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1. Introduction

In '**Death by discount rate**', Frank Curtiss and I discussed the discount rates being used by schemes to value their liabilities. Accounting standards require the rate to be based on the yield on high quality corporate bonds. The scheme funding regulations allow more discretion but, according to **data** from The Pensions Regulator (tPR) updated since the article was written, the median scheme uses a rate about 1% above 20-year gilts. The essence of the article was summarised in paragraph three:

The theoretical case for these rates is acutely defective. They have wrecked company balance sheets, caused the misallocation of billions of pounds of corporate resources to plug illusory deficits, distorted scheme investment strategies, and played a major part in the collapse of private DB [defined benefit] provision.

In the case of the USS, consider the following evidence. On 31 March 2011 the assets of the USS were £32.7bn ('**Report and accounts for the year ended 31 March 2012**', p. 42), and its deficit on the technical provisions basis was £2.9bn (p. 18). Seven years later, by the time of the 31 March 2018 funding update, the deficit had increased to £12.1bn ('**Report and accounts for the year ended 31 March 2018**' p. 9), despite assets having nearly *doubled* in the interim, to £63.6bn (p. 58). At the same time, according to a **cashflow forecast** prepared by First Actuarial on behalf of the UCU (p.10 ff.), the scheme will probably be able to run for at least fifty years without needing to liquidate any of its assets and yet still maintain its funding level. To do this, it won't even need to spend all its investment income.

Maybe you can study the above figures without thinking there's something odd about the way changing discount rates are affecting liabilities (and hence deficits). If so, take a look at this extraordinary paragraph, lifted directly from the 2012 USS **report and accounts**

(see p. 70), explaining how the £2.9bn deficit mentioned above had increased to £9.8bn in the twelve months to 31 March 2012 (the emphasis is mine):

> The funding level of the scheme on its technical provisions basis has fallen significantly due to a *large increase, 23.8%, in the liabilities*, which has not been matched by the 4.4% increase in the assets over the year. *The increase in liabilities has primarily been brought about by the historically low yield on gilts* resulting from the current economic climate and the Bank of England's policy of buying gilts, which is also known as 'quantitative easing'. This fall in the discount rate means that the present value of future liabilities has increased. *It does not mean that the future cashflows are significantly different from those predicted at the last valuation*.

This, presumably unintentionally, is a remarkably good exposition of the discount rate problem. It says that even if contributions, inflation, benefits, demographics, longevity, investment income, asset values and everything else that has a real-world effect on the cost of running a pension scheme don't change at all, a relatively small change in the discount rate can completely swamp the funding calculation in just twelve months.

Everyone involved in running a pension scheme ought to know this. Scheme actuaries even helpfully break down the changes in the deficit into its component parts, so that the effect of the discount rate can be separated from other effects. So why, in the debate about the future of the USS, was there an almost complete focus on the headline figure, rather than on the actual long-run cost of operating the scheme?

Regulations and tPR are partly to blame since, broadly speaking, they treat the deficit as if it is an ordinary liability or some sort of loss that has to be quickly eliminated. To see why this is not correct, skip ahead to section 6. The media coverage of pensions disputes (for example from the **BBC**) is also highly one-sided, being seemingly unable to discuss them without giving top billing to deficits (see for example '**Academics face pension threat as Universities UK tries to plug £17.5bn shortfall**'), as if cash doesn't matter at all. If only journalists spent more time speaking to qualified actuaries, then perhaps their pension articles would improve.

Fixing the discount rate problem would not be a panacea. Even when things are going according to plan, defined benefit pensions are not a cheap item. In the case of the USS, the employer has pledged not to decrease its contributions if the scheme is replaced with DC (see Universities UK's (UUK's) '**5 facts: USS pensions**' [fact 3]). But in the sad history of DB provision over the last twenty years, it has been extremely convenient for employers who might want to close a scheme in favour of something a little easier on their wallets to be able to point to an eye-watering negative figure while shouting 'Unaffordable!' at full volume, hoping no-one will notice that the figure in question is merely a technical artefact of constantly fluctuating discount rates.

2. The aim of this article

What this paper is not is an argument that DB schemes can't go bust, should never be closed, or that contributions will never need to increase. And if you're completely risk averse, then no argument will ever be good enough to convince you to run a DB pension scheme anyway. (Against this, if we eliminated from the world of business and commerce everything that's as risky as running the USS, there would be practically nothing left.)

The aim of this paper is to show that any argument for the closure or restructuring of the USS is completely worthless unless it is backed up with costings, cashflow forecasts or other evidence not subject to the capricious effects of shifting discount rates. Statements from UUK — such as from **Koen Lamberts** and in '**5 facts: USS pensions**' — and press articles thus far have emphasised the regulatory need to eliminate the deficit, often to the exclusion of everything else. The proponents of this case need to find a better argument because, as I hope to show, the one they are using is not fit for purpose. As to whether alternative arguments can be found, and if so whether they make any sense, I have nothing to say here.

Having discussed the discount rate issue in sections 3, 4, and 5, in section 6 I go on to show that the limitations of a discounted liability calculation as a means of managing a pension scheme are not simply down to the deficiency of any particular discount rate. When future payments are discounted back to a present value 'liability', no matter what the rate, the numerical result is effectively meaningless if it is conflated with a 'liability' in the commonplace or accounting meaning of the term, especially insofar as it increases or decreases in response to exogenous changes in the discount rate.

That is not to say that there is no value whatsoever in discounting liabilities to present value. Discounted liabilities do have their place, but can only be given useful meaning if deployed as a tool for examining the effect other factors or assumptions have on the financial position of the scheme (holding the discount rate constant), or else as part of a stress test of assumptions to see what rates of return are required to ensure the scheme will have adequate cash to pay its benefits. To interpret them as an ordinary liability that needs to be eliminated by the injection of actual near-term cash is a category mistake, resting on confusion between two different meanings of the word 'liability'.

For these reasons, both this paper and the original *Professional Pensions* **article** by Frank Curtiss and me should be read as arguing that cashflow forecasts are the most suitable primary tool currently available for managing a pension scheme (which is not to say that other tools, including *appropriate* use of discounted cashflow will not also be helpful), and hence as endorsing and supporting First Actuarial's **report**.

3. The time value of money

There are at least two conflicting schools of thought on discount rates that can never be squared with each other.

The first regards a pension scheme as a project, with cash inflows and outflows, which is to be run so as to deliver benefits while striking an acceptable balance between cost and risk in the long term. In this context, the theoretical underpinning of the time value of money, being the notion that a discount rate should be set in relation to the alternative uses to which money might reasonably be put, leads to the conclusion that the appropriate rate is the expected investment return, since any money not spent on benefits will be invested. Another factor strongly supporting this rate is that it is the one that corresponds most closely to a cashflow forecast.

The second holds that since a defined benefit promise is low risk in the sense of the value of past service benefits earned, the associated liability should be discounted with a low risk bond rate. If these two rates are brought into line, that will leave a disconnect with the third corner of the rate triangle, namely the actual investment strategy; and so this should also be changed, and the scheme should invest entirely in low risk bonds. Note, however, that if taken to its conclusion, this argument still results in a discount rate equal to the investment return, since both will be equal to a bond rate.

In the case of the USS, the trustees, astutely and very successfully, have so far *not* adopted a very low risk investment strategy, with well over half the scheme invested in equity, private equity and property. This is not only sensible, it is exactly what was envisaged by our predecessors who devised defined benefit schemes. Why? Because they took the view that schemes should seek to provide benefits at the lowest cost consistent with not taking undue risks.

It should hardly be a surprise to anyone that it is not possible to minimise both risk and cost at the same time, or that finding a sensible balance between the two will mean investing in equities and property to some extent.

If, like the USS, a scheme is *not* mainly invested in low risk bonds, the discount rate cannot be consistent with both the pension promise and the investment strategy at the same time. Unfortunately, when it comes to the technical provisions, some rate or other has to be chosen. At the moment, according to the **data** from tPR, schemes seem to be settling on a trade-off. The result is all too often a compromise usually referred to as 'gilts plus' for the rate in the technical provisions.

It might be argued that this isn't really a compromise, but rather that gilts plus one or two per cent is in fact a reasonable proxy for investment return, after taking into account the requirement of **The Occupational Pension Schemes (Scheme Funding) Regulations 2005** that the rate be chosen prudently. The problem then becomes the question of how much prudence is enough.

4. Prudent rate setting

The Scheme Funding Regulations explicitly allow a rate based on the expected investment return of the scheme (see para 5 (4) (b) (i)). So far, so good — at least the authors of the regulations seem to have understood the concept of the time value of money. The regulations also require that the rate be chosen 'prudently'. You might think this would mean nothing more than the obvious fact that schemes should be careful not to overestimate or be too bullish with their estimated long run investment return, and that this could be policed by auditors, actuaries or regulators. So why are such low rates being used?

There is overwhelming evidence that in the long run, equities and property do far better than gilts. This is even more so now, with yields currently being artificially depressed owing to quantitative easing (see for example **USSbriefs35**). But that is not the argument I am making here.

Far more pertinent than the empirical evidence that 'gilts plus' is much too cautious, is the underlying problem with the regulatory requirement that 'the rates of interest used to discount future payments of benefits must be chosen prudently' (see **The Scheme Funding Regulations**, para 5 (4) (b)). Prudence in the sense of trying to predict future returns without overestimating is one thing. But instead, the requirement has been interpreted, under advice from the regulator, as meaning that some sort of deliberate reduction to the best-estimate rate has to be made as a kind of 'allowance for prudence', especially if there is doubt over the employer covenant. At this point, things go to pieces very quickly. Building prudence into a discount rate *a priori* is much more difficult than it might seem owing to the cognitive bias we all have against a proper appreciation of compound discounting or geometric progression.

According to the (perhaps apocryphal) story of the invention of chess, legend has it that Sessa, the ancient Indian minister and creator of *chaturanga*, one of the precursors to chess, was asked by his ruler what reward he would wish for the invention of such a marvellous game. In reply, he requested one grain of wheat on the first square of his chaturanga board, two grains on the second, four on the third, eight on the fourth, sixteen on the fifth, and so on for all 64 squares. The ruler laughed off such a meagre prize and immediately agreed, unaware that the total number of grains of wheat required to fulfil such a promise would be 18,446,744,073,709,551,615.

The human brain is not well equipped to deal with geometric effects. This is partly why discount rates are so difficult to set generally, and why it is almost impossible *a priori* to build a reasonable level of prudence into them. Any given level of prudence will tend to have a much bigger effect than expected. In the case of the USS, when the discount rate was raised by a mere 0.25%, one measure of actuarial liabilities was reduced by a whopping £5bn (USS **Report and accounts for the year ended 31 March 2018**, p. 84). Remember, other things being equal, changing this rate doesn't affect the cash position or actual affordability of the scheme, either now or in the future: the rate is just being

used in a technical calculation designed to assign theoretical present values to cashflows that run decades in the future.

With such small changes having such huge effects, and with such bitter arguments over what might be the correct rate, the only sensible course is to take the rate out of the equation altogether and consider the problem from the point of view of the actual expected stream of payments and receipts. In other words, to consider a cashflow forecast. Meanwhile, discounted liability calculations can be useful to help understand the effect of changes *other than the discount rate*, such as demographics. Special discount rates such as the break-even discount rates for past and future service are also useful for comparative purposes, as in First Actuarial's **report**.

Only by examining the problem from several points of view, and by stress-testing the assumptions therein, will a valid and coherent picture of the true health of the scheme emerge.

This multi-faceted approach is what all schemes should adopt when deciding on both their investment strategy and future funding requirements. A discounted liability calculation on its own is too blunt an instrument and much too sensitive to the discount rate. I'd like to take credit for this idea, but unfortunately I can't, because many people have said as much before, including Michael O'Higgins, former chairman of tPR, in his article '**Flawed discount rates are harming business**'.

5. Other regulatory issues and prudence

There are other reasons to suspect the regulations have had the opposite of their intended effect of protecting schemes. I note that of the twelve trustees of the USS as at 31 March 2017, only four were nominated by UUK. There are very good reasons for thinking that having a majority of trustees who are either independent or who represent the members is a great benefit in most respects but, in the light of the foregoing, it may not be helpful in arriving at a sensible, trustee-approved discount rate for the technical provisions.

The lower the rate, the greater the shortfall, and the shortfall has to be met by UUK. Independent or member-nominated trustees may therefore have a subconscious sympathy towards a lower rate which, regulations being what they currently are, will result in increased payments into the scheme from the employer, *prima facie* both reducing funding risk and benefitting members. Only when the apparent (but illusory) deficit becomes so great that the employer balks and tries to close or restructure the scheme does the weakness in this logic become evident.

The regulator, tPR, is similarly conflicted. In applying pressure to trustees to choose rates prudently, tPR may also think it is protecting members. Again this only holds for as long as schemes remain open and, as Michael O'Higgins **notes**, may have adverse

macroeconomic consequences, forcing employers to pay large, and unnecessary, sums into their schemes rather than investing in their businesses.

I am not saying that the trustees of the USS have deliberately manipulated rates downwards, but the nonsensical regulatory requirement to choose rates prudently, combined with pressure from tPR, certainly makes for an ecosystem in which rates that are more consistent with the real world of cashflow forecasts and projected investment returns will find it difficult to thrive.

6. Rate changes and the limitations of net present value as a tool

Sadly, the never-ending quest to find a good discount rate, prudent or otherwise, isn't even the main problem with the way 'unaffordable pension deficits' are bandied around in the press or used by employers as leverage to close or restructure schemes.

Consider this. Having chosen a gilt-based rate for the technical provisions, some schemes go on to link their discount rate, either explicitly or implicitly, and especially for monitoring purposes between triennial valuations, to future changes in the gilt rate, so that these feed directly and automatically into the discounting calculation. Of course, changes in gilt rates might affect a scheme, but in reality this will be only to the extent that they directly or indirectly affect the market value of its assets, investment income, and so on.

When a change in the gilt rate then 'causes' a colossal increase in the 'liabilities' of a scheme, even though the projected cashflows of the scheme may have changed hardly at all, the absurdity of this result should make it immediately obvious that we are not talking about a liability of the ordinary kind. But people seem to think nothing of concluding that the scheme is suddenly out of pocket in some way, or that vast corrective payments into the scheme are now required, when all that has happened is that the discount rate has changed, while the real underlying economics of running the scheme are no better or worse than they were before.

People have become accustomed to regarding an actuarial liability as if it is an ordinary liability no different from a loan or an everyday obligation to pay for goods received. But it is not. It is a completely different concept: a theoretical construct designed to compress a very complicated, long-range cashflow forecast down to current values for ease of presentation.

In some cases, simplifications of this kind can be extremely helpful. But in the case of pensions, the category error of confusing actuarial liabilities with workaday accounting liabilities has sown confusion, as people have become mesmerised by the immense numbers involved and interminable arguments over discount rates.

In the detail of actuarial valuations, the change in liabilities is broken down into its constituent parts, of which the change in discount rate is just one. Since it tends to be the largest component, however, it too easily dominates the picture. Changes in the present value of the liabilities due to *other* factors may be helpful in developing an understanding of what is happening to the scheme; but drawing conclusions of any kind on the basis of observing an increase in the net deficit viewed through the lens of fluctuating discount rates is equivalent to the mistake of concluding that the size of Jupiter has increased on the basis of observing it through a more powerful telescope.

When we read in the press about enormous increases in scheme deficits being explicitly attributable to the effect reductions in gilt yields have had on liabilities, we are literally reading about accounting and actuarial phantoms. It is to the shameful discredit of the industry, first, that some schemes see no issue with changing their discount rates in such an arbitrary and unthinking way; and second, that we have allowed the resulting wild reported swings in deficits to dominate a very public debate, and to contribute to the closure of entire schemes, when they are no more than arithmetic mirages resulting from lazy assumptions fed into a bad metric.

Thus, both the impossibility of building prudence into the rate and the severe limitations of the discounted liability calculation itself (whatever the rate) both lead to the same conclusion: in the case of pension schemes, the present value calculation has outlived its usefulness, at least as the primary tool. It is time to find a better alternative, or simply to rely on the underlying data — the cashflow forecast — which supports the present value calculation in the first place.

7. Discount rate prudence — possible solutions without changes to regulations

In '**Death by discount rate**', and in the paragraphs above, I have argued that the expected scheme return should be used for the calculation of the technical provisions. For a different argument in support of the same conclusion, the reader is recommended to an article in *The Actuary* magazine, '**Pensions: the going rate**'. However, I hope I have also made it clear this has more to do with the weakness of the measure than the correctness of any particular rate. There is no 'correct' discount rate, since the proper tool for monitoring a pension scheme is actually a cash flow forecast. It is impossible to find the correct settings on an apparatus that is not capable of performing the task at hand.

If the regulations cannot be changed to avoid the discounting calculation altogether, which is certainly the case in the short term, it would be better to arrive at the 'prudent discount rate' by iteratively adjusting the rate until it produces a deficit consistent with what the trustees and employer agree is a sensible schedule of prudent payments required to fill any gaps in cashflow. In other words, the discount rate is 'least wrong' when it is set so as to force the calculated scheme deficit to equal a prudent, real-world funding requirement, in actual cash terms.

If this sounds like an artificial rate, then so it is. The better solution would be to change the regulations so that they do not rely on the impossible requirement to draw sensible conclusions from present values and prudent rates.

Alternatively, the discounting calculation should fall back on the expected return on investments, which at least has the virtue of being consistent with the cashflow forecast and investment strategy, and prudence should be dealt with completely separately, based on the cashflow forecast, to decide what corrective payments are required.

8. Conclusion

The vast majority of the potential damage to funded DB provision in the UK is already done. Most funded DB schemes are fully or partially closed. Perhaps the future lies with collective defined contribution. The USS currently stands as one of very few that have so far bucked the general trend, owing to the exceptional way it has been run and its outstanding investment strategy of recent years.

It is worth repeating that according to the **analysis** performed by First Actuarial, if the USS remains open and well managed, it will in all likelihood never need to draw upon the capital value of its investment assets, and upon only a small proportion of its investment income, in order to pay benefits in perpetuity, despite its £12.1bn **deficit**. If this is even close to being correct, it is in itself a perfect demonstration of the absurd way regulations are currently functioning. If your accountant announced that you didn't have anywhere near enough money to pay your creditors, but at the same time told you that you were never going to run out of cash, you'd know it was time to get a new accountant.

The debate over the future of the USS will no doubt continue for some time to come. But any argument that hinges on a deficit figure calculated using a constantly shifting *a priori* 'prudent discount rate' will always be, to borrow the phrase **usually attributed** to the theoretical physicist Wolfgang Pauli, not even wrong, but just meaningless.

It would be extremely unfortunate if the USS, the largest remaining funded defined benefit scheme in the UK, should become yet another victim of funding regulations that have not served UK DB provision well.

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