can produce negative results when deflation applies while DB schemes have a floor during periods of deflation of zero per cent. However, either or both ILGs and swaps could be validly used in the risk management of pensions, in pursuit of the trustee’s primary duty.

The first problem with both of these approaches lies in their “breakeven” yields. Recently, these have been in the range from 4.6% for short maturities to 3.5% for the longest maturities. If experienced inflation proves to be higher than these rates, the scheme will gain, if lower it will experience losses. This means that inflation exposures below these values will not be as well covered by the ILG as by the conventional gilt of equivalent duration.

Suppose one of these breakeven rates, say 4.6%, proves to be the rate of inflation, those pensions indexed at 2.5% would not receive any offset from the ILG or swap, and those pensions limited at 5% would be uprated by price inflation, say 4.6%, but there would be no offsetting gain from the ILG or swap. Inflation would need to be higher for the ILG or swap to deliver a (nominal) return in excess of its conventional cost.

There are further problems with ILGs, with respect to their extremely high variability, both absolutely and relative to price inflation. Descriptive statistics for the return distributions of a selection of ILGs and the Retail Price Index are shown in Table 1

Table 1: Annualised Volatility of Selected ILGs and Retail Prices Index April 2017 – April 2022

Returns	2029	2036	2044	2056	2068	RPI
Volatility	6.8%	11.1%	15.6%	23.5%	31.4%	1.6%
Maximum	2.7%	4.1%	6.5%	10.4%	14.1%	1.4%
Minimum	-2.5%	-5.0%	-7.2%	-9.9%	-	-0.9%

The figures shown above are the maximum and minimum daily returns for the ILGs and the monthly returns for RPI. The volatility of these securities makes them singularly inappropriate as ‘hedging’ instruments for retail price inflation. Their use will import volatility into the fund and scheme valuations.

There is no defence arising from the cumulative returns. Table 2 shows the five-year cumulative return from a selection of ILGs and RPI over the same 2017-2022 period’

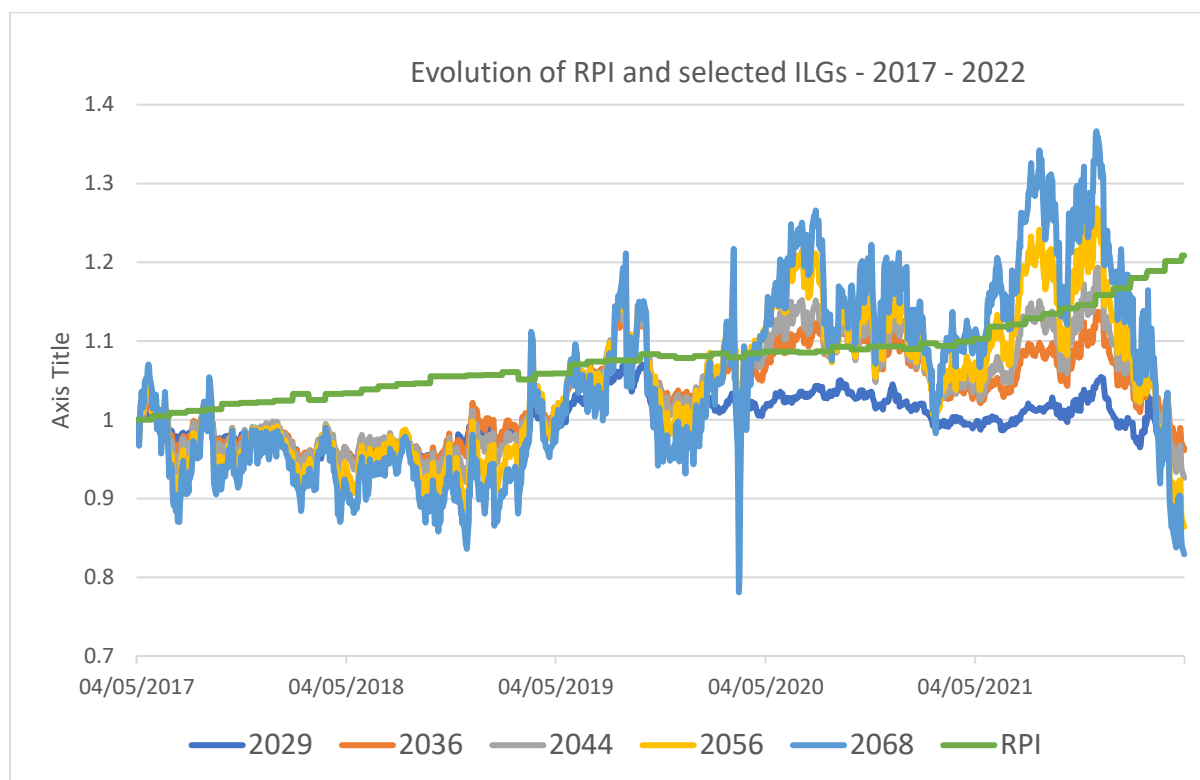
For completeness, we note that pension scheme increase indexation may be based on RPI or CPI and that index-linked gilts will move from RPI to CPIH from 2030. This may increase or reduce basis risk, depending on the scheme benefit design. But it does not detract from the main thrust of our argument.

Table 2: Five-year Cumulative Returns from a Selection of ILGs and RPI April 2017 – April 2022

	2029	2036	2044	2056	2068	RPI
Cumulative Return	-3.7%	-3.9%	-7.4%	-13.6%	-17.1%	20.20%

We also show in Figure 1 the evolution of cumulative values for these ILGs and the RPI.

Figure 1: Cumulative Values for ILGs and RPI April 2017 – April 2022

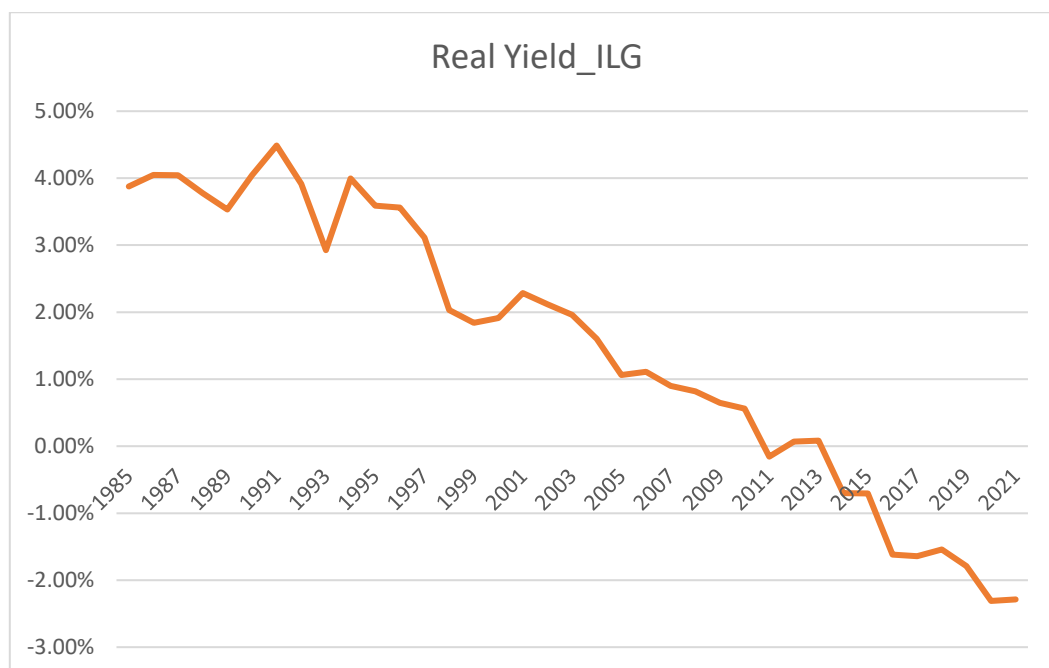


While it is obvious from Figure 1 that ILGs really do not reproduce the behaviour of the Retail Price Index, the number of occasions where it was above RPI is perhaps informative. Table 3 shows the proportion of time that the cumulative performance of ILGs was above the cumulative performance of the Retail Price Index, and confirms their unsuitability as hedging instruments.

Table 3: Proportion of Time in Period 2017-2022 when ILG Cumulative Returns were above RPI

	2029	2036	2044	2056	2068
Outperforming	1.8%	16.8%	22.9%	31.3%	37.4%

The real return expected to be earned by holding an ILG to maturity has declined markedly over the decades, and these are now negative, that is a buyer is expecting to receive less than inflation. This is illustrated in Figure 2, which uses throughout, for comparability, an expected inflation rate of 2.5% pa. This is a clear result of substantial demand and limited government issuance.

Figure 2: Yield on 15+ Index-Linked Gilts – 1995 to 2021

We appreciate that ‘hindsight investing’ is not the correct test for evaluating a breach of the prudent person rule. But, observed outturns do raise the question as to whether the prudent person rule was correctly applied at the outset when the strategy of acquiring ILGs to hedge inflation in respect of capped inflation-linked pension increases was set. Moreover, buying more Index-Linked Gilts at negative real returns must raise further questions over why a prudent person would invest in such assets, knowing, ex-ante, that the real returns are guaranteed to be negative.

We cannot comment in general on inflation-linked derivatives as hedging instruments as their suitability is a matter of specific contract design and pricing. It is certainly possible to design contracts which do effectively hedge the inflation exposures of the schemes indexed pension obligations.

But there remain two concerns: are derivatives hedging the discount rate permitted and does this directly or indirectly involve leverage? In addition, there is, of course, a basis risk between inflation derivatives and inflation-indexed securities. With inflation protection demand far broader and larger than its supply, inflation swaps tend to run at a premium to linkers, and at various points a substantial premium at that. It is all too easy to think of derivatives as ‘unlimited’ in availability, but in practice, swap desks need to hedge inflation too. They need ILGs or corporate linkers or flows from utilities or something linked to inflation to be able to print more inflation swaps at ‘fair’ levels.

The Use of Leverage

As we move to consider leverage, we must first consider the statutory legal position. Despite Brexit, the IORP Directive II Article 19 still applies, and it says that pension funds:

- may only use derivatives for efficient portfolio management purposes or for ***investment*** risk reduction purposes, and
- may only borrow for temporary liquidity purposes.

The Occupational Pension Schemes (Investment) Regulations 2005, as amended, transposed the IORP Directive I Article 18 requirements (now reborn in the IORP II Directive Article 19) into UK domestic law via Regulation 4 and Regulation 5. Reg 4 states: Investment in derivative instruments may be made only in so far as they—

- (a) contribute to a reduction of risks; or
- (b) facilitate efficient portfolio management (including the reduction of cost or the generation of additional capital or income with an acceptable level of risk).

Note that, when interpreting UK regulations transposing EU Directives, the courts are still required, notwithstanding Brexit, to apply a purposive interpretative approach to give effect to the purpose of the directive (and not a literal interpretation) unless Parliament legislates in the future for a different approach. On this basis, while Reg 4 omits the word “investment” before risks, emphasised in the IORP II extract above, why would a court not, unless such future legislation is made, read that word in, given that is how the regulations are required to be interpreted?

Hedging interest rates through the purchase of derivatives to avoid a deficit at a triennial valuation date is not being done for the purpose of reducing investment risk. It is not being done for long-term investment purposes to enable the pension fund to pay pensions as and when they fall due. Hedging interest rates is being undertaken to deal with the alternative objective of not showing or reducing a deficit at a triennial valuation date while increasing the cost to the pension fund and ultimately the sponsoring employer of paying pensions as and when they fall due. They are not an attempt at generating additional capital or income. We note the alternative argument that preventing

a valuation deficit avoids a recovery period and deficit make up contributions by the employer and hence justifies that hedging from the employer's perspective. But this is not about reduction of investment risk or about facilitating efficient portfolio management through using derivatives. To be clear, hedging of interest rates by buying gilts, is not using derivatives and our point on Reg 4 does not relate to buying gilts (but see below if those gilt purchases are financed with repos). There is a separate point, outside the scope of this paper, as to whether buying gilts to hedge the valuation date discount rate variability is the exercise of the trustee's investment power for its proper purpose of providing pensions when they become due.

Given the very long-term time horizons of pension funds, which are operating on a going concern basis, the only certainty of the valuation assumptions is that they will be wrong. So, a hedging strategy to hedge a discount rate that will be wrong is not obviously prudent. For further discussion of discount rates and accounting standards and the logic holes in deriving a discount rate from the yield on bonds see: "Does IAS 19 (Accounting for pension costs) meet the criteria for its adoption and retention including the legal requirement of being conducive to the public good?".⁶

Furthermore, where the motivation for a set of 'hedging' actions is to offset pensions variations as at a valuation date by hedging the valuation discount rate, these actions would, as noted above, fail to satisfy the alternative permitted use of derivatives to facilitate efficient portfolio management.

There is an additional issue that also arises. Some pension funds have derivatives hedges in effect for amounts in excess of their liabilities' exposure, as has been reported in numerous consultant surveys. The December 2019 report prepared for the Pensions Regulator "DB Pension Scheme Leverage and Liquidity Survey"⁷ provides much insight into scheme practices. See Box 1 above.

Apart from being a use of derivatives for a purpose outside that, it would appear, permitted under the IORP Directive (and Reg 4 on, we would argue its correct interpretation), this introduces leverage and often substantial leverage into the pension fund. Despite these concerns, there are many schemes hedging interest rates, inflation, and leveraging their asset portfolios as outlined in the December

⁶ Available from: https://fsclub.zyen.com/media/documents/Public_good_FINAL_Con_Keating.pdf

⁷ <https://www.thepensionsregulator.gov.uk/-/media/thepensionsregulator/files/import/pdf/db-pension-scheme-leverage-and-liquidity-survey.ashx> .

2019 report. Indeed, the Pensions Regulator appears actively to encourage this behaviour in its proactive engagement with trustees when they are setting the scheme valuation assumptions.

Because this discount hedging approach is a common practice, does not in itself, lead to the conclusion that it is free of legal risk for pension fund trustees and their LDI managers. Take the example of another derivatives scenario, that of Hammersmith and Fulham⁸, which went wrong, and the legal chickens came home to roost. So as interest rates rise and more and more collateral has to be posted, this raises the question: will there be a major pension fund failure? Moreover, if there is, who will the courts hold liable - the LDI manager, the consultants, the trustees, or the counterparty? As interest rates rise, will this commonly adopted strategy be shown to be, or become generally accepted as being, based on a false premise?

There is a further legal pitfall as to how cash for posting collateral or purchasing gilts is raised. We explain this next: the prohibition on borrowing in Investment Regulation 5 is clear:

(1) Except as provided in paragraph (2), the trustees of a trust scheme, ... must not borrow money, ..., where the borrowing is liable to be repaid, ..., out of the assets of the scheme.

And the second paragraph simply exempts temporary borrowing for liquidity purposes:

(2) Paragraph (1) does not preclude borrowing made only for the purpose of providing liquidity for the scheme and on a temporary basis.

But what is borrowing? Is a literal meaning to be used, as in borrowing cash from the bank, or is a purposive meaning i.e. anything that amounts to borrowing in economic terms, the better interpretation? (See Box 1) Given the objective of this provision in the IORP Directive is to protect the pension fund and its members, a purposive meaning would appear to be the better interpretation.

⁸ https://en.wikipedia.org/wiki/Hazell_v_Hammersmith_and_Fulham_LBC

Box 1: Forms of Borrowing.

There are several ways in which schemes may borrow. This may take the form of borrowing from the scheme's bank, but this appears to have little use other than in some short-term overdraft arrangements. It appears that no scheme has borrowed or indeed even tried to borrow by the issuance of public or private notes or bonds. In our opinion, this would be such a clear breach of the prohibition on borrowing that it would not pass investor due diligence scrutiny.

But, on a literal analysis, there is a way in which a pension scheme may borrow in economic terms through the use of 'repos'. These are the sale of a security, usually a gilt, along with a commitment to repurchase this at a fixed future date (eg 3 months) at a fixed price. This amounts to borrowing of the net sale proceeds. It is, in economic terms, borrowing regardless of the use to which these funds are put.

So, the next question is whether such borrowing is for temporary liquidity purposes. The regular rolling of repos leads to the answer that this is not a temporary borrowing. Therefore, if the repo transaction is classified as borrowing and rolled regularly, it is borrowing in breach of Reg 4.

So, 3 or 6-month Gilt Repos entered into by the pension fund's LDI manager to raise cash to post collateral on out-of-the-money swaps or to buy long-dated gilts, where the repos are rolled over regularly, have the look and feel of borrowing in economic terms, and more fundamentally, the regular rolling over of those repos leads to the conclusion that this borrowing is not temporary. Throw a distressed pension fund into the mix and decide which side you would rather be on in court! Lehman Bros and Repo 105 come to mind.⁹

Conclusion

There are different considerations where the investment strategy is aimed at matching cash flows of pensions as they are to be paid with cash flows from the scheme's assets. However, in the light of the above, it is, perhaps, a brave (in the Yes Minister sense) trustee board that decides to increase its hedging of the discount rate to be used at future valuations given the potential legal risks. There is the non-trivial potential liability of the trustee's LDI manager. And

⁹ <https://blogs.harvard.edu/michaellaw/2014/01/29/lehman-brothers-repo-105-recap/>

trustee boards that approved these strategies may wish to re-evaluate the advice they received as to the cost of hedging the wrong thing.

HM Treasury may also want to take an interest given the cost to the tax-payer of the tax relief on additional contributions flowing from this strategy and the diversion of patient long-term capital into gilts settled at T+1.

Trustee boards should be looking at the level of repo transactions engaged in by their LDI manager for the scheme and reviewing, with their legal advisers, the extent of their compliance with Reg 4 and whether they have reporting obligations to the Pensions Regulator. And the LDI manager may wish to consider the extent of its legal liability.



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