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Dear Professor Harris, Members of the USS Trustee Board

Estimating the USS pension fund deficit

We are writing as professors of statistics, financial mathematics or actuarial science. Our primary expertise is in the evaluation and modelling of data, for which the quantification of uncertainty and the critical appraisal of model assumptions are central.

We are writing to express serious concerns about the assumptions underpinning the estimation of the USS pension fund deficit, as detailed in the Oct 2014 document 'USS: 2014 Actuarial Valuation: A Consultation on the proposed assumptions...' (henceforth 'the AV consultation'). For each of our concerns the difference between what is assumed and what we believe to be reasonably justified (on the basis of available information) might appear relatively small (1 percent here, fractions of a percent elsewhere). Nevertheless, as you are well aware, it is in the nature of compound interest and discounting calculations that such changes of a few percent can jointly and cumulatively produce very substantial changes in the estimated state of a fund. The table in section C.5 of the AV consultation makes these sensitivities very clear.

Our concerns are as follows:

1. The Gilts plus method of estimating future investment returns represents an unduly pessimistic assumption which is substantially out of line with what USS has managed historically. It is clearly not prudent to change the basis of the valuation merely because the resulting outcome is uncomfortable: but this observation is not a justification for sticking with a valuation method and assumptions for which the underlying model has ceased to be reliable. This must be the case for a Gilts based valuation in the aftermath of quantitative easing by the Bank of England. We also note that the Pensions Regulator does not mandate the use of the Gilts plus approach and considers methodology based on actual asset performance to be perfectly acceptable, as is made clear by point 125 p.35 of:

<http://www.thepensionsregulator.gov.uk/docs/code-03-funding-defined-benefits.pdf>.

2. The market derived inflation assumptions appear unduly high relative to the historical RPI record or the Bank of England CPI target of 2%. This high rate has been achieved by assuming an exceptionally low inflation risk premium (0.2% dropping to 0.1%), which is much lower than empirical estimates, and by ignoring the depressed state of yields on index-linked gilts related to supply issues. See for example the survey of empirical estimates in http://www.gla.ac.uk/media/media_293624_en.pdf, (p12-13). The Bank of England

estimates <http://www.bankofengland.co.uk/research/Documents/workingpapers/2009/wp360.pdf>, also discusses how pension fund de-risking may be driving down Gilt yields. An especially good statement of the topic is provided in

<http://www.boi.org.il/en/DataAndStatistics/Pages/InflationExpectationsExplanation.aspx> Further discussion is provided in the appendix,

3. The assumed basic rate of salary growth (i.e. before accounting for progression and promotion) of RPI + 1% is much higher than has been achieved historically (See figure below.). A growth rate matching RPI is what has been achieved since 1990. Had RPI+1% occurred since 1990, academic salaries would now be 25% higher than they are. Clearly this leads to an overstatement of future liabilities.

4. We are concerned that the assumption of an increase in the rate of increase of longevity has been made without supporting data. Indeed CMI2012 reports a *reduction* in expected lifespans relative to CMI2011. We would also make the more contentious point that actuarial extrapolation of decreased mortality rates has limitations, and a more biologically informed view, or one recognising the currently depressed state of drug development pipelines, does not support the continuation of this trend: e.g. <http://onlinelibrary.wiley.com/doi/10.1111/j.1728-4457.2007.00172.x/abstract>. (Abstract below.)

5. We see an element of circularity in the valuation. A large part of the deficit estimate is driven by the assumptions on future returns. These assumptions are driven by a de-risking strategy designed to avoid further reliance on the employer covenant. (See 'Employer covenant below.) This further reliance has been deemed undesirable because of the extra costs caused by the deficit estimate.

6. We are concerned that the difference between liabilities under the technical provisions basis and under the self-sufficiency basis is a very crude measure of the real risk being undertaken by a large scheme with a diverse asset portfolio, and is hence a poor measure of reliance on the employer covenant. In addition, the adoption of a 20 year horizon for the robustness of the employer covenant appears arbitrarily small, given the absence to date of any institutional failure in a sector in which many institutions having existed for over a century, and a number for many centuries. This excessively short horizon adversely affects the estimated funding position.

We are especially disturbed to note that points 2, 3 and 5 also apply to the self-sufficiency and economic basis calculations, and even to the 'neutral basis' calculation. From the information provided in sections C.5 and C.16 of the AV consultation, it appears that moving to evidence-based assumptions on salary growth and RPI would show the scheme to be in healthy surplus on a neutral assumptions basis. Remove the de-risking assumptions and that surplus would be substantial. Substitute historic asset growth performance for Gilts plus and the neutral basis would show a very substantial surplus.

With regard to points 1-3, in particular, it seems that the assumptions are chosen in a manner that is economically incoherent. For example, wages growth assumes a thriving economy, while asset growth assumes a recession. This sort of incoherence in the assumptions goes well beyond what could reasonably be considered prudent pessimism. The third paragraph on RPI in the appendix gives a particularly influential example of incoherence.

Guidance from the Pensions Regulator is that valuations should not be based on only worst case assumptions in every issue. Rather, "an appropriate overall level of prudence in the technical provisions should be the paramount objective" of a valuation. "Indeed, in the extreme, for some less key assumptions it might be appropriate to assume best estimate, as long as overall technical provisions are adequately prudent" (Code, para 84, 85).

Our concerns are strengthened by a further observation. By their nature, the scheme's real liabilities must vary slowly on a decadal timescale. Liability estimates that show rapid variation on a scale of months to years (as they do for USS) are an indication of instability in those model-derived estimates, not the underlying reality. We would urge you to change to a more stable methodology, rather than allowing the actuarial assumptions tail to wag the investment strategy dog, by 'de-risking' into Gilts and substantially reducing members benefits. The wild swings in actuarial valuations we are now seeing are either the classic symptoms of a controlled system with (highly undesirable) positive feedback or the "chattering" you get with a controlled system where the control needs to be smoothed over time.

We are not arguing that nothing should change. We are supportive of CRB as a fairer approach than final salary for defined benefits (DB) (provided the transition is made with appropriate adjustment to avoid large average benefit reductions). But we are particularly disturbed (i) that the de-risking strategy involves a move away from economically useful long term investment in productive assets into less productive government debt, and (ii) about the defined contribution (DC) element being introduced into the scheme

as a result of a valuation based on what appear to be poorly-founded assumptions. The comparison between DB and DC is unfavourable for DC:

A recent report commissioned by the Canadian Public Pension Leadership Council (October 2014) concludes:

"Large, well-run DB plans are more efficient at producing retirement income than are DC plans. Several U.S. states that have looked at converting DB plans to DC have concluded that it would cost considerably more to maintain similar benefits. Two states that had converted to DC at least partially converted back because of concerns over how little income they were producing for retirees (Nebraska and West Virginia)."

The USS trustee has a responsibility to manage the scheme so that the promised benefits are paid as they become due; to meet this responsibility only by changing the promise and offering much reduced benefits is an exercise in using the letter of the law to destroy the spirit. If, by contrast, reasonable assumptions regarding the valuation of liabilities and the need to de-risk investments were adopted, it would be possible for all USS members to be moved over to a career average salary DB scheme that is superior to the hybrid DB/DC proposal now on offer, with greatly reduced reduction in average benefits.

The guidance from the pensions regulator states that: "As a trustee, you must protect the interests of beneficiaries." In that spirit, we urge you to replace the valuation assumptions with assumptions better grounded in evidence, and to move to a methodology better reflecting the scheme's real investment performance and more suited to long-term planning. We also urge you to be more prudent by not pushing all assumptions simultaneously to their most pessimistic limit, but rather by aiming for balance and a measure of economic self-consistency.

Yours sincerely



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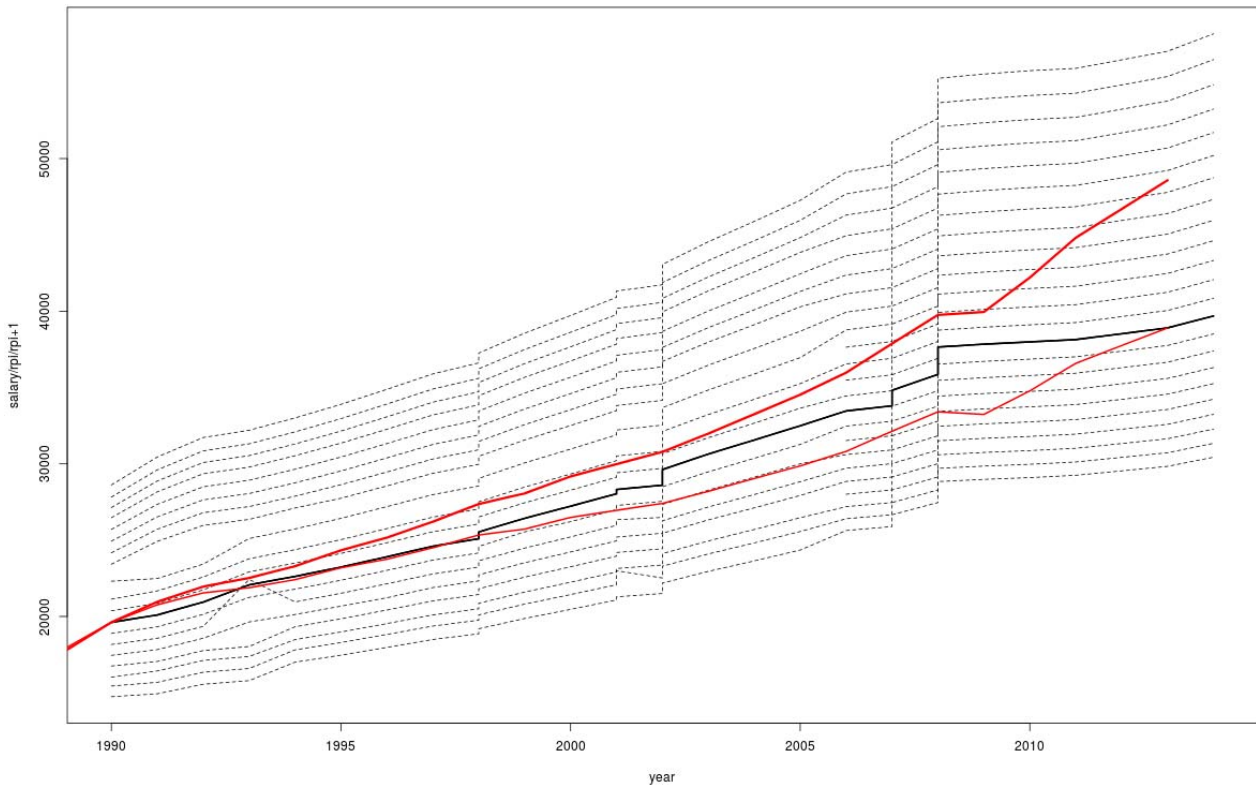
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Appendix

1. Salaries

Model checking includes comparisons with historical data. The figure below shows actual salaries, 1990-2014. Each grey line represents a spine point on the current scale. To compare the actual data with the USS assumption, spine point 38 is highlighted in black. The lower thin red curve is RPI (until 2013) [from ONS data], normalized to the spine point 38 salary in 1990. The thick red curve is RPI + 1% as assumed for future wage growth for the USS valuation.



The USS assumption results in over-estimation of salaries (and hence final salary pension liability) of about 25% over 23 years. As USS adds a further 1-4% for progression and salary grade inflation, this will substantially over-estimate the liability, and contribute to the estimated deficit.

Technical details: The 2006 regrading is matched using UCU data from 2005-6. There are a couple of obvious data errors in a couple of series which have not been corrected. Where the series jump in steps it is because that year's increase came in 2 parts - time is rounded to the nearest year. Code and data are available on request.

2. RPI

The assumption for RPI inflation is 3.4%. This is a "market derived" number, meaning that it is derived from a break-even inflation rate (under the assumption that the inflation risk premium of 0.2% in year 1 falling to 0.1% over the twenty year period) and from the real yield on Index-Linked Gilts. The Bank of England's inflation target is much lower, and we believe, given all that's gone on since 2008/09, that the risk premium in the break-even is almost certainly, much, much higher. From what is written in the AV consultation, reducing the RPI assumption from 3.4% even to 2.8% would reduce "technical provisions" by around £5.4bn.

The reason for reducing the inflation risk premium is invalid. It is simply wrong to claim that the risk premium should fall because exposure to inflation is falling over time. The inflation risk premium has nothing to do with USS's exposure to inflation. It has everything to do with the market view of uncertainty surrounding future inflation expectations – hence the comment above that it should be much, much higher than 0.2%pa.

The incoherence of the RPI assumptions can be seen by looking at the assumed market derived figure of 3.6% including risk premium, and comparing that to the current CPI of 1.4%. Allowing a 0.9% difference to RPI, suggests a risk premium around 1.3% now. Being prudently conservative it might be reasonable to reduce that to 1%, but not to the 0.2% actually assumed.

3. A Realist View of Aging, Mortality, and Future Longevity

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Article first published online: 29 MAY 2007 DOI: 10.1111/j.1728-4457.2007.00172.x

Differences in methodology and philosophy have led scientists analyzing the same mortality data to arrive at very different conclusions about the behavior of mortality trajectories, the nature of aging, and the future of human longevity. This note describes the authors' views on these issues, which taken together can be termed a "realist" position. In this view, life expectancy is unlikely to exceed an average of 85 years absent significant advances in the control of aging. We identify a number of myths that have been attached to our work: 1) Reaching an average life expectancy of 85 years is a pessimistic outlook for human longevity, 2) Species possess an intrinsic mortality schedule that cannot be modified by human intervention, 3) Realist scenarios of the future course of human longevity are based on notions of biological determinism, 4) Realists assert that there is an age beyond which there can be no survivors, 5) Hypothesized biological barriers to longer life spans have been scientifically studied and refuted, and 6) Realists claim that life expectancy at birth cannot exceed 85 years. In dispelling these myths, we hope to provide a more accurate representation of our school of bio demographic thought.

4. Employer covenant

The employer covenant is originally a private sector concept. It is being applied to the HE system as though there were **one** employer whose long term "survival" is uncertain. We argue that the Government has providing a level of backing to the HE system for the 40 years of the lifetime of USS, and continues to do so. Hence the idea of thinking about a 20 year covenant seems to be false. The covenant is described as being robust in some of the documents and yet the future time frame for the duration of this robustness is taken to be 20 years. This is an important assumption. Is there any evidence to support the assumption? How do we know that 20 years is the right number? The background is that no university has become insolvent to the extent that it has been unable to meet its (employer's) pension contributions.