

## DO YOU REALLY KNOW THE CHARACTERISTICS OF YOUR SCHEME'S LIABILITIES?

### A DISCUSSION MEETING

[Held by the Institute of Actuaries, 2 June 2008, in Bristol]

#### ABSTRACT OF THE DISCUSSION

**Mr R. N. Wharmby, F.I.A.** (opening the presentation): We are here, ready to answer this important question: "Do you really know the characteristics of your scheme's liabilities?" The sad news, I have to tell you, is that I am not going to give you the answer to that. Instead, we are going to be talking about how you might go about identifying and displaying the characteristics of the liabilities of a typical defined benefit pension scheme. Although we will concentrate on the sphere of pensions, some of what we will consider can be translated, quite easily, into other fields, particularly into the annuity buy-out market.

So, what are the characteristics of your scheme's liabilities, or, to put it another way, what analysis should be carried out to illustrate these characteristics? We are going to focus, quite heavily, on cash flow production, and how you communicate those cash flows to clients and to third parties.

It is a bit of an odd world. What goes around comes around. Many years ago someone invented electricity which flowed through wires. Then someone came along and invented the wireless. Then we went back to cable TV. Now we are into internet wireless connectivity, and so on. A similar process can be observed in the Actuarial Profession. Back in 1856, when the Faculty was formed, someone came up with the idea that somewhere there would be a liability, and that, somehow, they might discount that liability. So, they started with the basic bare bones of actuarial work, a future cash flow, which was then discounted, resulting in a present value of that liability.

As time went on, and as products in the pensions and life assurance world became more complex, they decided to extend this principle and discount more and more cash flows, each with a probability attached. This started to become very complicated, and overpowered the poor old slide rules which were in place at that time. Then, someone came up with the great idea of wrapping up all of these into a simple function, annuity values, or commutation functions. Systems were built around these so-called commutation functions, as were the consulting styles of those who used these functions. This approach encouraged people to look only at single liability figures, rather than at a series of cash flows.

Some effort is now being made to deconstruct these single liability figures, and to take away some of the constituent parts of their derivation. In particular, the discounting process is now often looked at separately, and a future stream of cash flows is now an integral part of any 'result'.

What we are going to explore here is whether such cash flows should be deconstructed even further. In particular, we are going to explore the dangers of taking one simple set of cash flows which underlie a typical single liability figure, for instance the technical provisions used in scheme funding, and using that for every other potential purpose which might arise.

So, let us remind ourselves of who might use cash flows in today's world. Clearly, a Scheme Actuary will find them useful in advising trustee clients on funding, on investment strategy, on how mature a scheme is for both of these purposes, and also to illustrate income and outgo for the scheme for cash management purposes. The employer might need this information for similar reasons, including funding and the investment strategy, since they might be consulted on these issues, or will need to agree to them. Also, as from January 2007, the Accounting Standards

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Board's (ASB's) best practice is for accounting disclosures to provide some indication of future cash flows from a scheme. So, employers, too, are quite interested in cash flows.

Investment consultants are other users of cash flows. They use them predominantly for strategy purposes. However, cash flows are also used by other investment professionals: investment managers, for example, in setting benchmarks; or investment banks, which will be interested in advising on and in designing hedging strategies and/or selling those hedges to various parties.

Whereas, maybe, five years or ten years ago, cash flows were predominantly used for a triennial valuation process, and predominantly by the Scheme Actuary, nowadays the position is rather different. There are many more parties involved in running the pension scheme, and, therefore, many more parties interested in seeing the constituent components behind some of the single figure liability figures which we have been using for many years.

Let us look at the areas where cash flows are used in more detail. Typically, cash flows have been the constituent components in the funding valuation for many years (although they have been wrapped up in commutation functions, rather than being used directly). More recently, asset/liability modelling exercises have been carried out for many clients. In the early days, approximate summary data might have been used, but I suspect that now, with the computing power which we have, it will also be commonplace to use cash flows for that purpose.

The asset/liability modelling techniques have highlighted the investment mismatching aspect in many schemes and have encouraged the liability driven investment (LDI) approach. LDI is an investment strategy which tries to place a hedge against a certain stream of cash flows. However, is it really 'liability driven', or is it driven by a single set of cash flows which were designed for a completely different purpose?

This is really the area which we would like to explore now; to what extent do cash flows actually reflect the liabilities rather than a narrow subset of potential liabilities? Now that we see very complex investment products available, such as inflation hedges and interest rate hedges, it brings the consideration of the characteristics of liabilities into a sharper focus.

I suspect that it is commonplace for all of us to have, in our heads, an idea of the characteristics of the liabilities of a particular scheme. Broadly speaking, many are linked to inflation; the mean term is 20 years; and so on. But what if a trustee client or sponsor came to you and said: "We want to take out all of the investment risk; how much inflation hedge and how much interest rate hedge should we buy at each future duration for the lifetime of this pension scheme?" How many of us are actually in a position to provide the liability proxy to that level of detail?

In my experience, the project plan for a hedging exercise goes something like this. The Scheme Actuary is very happy with life, and always wants to please his clients. However, there is a banker, somewhere, whom the Scheme Actuary has never met and does not know. Nonetheless, a message is passed from the banker to the Scheme Actuary, via about six different people, and the message is: "Please could the Scheme Actuary provide the cash flows by lunchtime yesterday?" The Scheme Actuary is very accommodating, and happy to please. "Of course, I have some I can send you straight off the shelf. I did the valuation last week." Everyone is happy.

However, are they? Is that one set of cash flows, which had been prepared for valuation purposes, fit for the purpose for which someone, whom you have never met, might now want to use them? How do we communicate the characteristics of the cash flows to that third party?

That is the end of the introduction, and now I shall consider some of the details. As this is a discussion meeting, there is no paper to read beforehand. Also, there are no formulae in anything which Mr Evans and I will show you, but that is not to say that there are no formulae behind our presentations. In fact, the analysis is, in some cases, quite complex.

Figure D.1 shows a typical cash flow projection for a typical pension scheme. On the  $y$ -axis you have the pension payments made from the scheme, and along the  $x$ -axis you have time, measured in years in this particular case. You can see that, for this particular fictitious scheme, the cash flow starts at around £40 million; the level of the current pension roll. As actives and deferreds retire, the pension roll rises. (They seem to retire faster than most pensioners die these days.) Around the time all the actives and deferreds have retired, the zenith of the curve is

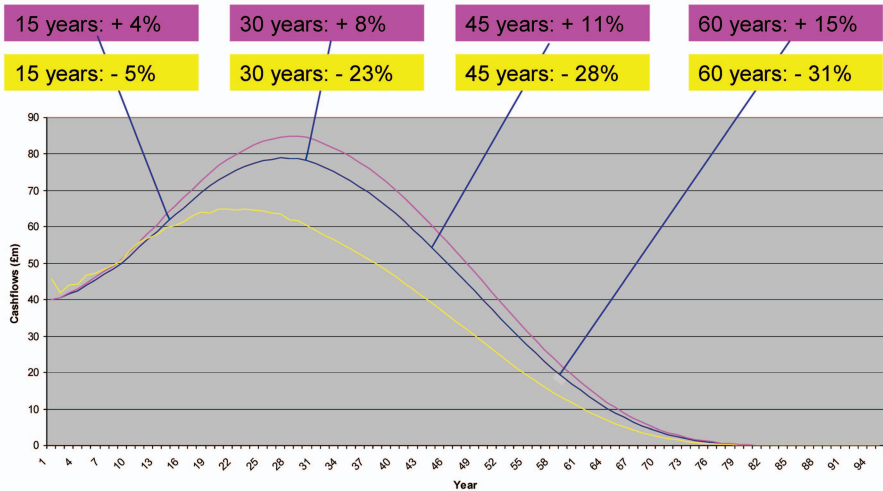


Figure D.1. Potential variation in cash flows in a typical scheme — before allowing for the forces of nature

reached, after about 30-odd years in this case, and then the curve drops down, as people die, towards zero at the 80+ years' point, when there are no further members nor beneficiaries of the scheme receiving pensions.

Figure D.1 illustrates some sensitivity to certain assumptions. The pink line represents the cash flows which might have been used to calculate a technical provisions figure. This set of cash flows rises up to about £85 million at its highest point.

I then went through the various scheme rules to see what might apply to this typical scheme. I identified certain characteristics which you could find in many other schemes, which involve benefit formulae, and also actions which can be taken by trustees, members and, potentially, employers and other parties, and which could affect the level of cash flows which the scheme might need to pay out in the future.

I have not tried to go to extremes by any means. The sensitivities reflect what might be seen, typically, in the normal course of events. I have ignored the forces of nature. In particular, I have, for now, ignored the impact of mortality on the projected cash flows, and I have also ignored the potential impact of scheme members who find a civil partner or spouse, simply so as to maximise their pension benefits! Simply, Figure D.1 illustrates only the variation in cash flows which might arise from the decisions taken by the trustees and the employer under the normal operation of a pension scheme. Three potential outcomes are shown, each illustrating the impact of a particular approach to the operation of the scheme. As well as the pink “technical provisions” set of cash flows, the blue line illustrates the impact of exercising one power and the yellow line illustrates the impact of a number of others. (The figures on the chart show the percentage sensitivity at selected durations relative to the blue set of cash flows.) The results are, potentially, quite interesting. For example, we can see that, going from the pink line down to the yellow line, at a duration of 30 years or so, we have a 30% or so variation in the cash flow which could be used for funding purposes. At 45 years, the variation is nearly 40%. These are all durations which now can be usually hedged. When investment banks, trustees, or sponsors, come to you and say: “Our intention is to hedge 90% of the liability stream over the next 50

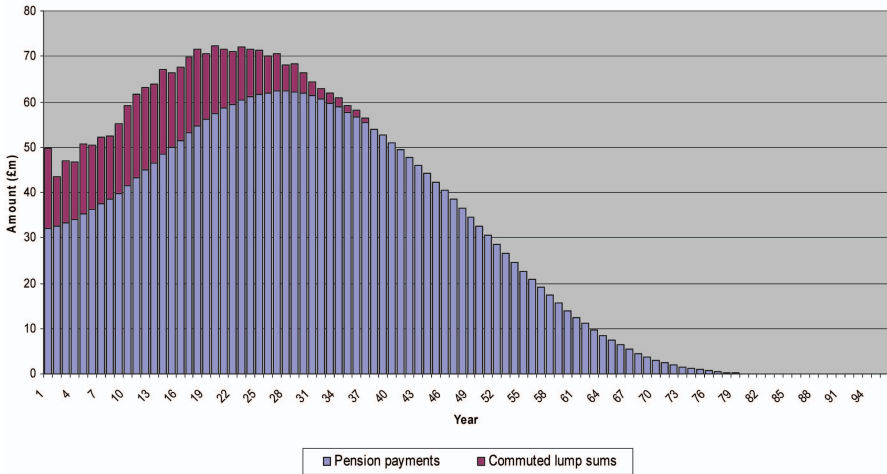


Figure D.2. Lump sum vs pension commuted

years,” the variations illustrated here start to raise questions about which liability stream will form the foundation of the hedge. In summary, there is quite a big difference in the projected cash flow streams based on different assumptions about how the pension scheme is managed.

One area where someone can influence the scale of the cash flow from a scheme is commutation. In Figure D.2 the shaded blue area illustrates the ‘after commutation’ position, assuming that everyone takes a commutation lump sum in the scheme. Thus, the blue area illustrates the residual pension which would be paid to members after they have retired. I have assumed that 25% of the pension is commuted in all future cases. Had I not assumed that, all the liability cash flows at the long end would have been 33% higher than shown in Figure D.2. (The impact at shorter duration would be less significant.) The red area illustrates the amount of the commutation lump sum paid. This demonstrates the shift in the amounts, and the timing, of the projected benefit payments.

Comparing the two, the term of the liability has shifted. We have brought the benefit commuted forward from a mean duration of 30 years or so down to, maybe, a mean duration of ten years. The characteristics might also change. Whereas, typically, the pension paid out would be an inflation-related pension payment, when we pay it as a lump sum it is just a single lump sum. There is no inflationary exposure to that lump sum after the point of commutation.

A consideration when hedging such a liability would be to determine who has the power to allow the commutation, and what their intentions and policy might be in this respect. It would be impractical to speak to every member and to ask him or her how much they would commute, but what you can do is to ask the others involved what their policy would be.

Typically, trustees must consent if a member takes a commutation. In theory, they could disallow commutation, and this would remove some uncertainty in the projected cash flows.

The employer may also have a role in some trust deeds (for example, in setting the level of the factors used). Alternatively, the rate of commutation might be set out in the trust deed. If there is a fixed rate of conversion in the rules, then you could be swapping an inflation-related liability for a fixed liability, and there would be a change in the duration of the benefits paid. These might have an impact on the hedging instruments which you might want to buy.

One of the main areas where hedging is considered is inflation. Pension provision in the

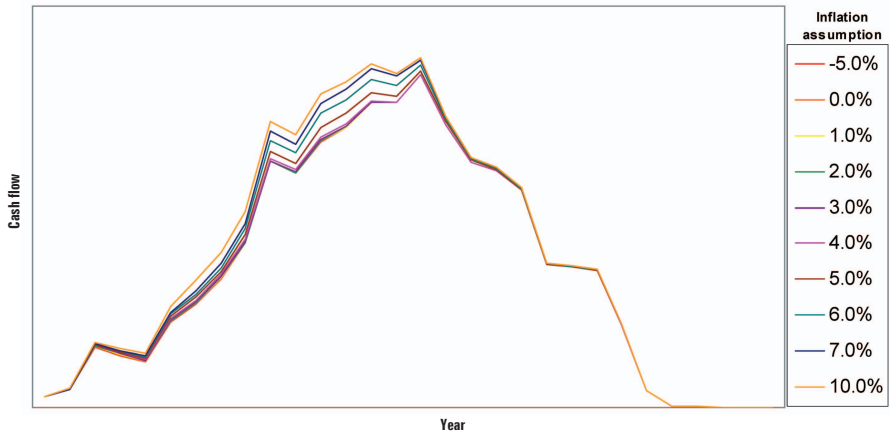


Figure D.3. Inflation sensitivity

United Kingdom is particularly complex, what with guaranteed minimum pensions (GMPs) (with either Section 148 revaluation, or a fixed revaluation), and with a variety of increases to pensions in payment (fixed, 0%, inflation with a maximum of 5%, 3%, or 2½%, etc.).

Statutory revaluation on the non-GMP pension also applies in most schemes, and, in some, there might be scheme-specific increases overlaid onto the statutory increases. Figure D.3 attempts to illustrate the inflation sensitivity of the capital value at retirement of a benefit with a collar on the level of increase in deferment. We considered the impact of assuming inflation of -5%, 0%, 1%, 2%, 3%, (etc.), up to 7% p.a., and also 10% p.a. This particular benefit formula delivers little inflation sensitivity until you get to inflation levels of over about 4% p.a., and then only for retirees within a certain period.

What is the message from this? I think that the message is that illustrating inflation sensitivity using a central valuation inflation assumption, plus or minus, say, 0.25% p.a., may not be sufficient to design an inflation hedge.

I have explained that, up until now, I have not considered the forces of nature (mortality, for example). The figures, so far, have demonstrated the impact of either markets or management actions. I have ignored, entirely, the natural influences on projected cash flows. It is only right that we address those.

**Mr H. M. Evans, F.F.A.** (continuing the presentation): Mortality is the elephant in the room. Mr Wharmby has cogently argued that it is worth looking at the liabilities in more detail. However, we all know that mortality is very uncertain. Is it actually worth all that extra analysis? I think that it is, and that it stands to reason that, if we are reporting our results in more detail, we need to check that our assumptions support that level of detail. So, if we are reporting cash flows rather than a single capital value, we need to look at our assumptions in detail, and that includes understanding the uncertainty around future mortality. At the same time, we need to be more open with our clients about the limitations of our assumptions and to ensure that the decisions which should be made by our clients are made by them.

Arguably, the base mortality is the easy part. In principle, you can calibrate a standard table to fit the experience. However, in practice, it is only schemes which have tens of thousands of pensioners which can say, with confidence, that one standard table has a shape which better fits their underlying mortality experience than another standard table. I think that this lends support

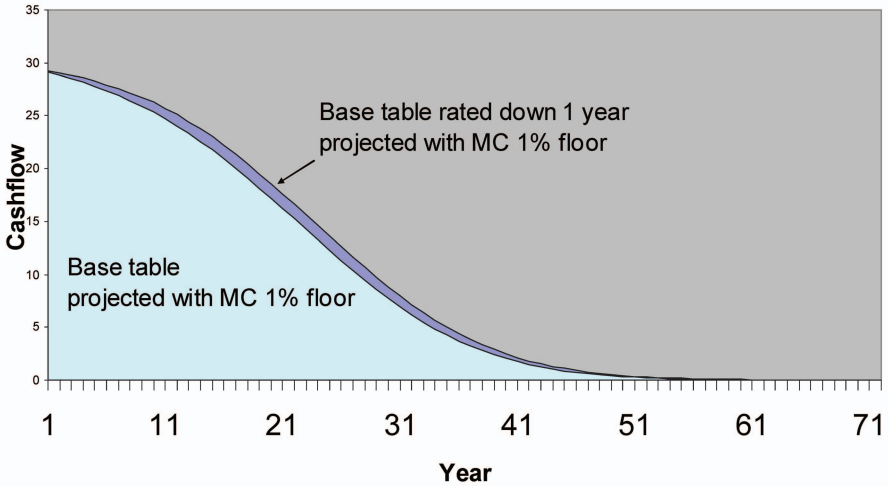


Figure D.4. Sensitivity to base table; pensions in payment cash flows

to the assertion, in the Board for Actuarial Standards' (BAS) discussion paper, 'Actuarial Mortality Assumptions' (March 2008), that we should be using the latest tables where possible.

However, how sensitive are cash flows to the base table? Figure D.4 is an example of pension-in-payment cash flows in which I have first taken a base table, and then I have projected it forward with the median cohort with a 1% floor. (I picked this projection simply because it is used by Pensions Protection Fund (PPF) valuations.) I have then age rated it to see how sensitive the cash flows are to age rating. On the face of it, the answer is 'not very', but, on closer inspection, when you get to around the 30-years mark, the upper portion is quite large relative to the lower portion. The difference is about 14%. If you go further out to the extreme, say 45 years, the difference is as much as 24%.

Figure D.5 shows that the position is much the same with deferred members. The shape is rather different from that of Figure D.4, so, if I look only at the 30 and 45 years mark, the percentage difference is small, something like 3½% and 10% respectively for the age rating, and even less for a 5% scaling of the probability of dying.

On the face of it, then, cash flows are not that sensitive to the choice of base table, except at long durations — but these are the durations which matter if you aim to hedge inflation risk or interest risk. For this reason, there may be some value in analysing your data in more detail than you would if you were just calculating a capital value. For example, you might split the data by pension amounts.

Certainly, if you are going to make a very strong assumption about longevity improvements, you need to look closely at what happens to the projected mortality rates for high ages. You can get some very strange effects, such as mortality rates which fall as the age increases. You may also find that the expected population immediately before the terminal age of the table is substantial, in which case you would have a cliff edge rather than a tailing off of cash flows, such as in Figure D.5.

It is when you come to future improvements that you start to see any real significance in your choice of assumption. You might not think so when you look at Figure D.6. This compares my median cohort 1% floor projection to the central Lee-Carter projection. Again, you might think that it is not such a big deal, but remember, this is only the central projection. If you look

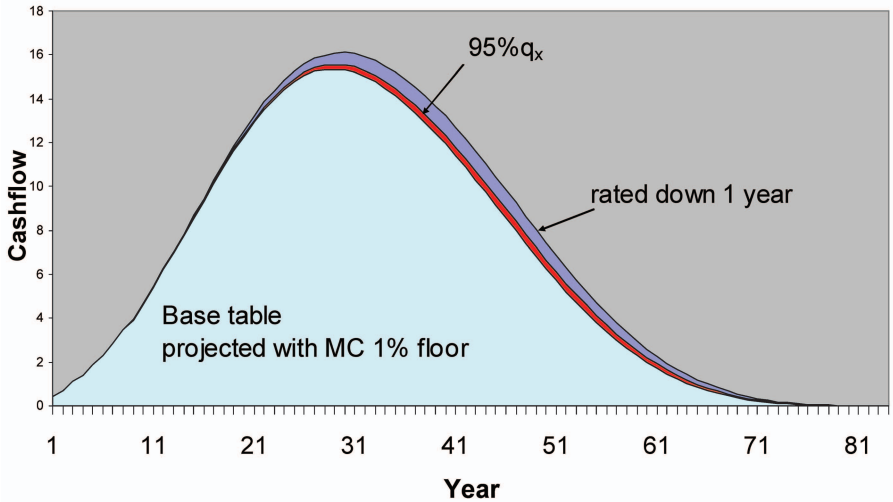


Figure D.5. Sensitivity to base table; deferred pension cash flows

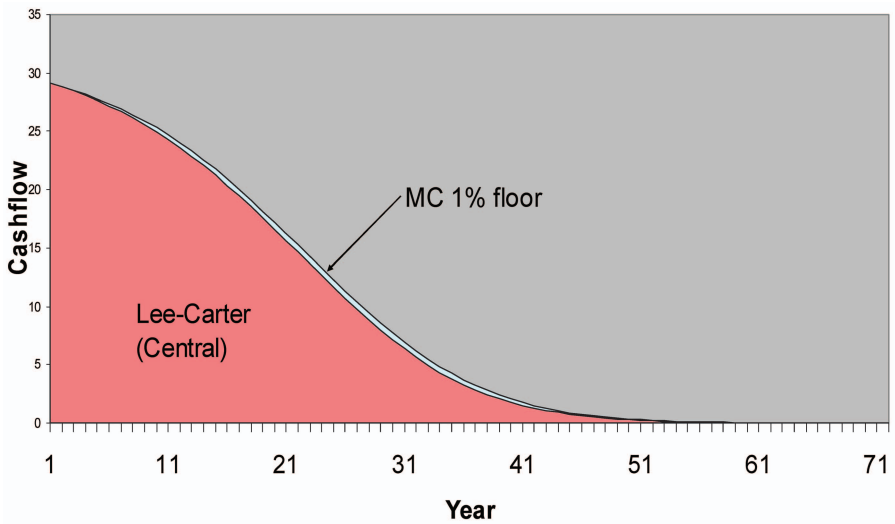


Figure D.6. Sensitivity to future improvements; pensions in payment cash flows

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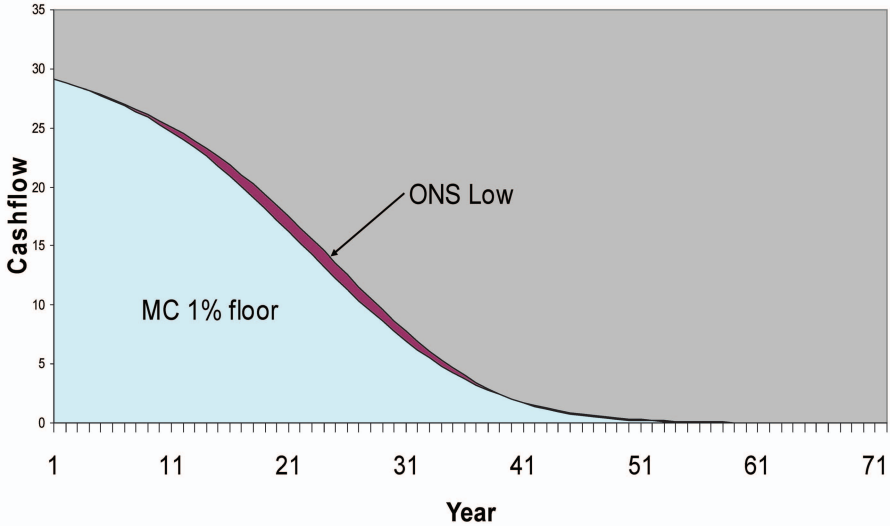


Figure D.7. Sensitivity to future improvements; pensions in payment cash flows

at the different quartiles, etc., you will find that already there is quite a difference between cash flows for different projections.

I have also looked at what happens if you use the ONS's projections, and this is shown in Figure D.7. Again, if you are still using the median cohort 1%, you can take some comfort from the fact that the ONS 'Low' projection is not very different for pensions in payment. However,

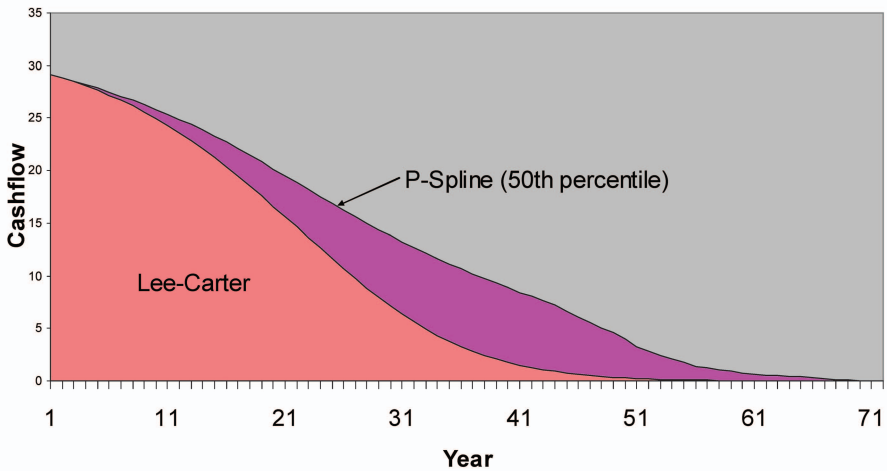


Figure D.8. Sensitivity to future improvements; pensions in payment cash flows



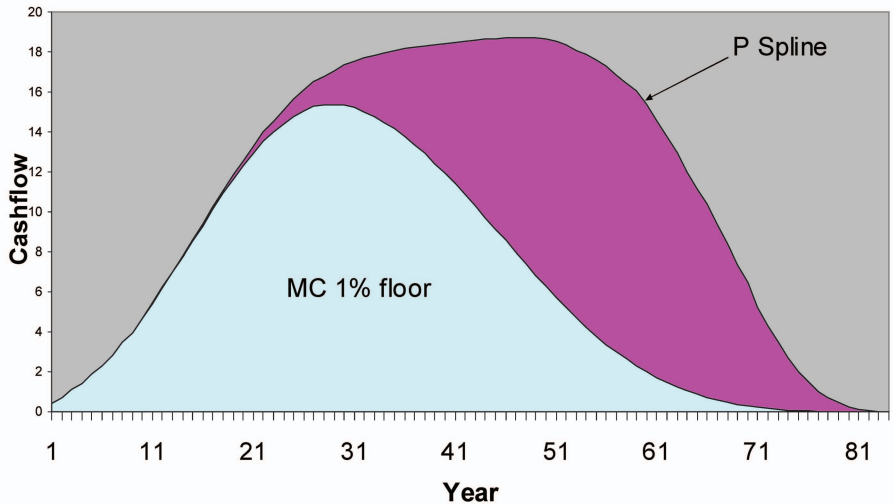


Figure D.9. Sensitivity to future improvements; deferred pension cash flows

of course, if you use something more extreme, like a *P*-spline projection, then you start to see some really big differences in your cash flows. For example, in Figure D.8, the difference at 30 years is about 90% and the difference at 45 years is 800%. The position is even more extreme if you look at deferred pensions, as is shown in Figure D.9. Unfortunately, interest rates and inflation hedge pricing are driven by cash flows at those longer durations. It is easy to dismiss the

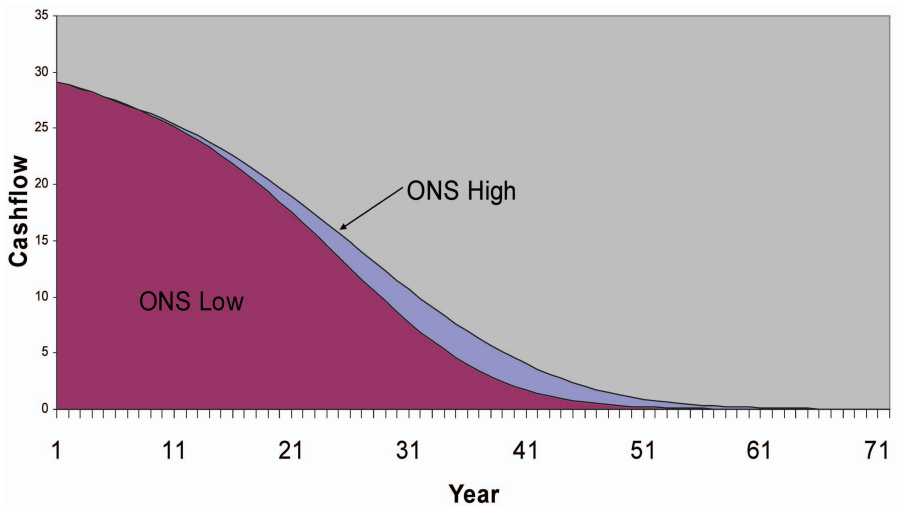


Figure D.10. Sensitivity to future improvements; pensions in payment cash flows

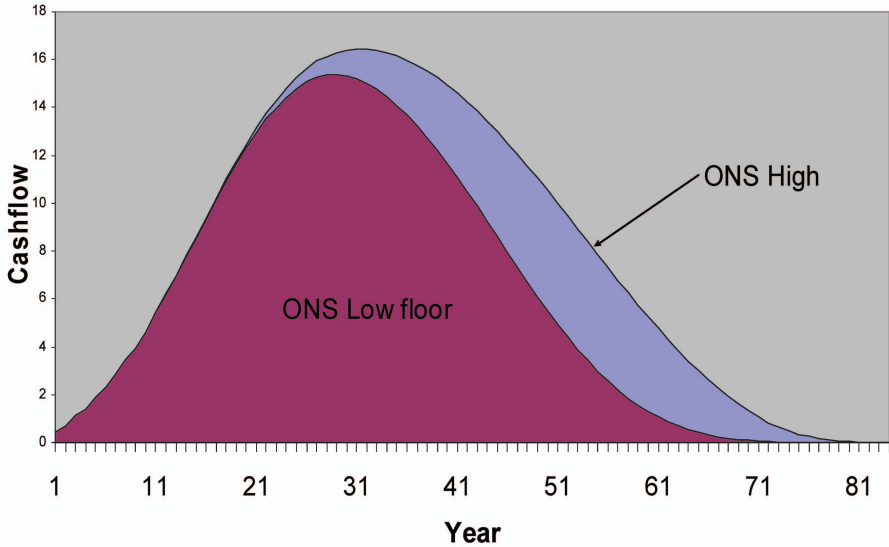


Figure D.11. Sensitivity to future improvements; deferred pension cash flows

*P*-spline projection shown in Figure D.9 as extreme, but, even if I restrict the analysis to something like the ONS projections in the CMI library, you will see, in Figure D.10, that the spread of cash flows is actually rather large. At 30 years the difference in this figure is 33%. At 45 years it is 200%. You see much the same thing coming through in the deferred pension projection, as in Figure D.11, and, when you start to explore some of the more extreme underpins in your cohort projections, then you see similar effects.

It is worth saying a few things about underpins, because, when you are looking at cash flows, it starts to matter that what you are actually doing with an underpin is to make a correction at the long end for a problem at the short end; that is that mortality improvements which we are experiencing now are higher than, for example, the median cohort projection anticipates. That might not matter if you are discounting to get a single capital value; but, if you need cash flows, whether or not you use an underpin might be important.

I would not say that there is any agreement on which projection you should use. I chose my examples more or less at random out of the CMI library. So, I realise, for example, that the unadjusted Lee-Carter does not back test very well, because it does not deal well with the cohort effect. Equally, I realise that *P*-spline projections can vary quite dramatically when you add an extra year of data — the so-called ‘edge effect’. The point is that these are the kinds of differences which we need to explain to our clients, so that they can make informed choices as to which cash flows to use for whatever purpose.

How do they reach that choice? You could have a discussion with them about varying the improvements by sex or by socio-economic group. I gave, as an example, splitting the data into homogeneous groups by pension amount. You might want to use scenario testing, and show them what would happen if there was a pandemic like bird ‘flu or SARS, or, conversely, a cure for cancer. There is scope for much extra analysis and advice.

You might think that, perhaps, you could use mortality derivatives to take away this problem. I am sure that they can help, but only to the extent that you are certain about how

much of that mortality derivative you need to buy, which brings us back to the cash flow variations, about which Mr Wharmby was talking.

Part of being careful is to ensure sufficient disclosure. Those of you who have read the BAS discussion paper ('Actuarial Mortality Assumptions', March 2008) will see that it has quite a lot to say on this topic. If you are using a bespoke base table, it suggests that the BAS standard could say that you need to talk about the data source and the amount and the credibility of your experience; the method or the model which you have used to graduate your base table; and also the maximum life span implied.

The BAS has suggested analogous disclosures for published base tables: which base table you have, and the reason for choosing it; your method of adjustment, and why it is justified; your data source; the amount and the credibility of the experience on which the adjustment is based; the method used to update the published table to the calculation date; and, again, the maximum life span assumed.

The BAS paper has a parallel set of suggested disclosures for the improvement allowances. For example, if you are using a bespoke allowance rather than a published model, you need to explain that model and the reason for using it. You also need to explain your data source, the amount and the credibility of the experience, and the estimated parameter values.

I am not aware of any pension scheme which can demonstrate the cohort effect, although that may be because there are very few pension schemes with enough data. The cohort effect, as I understand it, has been observed in the general population and in the assured lives data, but I also hear that some annuity portfolios even exhibit an inverse cohort effect. All in all, I do not think that we should take it for granted that there is a cohort effect in the mortality of occupational pension schemes.

Many of the same kinds of disclosures are suggested by the BAS if you use a published projection. You would need to say which one you have used and why; and, if you have adjusted it, how you have adjusted it and why you have adjusted it. Of course, if you have used approximations along the way, then you would need to explain what they are, why you have used them, your reasons for considering that those approximations are valid, and their possible impact.

**Mr Wharmby** (concluding the presentation): The BAS has published various papers over the last few months. Not only has it commented on mortality, but also on cash flows. It released its consultation document 'Towards a Conceptual Framework' in November 2007, which included reference to the disclosure of undiscounted cash flows.

The BAS exposure draft 'Reporting Actuarial Information', the technical standard relating to reporting financial information that requirement issued in April 2008, dropped that requirement, but the new document does encourage the disclosure of cash flows if it aids understanding. It also goes on to say that the advice is not complete unless it is presented with a discussion about the risks involved in the advice given.

The variations observed in the figures which we have just seen reinforce the fact that we need to be careful about how we present a single set of cash flows, especially when they have not, necessarily, been designed for that purpose.

The BAS exposure draft 'Conceptual Framework for Technical Actuarial Standards and Scope & Authority of Technical Standards', issued in March 2008, also mentions cash flows. It states that cash flows should depend upon the objectives of the calculation.

When we were calculating single figure liability values, typically we took care as to how that figure was represented. I think that the same principle should apply to any constituent component of any particular single figure liability. In my view, cash flows should not be seen as a breakdown of a single liability figure, or even processed data, but, instead, should be regarded as a large number of results. I think that it is very important that the cash flows, themselves, should be as fit for their purpose as any single liability figure would be.

We are not yet bound by the BAS documents, but we still have Professional Conduct Standards (PCSs) in place. These already say that we must include sufficient information and discussion for the client to be able to judge the appropriateness of any advice which we give. If

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'advice' also encompasses calculated cash flows, then, maybe, we should include rather more discussion than illustrated in my earlier project plan.

The PCSs also state that you need to make it clear that advice to the client is not necessarily formulated for third parties. It would be interesting to consider how this should be addressed in situations where our clients forward cash flows to their investment consultants and investment banks. The PCSs also say that you should make clients aware of the fact that advice or information has no broader applicability than was intended originally by the actuary providing the advice.

Arguably, I think that the existing (and potential future) framework encourages and/or requires us to take seriously requests from clients and third parties seeking cash flows from Scheme Actuaries.

The PCSs are expected to be replaced by a new document, the Actuary's Code. The Exposure Draft (EXD15), on communication, does say that sufficient information should be provided with the advice to ensure that the advice or the information can be put in proper context. So, simple cash flows may not be sufficient, and, arguably, we should send further information to make sure that the recipients of those cash flows know what the cash flows are.

So, I do not think that cash flows are raw data, but that they are processed results. Before carrying out any cash flow exercise, it is well worth identifying the following, in addition to collecting all the usual member data:

- *The purpose of the exercise.* When the BAS standard comes into force, we will be encouraged to think about that in more detail.
- *The benefit provisions.* What is in the trust deed and rules? What are the benefits of the scheme? The benefits taken into account in the valuation may not be relevant, necessarily, for the particular purpose now under consideration. What could the benefits become if someone were to take action somewhere to change those benefits?
- *The assumptions.* As well as the usual financial and demographic assumptions, you can go and ask the people involved in running a pension scheme what their policy is in areas which might impact the benefits. Employee behaviour is tricky, but a steer on likely trustee behaviour is certainly one to which, as a Scheme Actuary, you should have easy access. In my view, this information is all part of the raw data needed for the exercise. The production of cash flows is not a simple, straightforward, factual calculation. There is judgement involved in assessing the assumptions behind calculating these cash flows.
- *Power and discretions, complex benefit provisions, member options.* Do not forget all these items when looking at cash flows.
- *Professional conduct and risk management.* These are about how we communicate these cash flows to the recipients. I would encourage those involved in cash flow provision to define or to agree the purposes for which these might be used, and agree the purposes for which they cannot be used. They may be fit for the purpose of a valuation, but they might not be fit for any other purpose, and, maybe, we should say so to our clients and/or to third parties.
- *Disclaimers and third party reliance.* If we, as professionals, do not want to take any responsibility for some of the information which gets passed around in the market, we should be very clear on that, and draw that to the potential recipient's attention.
- *Communication channels and disclosure of information.* These are quite important. I mentioned before, with the example of my 'unknown banker', that long e-mail trails are not unheard of. A request may pass through trustees, sponsors and investment consultants before, eventually, reaching the Scheme Actuary. We have to remember who our clients are, and decide with them whether this information should be passed around the market. If you seek a good purchase price for oranges in a market, would you want to look as if you were desperate for an orange? Should we really be circulating cash flows around the investment banking arena? Is that really in our client's interest? Potentially, will that action alter the price of certain contracts? I do not know. I am just asking the question, but it is certainly worth thinking about, and worth discussing with your client.
- *Disclosure of information.* If you are disclosing information to third parties, it would be wise to obtain the consent of your client to do so. I will not make any further comments here on conflicts of interest and the confidentiality of information.

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**Mr C. Parnell, F.I.A.** (opening the discussion): With regard to hedging and inflation, given the nature of pension scheme cash flows and the fact that they are highly variable, for example in respect of mortality, do you think that trustees are in a position to monitor mortality, and to project it accurately enough to put the inflation hedge in place? We do not have the expertise, and we have not put the governance in place to be able to monitor this in the future.

**Mr Wharmby:** I think that trustees are becoming much more familiar with the uncertainty surrounding mortality. All of them should have completed, or will very soon have completed, their first valuation under the scheme-specific funding regime. Given that they need to understand what they are assuming under that process, they should be able to form a view for other purposes as well.

I believe that our job, as actuarial advisers, is to take all the latest ideas and projections to them, and to illustrate where the assumptions used are within the ranges currently considered as being reasonable, and to illustrate the financial impact of other assumptions, techniques or projections.

I do not believe that the uncertainty surrounding mortality places a bar on hedging, for example, inflation. Under many schemes, the first 'hedge' on mortality is the adoption of a prudent table for funding purposes. The point which we are making is that the assumption used for this may not be what the trustees would want to use for designing an inflation hedge.

To take an analogy; when you set sail in your yacht across the Channel aiming for Cherbourg, you would refer to a chart and a compass to establish whether you should head south, east or west. Similarly, when designing an inflation hedge, trustees should know whether they are likely to be over-hedging or under-hedging.

**The President (Mr N. J. Dumbreck, F.I.A.):** To take that analogy a bit further, if you set sail for Cherbourg, then you would expect to check your course from time to time, and, if necessary, make corrections to your course. If you purchase a hedge, presumably you are liable to find out that it is not a perfect hedge, two or three years later, and want to alter it.

To what extent do the products available for hedging pension scheme liabilities allow that flexibility?

**Mr Wharmby:** That might be better answered by an investment specialist, but you would expect that it is possible to purchase additional hedges, and/or sell in the future. This would depend on the liquidity of the instruments, and on the prices available in the market. The worry is that, if you put a hedge for 120% of what you might need in place, just because the cash flows are prudent in the first place, then, at some point in the future, you might need to unwind some of that hedge if you want to retain the same level of matching.

We would prefer it if the trustees or the sponsor, or whoever is making decisions in this area, had all the information needed to make an assessment for themselves, as to whether it is likely to be under-hedged or over-hedged, and to what degree they might still want to over-hedge, perhaps because the terms are better at a particular duration. That way, at least, a conscious decision is being made as to the level of hedge to purchase.

With only one set of cash flows, you do not really know to what extent the hedge is fit for purpose.

**Mr J. M. Radford, F.I.A.:** You have spoken a lot about the uncertainty of the liabilities and the cash flows used to determine hedges, but not much about the quality of the hedges, the asset incomes and the things backing all these liabilities; and, indeed, whether we should give more information to the client about the quality of the hedges which have been used to match the liabilities.

We seem to be spending much time and effort on the liabilities side, but it is taken as read that the hedge will just do its job. I wonder what your opinion is regarding the disclosure of the risk inherent in the hedges.

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**Mr Wharmby:** We are here talking about the liabilities and the uncertainties in those liabilities. I would not profess to be an expert on all the assets available in the markets which would be used for hedging purposes.

If you want to put in place a perfect hedge, and, if the instruments to do this existed, then you would need to identify, with some precision, the characteristics of your liabilities.

The problem is that, in practice, you cannot buy assets which will hedge every single part of a pension scheme's operation precisely. Indeed, I suspect that many trustees will choose to be mismatched to some degree, in order to take advantage of better terms in the market on a less precise hedge. There is obviously much more of a market, for example, in retail price index (RPI) related inflation protection than LPI inflation protection. It is a judgement call for them if they want to seek a better return in exchange for a higher level of risk.

Our point is that, if you have only one single set of cash flows, you are unlikely to be able to illustrate any characteristics at all, and so this approach has very little chance of providing an accurate hedge going forward.

**Mr J. M. Giddings, F.I.A.:** The figures which you have produced indicate expected variances over long future periods. Some trustees may be more concerned with what will happen between one scheme valuation and the next, and the extent to which a healthy funding position now will turn into a nightmare scenario at the next valuation. Events do not always seem to follow statistical patterns, and it is always the unexpected risk which materialises. Clearly, a stock market shock will achieve this, but also an oil crisis which causes runaway inflation. On the other hand, an epidemic could provide beneficial outcomes for the funding of a pension scheme at a future valuation.

While the education process which you have outlined for trustees, in relation to risks caused by expected statistical variances in experience, is important, the trustees also need to be made aware of the shock-risk scenarios which can occur, and to consider what risk mitigation process they should pursue.

Have you any plans to develop your education process to include the discussion of the management of shock risk scenarios?

**Mr Evans:** I have some sympathy with Mr Giddings' comments. As you say, I did draw attention to the fact that scenario testing would inform trustees' decisions about which cash flows are the ones to use for any given purpose.

I am not sure that mortality, in particular, has become more volatile in recent years. Unfortunately, whether or not it has would not show on the figures which were shown in the presentations, because I was just projecting from a valuation date, using standard projections.

With mortality, one of the big issues is that the stochastic variation can mask the trend. Often the variations experienced from year to year are just much bigger than the underlying trend. Of course, when you have cash flows which extend over 80-odd years, it is really the trend about which you need to worry. Identifying that trend is very difficult, without data, for tens of thousands of pensioners. Even the population data are very 'noisy'.

I touched on the problem of mortality rates at high ages. The main thing which strikes you, when you are looking at the rates above age 90, is that the crude data are so 'noisy' that none of the rates are particularly credible.

This is a real problem for the Profession, because, if you believe that some of the more cautious mortality improvement assumptions being adopted now are going to come to pass, in effect you believe that a substantial part of our population will be living beyond age 100. For example, if you use something like the long cohort projection with a 2% floor, you can find that about 50% of the 21-year-olds in your data are assumed to live to age 100.

Given that we do not actually have reliable mortality rates at high ages, projecting cash flows can be fraught with hazards.

**Mr H. D. Sutherland, F.I.A.:** I am not a pensions actuary, so I will not comment on the technicalities. However, I am interested in the communication issue which has been raised. I

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suspect that, in many instances, the use of diagrams to communicate to non-technical clients is worth considering.

I was particularly interested in the figures which show inflation experience. I could not understand why, at about 30 to 40 years' duration and beyond that, there was no difference, whatever the rate of inflation was. What is happening in the data which causes this?

**Mr Wharmby:** Figure D.3 was not looking at cash flows in each year, but was considering another useful statistic relevant to this particular benefit structure. One feature of this structure was that the inflation sensitivity ran out after a certain time period. In practice, you would have more time than we have had in this meeting to explain and to communicate such extreme features to your client.

**A speaker:** Are you advocating a stochastic basis for doing these cash flows?

**Mr Wharmby:** Not necessarily — stochastic processes help to assess the potential risks, but they may not be sufficient to identify, for example, how much inflation hedge to buy at each duration. In other areas, for example where you are looking at decisions made by trustees which could influence the liabilities (for instance, the power to block commutation), a stochastic analysis seems inappropriate to me, in normal circumstances.

I suspect that there is far more which we could do in terms of deterministic analysis without needing to use stochastic modelling. Having said that, risk/return trade-offs might be best illustrated by stochastic processes. So, yes, I can see that, in terms of a holistic approach to managing assets and liabilities, stochastic projections would go hand-in-hand with some of the cash flow projections and deterministic analyses which we have described in this discussion.

**Mr N. B. Masters, F.I.A.:** To add to what Mr Wharmby was saying, I work in the life business, and we have been doing similar work on asset/liability matching across economic scenarios. We have found that the interaction of the stochastic model with the associated management decisions has proved crucial in quantifying liabilities. For example, if the economic scenario being tested is negative, it is important to model the switch to matched gilts and the cuts in bonus levels.

I think that you should look at what the trustee might do in the same way. What a trustee might do, in extreme economic circumstances, is actually far more important than what a trustee might do in normal circumstances. While I understand entirely how confusing it can be for trustees, I think that it is a very valuable exercise to push the trustees, or in my case, the management, by asking: "You have matched it like that now; but what would you do if interest rates dropped towards zero, as they did in Japan?"

**Mr Wharmby:** I agree with that entirely. For example, if you did manage to put a perfect hedge in place for a fully-funded pension scheme, you would not need to worry about what would happen if interest rates went up to 20% or if inflation went down to minus 20%. However, perfect hedges are not seen in practice, so, inevitably, stochastic analyses would be useful. I am not sure to what extent it would be useful to illustrate the variability of all cash flows, but they might be very useful in the overall management of the scheme.

A particular area where I could see this being of value is that of discretionary benefit increases. Although, typically, they could be included in a funding plan, the resulting cash flows would not demonstrate the impact of a decision to reduce or to cease discretionary increases if the funding position worsened, or if the employer became insolvent. I think that a vital part of this process is to identify the likely minimum level of benefits which might be expected to be paid.

**Mr D. Matthews:** I would like to go back to the figures at the start of the presentation, and to the part of the discussion about disclosure. Is there not a danger that the trustees can read off the cash flows in each year: year two, £20 million; year three, £25 million; etc.; and then the trustees think: "This is what my pension scheme is going to do for the next 60 years?"

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**Mr Wharmby:** Yes, I believe that there is a great danger that, once you produce one set of cash flows, then, especially if not communicated well, they are at risk of being perceived as facts. This is the reason why we are here.

I am tending towards including at least two projections of cash flows in any disclosure, in order to make sure that someone, somewhere, has to ask me the question: "Which one is 'correct'?" I can then answer: "Neither."

The point which we are trying to make is that it is not what the cash flows are that necessarily matters, it is the liabilities which matter. Thinking in this way encourages trustees to think about how they manage their pension scheme. It encourages a better governance process, and leads them to monitor risk and return far more frequently. I think that it will lead also to a greater understanding of their powers under the trust deed.

**The President (Mr N. J. Dumbreck, F.I.A.):** The next question which I ask, following on from that, is: "Where do you draw the line?"

Clearly, providing one set of cash flows is liable to be misleading, but, if you flex all the different variables which you could flex, then you would end up with a massive number of possible cash flow projections. In the end, the trustees, if they are going to try to hedge, have to decide which one is the most likely. Also, they would have some information about the variability, but how far do you go in exploring all the options, or is it enough just to make the point that there is a lot of variability, without showing the full extent?

**Mr Wharmby:** This is where professional actuarial judgement comes in. As actuarial advisers, we are likely to know the characteristics of schemes in far more detail than those who are running them. We have the ability to think about the impact of a trust deed power, about the impact of inflation and interest rates on the liabilities. We can use our professional judgement to advise clients. We can pick out the most important features. We can communicate those clearly.

I suspect that going through every single aspect of a pension scheme, and trying to produce a cash flow for each of those, and for all the possible variations thereof, will become a little tedious and boring, not least for the teams back in the office who are running all these cash flow projections.

Our role is to identify what is important, and to say to our clients: "Look, did you know about this really big effect?" If you do not address this in some way, trustees, arguably, would not have the information which they need to make decisions concerning the scheme. Rather than providing 'certainty out of uncertainty', we illustrate and communicate the uncertainty, and what the scale of it might be.

**Mr P. A. C. Seymour, F.I.A.** (Chairman, Board for Actuarial Standards): I shall go back to the Morris Review of the Actuarial Profession. The issue about actuaries making things sound more certain than they actually are is a central reason for the existence of the BAS. So, I could not support more the whole tenor of what has been said here. However, as has been pointed out, trying to explain uncertainty is not the simplest thing in the world.

The question to which I would be quite interested in the answer, because the BAS is thinking about it following our mortality discussion paper ('Actuarial Mortality Assumptions', March 2008), is this: "Would it help if there were, in fact, some sort of benchmarks (I am talking, specifically, about mortality now) against which trustees could say: 'Where are we against these benchmarks?'"

Obviously that is a big topic, but it is something about which the BAS is thinking. Speaking personally, I am neutral on the subject. I remember when AIDS came in, and the Government Actuary issued, let us say, four scenarios; and every single one of them was way above what actually happened. Nevertheless, this may have had a valuable social side-effect, in that it made people take more care not to get AIDS.

You can see what happens if you put benchmarks in place; and then they turn out to be fairly wrong. On the other hand, people do argue to the BAS that benchmarks would be helpful. So, I would be interested in your views.



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**Mr Evans:** I think that there is a little bit of a moral hazard for a Scheme Actuary to be asked to comment on this. Almost by definition, there will be much more work for us if there were no benchmarks. However, my concern would be that, if you publish benchmarks, then they would become defaults very quickly, and our clients would not think about the issues in the way in which we have been advocating in this discussion.

**Mr Wharmby:** If I were to offer a (not too serious) view, it might be a long cohort with a floor, judging by recent comments from the Pensions Regulator!

**Mr A. D. Jordan, F.I.A.:** I would like to ask where you see consulting around cash flows going over the next few years, particularly given the recent influx of requests for them. It seems to me that cash flow projections will be used much more in the future as a communication tool, as they can be used to help pension trustees and our other clients to understand our actuarial work.

**Mr Wharmby:** I think that there are two aspects to that question. I will address communication first. I think that trying to communicate some of these issues to clients is going to test all of us over the coming years.

The key thing, I believe, is to think about what is important for the particular scheme or liability in question, and to make sure that the picture illustrates that in a very clear way. I do not think that you should be restricted by what was presented 'last time' or what was used for another scheme.

We are going to have to become 'Blue Peter presenters'. We will be doing much more cutting and pasting, perhaps using pens and flipcharts as a teaching aid, and that is going to be pretty exciting. It will be a much more interesting job — we will become teachers rather than advisers. (I do not know where the line should be drawn between the two!)

I think that the proposed BAS documents will help us to do that, as they will require us to think what we need to do to make the advice complete.

In terms of cash flow production, I do think that there is going to be increased awareness of the risks involved. It will be more common to see more than one set of cash flows being used for any particular purpose. There will be more illustrations of the uncertainty, and we are likely to be required to do this by BAS standards.

It is only very recently that we have had investment banks knocking on our doors for cash flows. Their appreciation of pension scheme liabilities will grow, and they will seek increased sensitivity analysis.

I think that there is also going to be more innovation in how we develop some of the statistics. Cash flows are one thing, but we may well look at other statistics as well: capital values at retirement; further breakdowns; chunks of liability at certain durations, perhaps for pooled fund matching purposes.

We are going to have to develop our systems to cope with, not only the benefits of each particular pension scheme, but also the changes in the derivatives market. The introduction of new types of certain assets will encourage different ways of analysing liabilities.

As envisaged by the President earlier, once a hedge is put in place, there is going to be far more monitoring needed so as to tweak the hedge as experience emerges. So, I think that there will be much more financial information which we will have to deliver to our clients.

For trustees, the scheme-specific funding regime has certainly increased their appetite for knowledge about their schemes, and has certainly increased the level of governance, so far as I can see from my experience. I think that this is going to continue. As more trustees follow into hedging strategies, the level of detail will be far greater than any of us might have imagined ten years ago.

**The President (Mr N. J. Dumbreck, F.I.A.):** So, there will be plenty of work for pensions actuaries for the foreseeable future.

**Mr Evans (replying):** You will recall that, earlier, Mr Wharmby and I argued passionately that

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cash flows depend on the purpose for which they are being used, and, therefore, that the assumptions used to produce them should depend on that purpose, and that those assumptions may not be the same as the valuation assumptions. Mr Wharmby gave a good example around commutation, and talked about stripping out the margins, checking clients' decisions and discretions. The whole process is quite instructive in terms of understanding the nature of the liabilities.

We then spent some time looking at the work of the BAS in this area, professional conduct standards and the risk management implications for actuaries.

Mr Parnell asked whether the trustees had the expertise to get the inflation hedge right. We were pretty positive that they are certainly increasing their knowledge all the time. Mr Radford asked about the quality of the hedges available. We claimed no expertise in that area, although I have to say that it does seem to me to be a particularly interesting time right now, with all the innovations going on in the area of mortality hedging and also in other approaches to managing pensions risk.

We had some interesting comments about stochastic cash flows. Perhaps we will be back at some point in the future, having worked that one out. Mr Matthews raised a question about conveying too much certainty, and Mr Wharmby agreed that this would be a mistake, confessing that none of his cash flows is 'right'.

**The President (Mr N. J. Dumbreck, F.I.A.):** We will now show our appreciation to Mr Wharmby and to Mr Evans and to all those who participated in the discussion.