



NOTE: This document was first circulated to stakeholders in February 2017 as part of the Trustee's preparations for the 2017 valuation.

In December 2017, a formal actuarial report was submitted to the Joint Negotiating Committee. This report set out the Trustee's conclusions on the scheme's funding position (based on the existing level of scheme benefits).

Methodology and Inputs for the 2017 Valuation: Initial assessment

Technical discussion document for sponsoring employers

17 February 2017

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1. Introduction

This technical document sets out the trustee's initial assessment of the methodology and key inputs to be used in the actuarial valuation as at 31 March 2017 (the 2017 valuation). In particular, it explains the approach that the trustee intends to take to determine the reliance it can place on the employers' ability to support the scheme over the long term and the range of values the trustee is considering using for the key inputs for the valuation assumptions.

It should be noted that the methodology and inputs are not the primary driver of the ultimate cost of the benefits offered by employers to members. The cost in the main is determined by the level of benefits offered, the investment returns achieved on the assets, price inflation and the members' mortality.

However, the methodology and inputs are used by the trustee to form a view of the funding level of the scheme, and the required contribution rate for the current benefits, which employers and members are obliged to pay according to the scheme's rules. As such, they are a crucial part of the regular monitoring of the scheme and are reviewed in depth from first principles by the trustee at each actuarial valuation, which is undertaken at least every three years.

This discussion document provides details of the ranges of inputs that the trustee is considering now, based on the current market conditions and outlook, and builds on two earlier publications:

1. Proposed Approach to the Methodology for the 2017 Actuarial Valuation: Response to the Valuation Discussion Forum (VDF) published on 28 November 2016 (VDF paper);
2. Covenant Review for the 2017 Valuation which summarised the initial conclusions reached from the review of the employers' covenant published on 29 September 2016 for consultation with employers.

Both documents can be found on the employer portal, if you have log in details you can access them here <https://www.uss.co.uk/employers/employer-dashboard/employer-resources/2017-valuation>, alternatively you can request a copy from [REDACTED].

The trustee would like to hear views on the methodology and inputs presented in this paper and would welcome responses on the three areas highlighted in Box 1 below which, when taken in combination, will express how much risk employers are collectively willing for the trustee to take.

The trustee has estimated the potential impact of the various approaches to setting the inputs to the 2017 valuation and highlighted the potential areas of variation compared to the 2014 valuation. These estimates are provided to allow employers to understand the direction of movement and potential financial significance of each variation. The trustee has not yet considered a set of inputs in total and so no inference should be drawn on what combination of inputs is considered suitable by the trustee. By law, the trustee must adopt a set of assumptions that contain a level of prudence deemed reasonable in the context of the level of investment risk being taken and the strength of the employer covenant.

Box 1- key issues on methodology and inputs

The trustee would welcome comments from employers on the relevant trends and drivers that impact on the trustee's initial assessment of the methodology and inputs. The key drivers on which we particularly seek views are:

- i) the approach to determining the maximum reliance which can be placed on the employer covenant in future when funding the scheme, and in particular the inputs that are used to determine the reliance. The trustee has assessed that contingent contributions, paid over a time horizon of 20-40 years from now, of 7% of pensionable pay (being the difference between 25% maximum contribution and the regular contribution of 18%), consistent with the 2014 view is still reasonable;
- ii) the view on future investment returns, and in particular whether employers prefer to rely on the current market view for long term interest rates, or whether they prefer the view that long term interest rates will revert to higher levels than markets currently predict;
- iii) the degree of confidence required that the assumed pension costs will prove a reliable forecast, and how much risk the employers prefer to take out of the maximum risk possible. Specifically, is the risk appetite different for funding benefits earned to date versus the benefits the sector wishes to promise in future?

The trustee will seek the views of employers on the inputs to be used again in May once any feedback on this discussion document has been considered and ahead of issuing a formal consultation in early July to UUK as required under the USS rule 6.6 which is the statutory consultation for the 2017 valuation. At this stage, the trustee is seeking feedback on the key drivers and the direction of travel sponsoring employers wish to take with utilising the strength of the sector to underwrite pension promises.

The issues contained in this document are technical in nature and are shared with employers as part of the trustee's commitment to an open, transparent discussion on the 2017 valuation. Sponsoring employers are invited to open meetings with USS where we will explain the issues covered in this paper and facilitate a debate on its key issues. The dates and locations of these meetings are:

- 20 February at 10.30am – St Leonard's Hall, University of Edinburgh;
- 21 February at 10am – Business School, Manchester Metropolitan University;
- 23 February at 10am – Woburn House, London;
- 28 February at 2pm – Council Room, Aston University, Birmingham.

If you would like to attend any of these events please email [REDACTED].

Following the events, employers may wish to seek professional advice to assist in framing their responses.

Replies to this discussion document are requested by 17 March 2017. Please send these to [REDACTED] so that UUK, as the employer representative identified within the scheme rules, can compile a sector-wide response. Please also copy your response to USS at [REDACTED] so that feedback can be shared with the trustee board.

The trustee will discuss these issues at its board meetings on 23 March and 26 April. A further update to employers is planned in May, following the trustee board meeting in April, when the trustee's view is expected to be more fully formed on the range of inputs to be used. The formal consultation on the technical provisions and statement of funding principles, based on the outcome of the 2017 valuation, is expected to be issued in July.

2. High level overview

2.1 Proposed changes to inputs and tests compared to 2014 valuation

The 2014 valuation showed a significant deficit which the sector collectively agreed to repair over 17 years through higher contributions and closing the final salary section. Future pensions were enhanced as career revalued benefit members saw the accrual rate increase from 1/80th to 1/75th and employer risk was limited by a salary cap of £55,000 applying to future defined benefit accrual. Above the cap, members earned benefits on a defined contribution basis with all members having the option to pay extra contributions and benefit from a matching employer contribution of 1%.

The agreement required employers to be willing to take the maximum risk that the trustee felt able to offer. Employers required a low probability of future pension costs having to rise. The agreed solution carried a risk, measured at 40% likelihood, of pension costs rising from the 18% employers had committed to pay to up to 21%, and a 20% probability of costs rising above 21%.

Since 2014, long term interest rates have fallen impacting the future investment outlook for all asset classes. The main impact of lower future investment returns is a higher price for future pension accrual. The scheme's investments have outperformed their benchmark returns so the impact on the deficit is far less marked than the impact on future pension costs.

The trustee has to re-calibrate its method and inputs to the 2017 valuation. There are three major questions to answer:

1. How much risk can the sponsoring employers afford to run? This is assessed by the level of extra contributions over and above the agreed funding level that employers could, if absolutely necessary, afford to pay into the scheme;
2. What view does the trustee take on the expected future returns from the assets the scheme holds now and into the future, allowing for any adjustments to the assets held to stay within the boundaries of the risk envelope noted in question one?;
3. What degree of confidence does the trustee feel is appropriate to apply to the combined view of future investment returns, and future employer contributions, to set a margin for prudence in the overall assessment?

The trustee is approaching the 2017 valuation from first principles to set all the inputs from a fresh look at markets and sector data. The method proposed is materially no different to 2014 though certain refinements to the process are being applied building on the experience gained. The actual inputs to the assumptions will be different but the underlying logic is consistent.

Employers will need to decide how much risk they wish the trustee to take on their behalf. Taking the most risk keeps the current price of pension low but if the forecasts prove too optimistic then employers risk having to pay more than they are comfortable with in future.

Table 1 below provides a summary of the potential variations to the methodology and inputs that could be considered for the 2017 valuation, compared to those adopted for the 2014 valuation. The supporting explanation to these potential variations and rationale is summarised in this section, with further detail provided in the subsequent sections.

Table 1 – Summary of input assumptions for 2017 valuation

Issue	2014 assumption	2017 proposal
Reliance on the sector and inputs to Test 1		
Reliance Horizon	20 years	20 years
Level of contingent contributions	7% between the difference between the amount that could be afforded <i>in extremis</i> and the regular contributions of 18	7% calculated on the same basis as 2014 subject to comments from employers
Period over which contingent contributions are payable	15-20 years	Base case of 20 years with 15-25 years being discussed
Growth in reliance over time	CPI inflation	CPI or salary inflation
Return on a “self-sufficient”, low-risk investment portfolio	Gilts + 0.5%	Gilts + 0.5%-0.75%
Financial inputs		
Discount rate assumptions	Market implied gilt yield plus expected asset out-performance adjusted for prudence	As 2014 or potential to reflect greater reversion of interest rates than currently envisaged in the market break even yields
Inflation assumptions in respect of CPI	Can be estimated from market implied inflation for RPI adjusted by a constant gap to reflect the difference in the construction of the two indices and the market willingness to over pay for inflation protection	As 2014 but potential to change the view on the appropriate adjustment
Salary increase assumptions	Longer term in line with general economic growth adjusted for short term views	Similar approach to 2014
Recovery plan assumptions	50% of difference between discount rate and best estimate for deficit recovery contributions	Similar approach to 2014

Demographic assumptions		
Mortality assumptions		Still being considered
Retirement assumptions	Those with final salary benefits up to April 2016 retire at 62 or at their normal retirement date	Revised to reflect scheme experience for normal health retirements giving a distribution between 60 and 65, no change for ill-health
Marriage assumptions		Revised to reflect lower numbers of female pensioners with dependents
Withdrawal assumptions		Revised to reflect scheme experience

The trustee is keen to ensure that the reliance it places on the employers in funding the scheme is not greater than that which the employers can support, or wish to provide. Reliance is measured by the trustee as the difference between the assets held by the scheme to fund the promised benefits, and those required by a low risk investment portfolio which would provide a high level of security of all future benefit payments being met. The trustee establishes the maximum reliance that it is willing to place on the employers as a collective, should employers wish the trustee to adopt a lower level of reliance, a funding strategy must be adopted which reflects that lower level of reliance. Adopting a lower level of reliance will generally result in a higher level of contribution being required for the same level of benefit, or a lower level of benefit for the same contribution rate.

The trustee's approach is captured in the first of its three tests (Test 1) as set out in the VDF paper. Following discussions with UUK on the findings of the covenant review, the trustee proposes to retain Test 1 in the same structural form as in 2014 but to amend its articulation to improve understanding of its derivation. The revised text is provided in [section 2.3](#) below.

It is proposed that Test 2, which looks at the probability of contributions exceeding particular levels at the next valuation, be replaced by more detailed ongoing assessments that can be used to monitor likely developments for the ongoing contribution rate. The current approach which assesses a probability of contributions needing to increase is not a sufficiently helpful indicator of future contribution requirements being simply a prediction involving many unknown elements. USS feels that estimating the required contribution using a model calibrated to the latest view of the expected return on assets will be a more reliable indicator of the employers' short term risk exposure. Test 3 which measures the employers' ability to deal with tail risk will be retained.

2.2 An update following the employer covenant review

The covenant of the scheme's sponsoring employers is fundamental to the funding of the scheme. It provides the trustee with the evidence to form a view on the amount of reliance it can reasonably place on the combined strength of the employers, including the ability to make higher contributions *in extremis* at some future point to meet liabilities already promised.

The trustee uses the term '*in extremis*' to mean a future situation when either the sponsoring employers or the trustee wish, or are required, to significantly reduce the risks associated with funding the promised benefits by moving to a lower investment risk portfolio to secure the accrued benefits.

Simplistically, a scheme where there is a significant covenant can afford to take more investment risk in the pursuit of higher returns and can target a lower level of assets held by the scheme to meet the future benefits. The required contributions can be lower, but the employers are accepting greater levels of risk: if the assumptions adopted turn out to be too optimistic then future contributions will need to rise. Employers collectively are able to request (through the formal consultation process in July) for the trustee to take lower risk if they do not feel comfortable with the maximum level of risk the trustee was willing to allow.

The covenant review concluded that it would be reasonable to anticipate that employers' long term finances were sufficiently robust to support contributions *in extremis* of up to 25% of pensionable salary. The trustee's view, confirmed by the work of our independent covenant assessors EY and PWC, was that those contributions would be affordable if significant changes to employers' business models were made. The difference between the level of contributions that would be afforded *in extremis* and the regular contributions (i.e. the 18% you currently pay) is referred to in this document as *contingent contributions*.

It is not intended to suggest that 25% of pensionable salary would be an acceptable level of regular contributions to employers, but rather an *in extremis* level should future circumstances warrant it. Further details on the role of the employer covenant are in [section three](#).

USS has explained to UUK how the essential elements of employers' long term finances are assessed as being strong enough to support an *in extremis* level of contingent contributions to fund the benefits accrued to date. Following feedback we have rearticulated Test 1 so that it is clearer that the trustee is referring to the availability of additional contributions *in extremis* recognising that, in some cases, this would have a substantial impact on employers' plans for future growth. USS's proposed approach to allowing for reliance on the employer is explained in the next section.

2.3 Test 1 and how reliance on the employers is taken into account in the valuation

The trustee's principle is that its maximum reliance on the sector should not be greater than the value of the available contingent contributions over a given period of time. Reliance on the sector is measured as the gap between the assets held and the assets required under a low-risk funding approach called "self-sufficiency". The combination of the assets held, future contributions promised under the agreed schedule of contributions, plus the ability to call on higher contingent contributions *in extremis*, result in a high confidence level that accrued benefits can be met. This concept is explained in more detail under Test 1 in the VDF paper, which is available on the employer portal.

In discussions with UUK on its findings from the covenant review, USS undertook to consult on the construction and expression of its Test 1.

A full discussion of the issues connected with Test 1 is provided in [section four](#). The trustee proposes to keep Test 1 in the same structural form as in 2014 and to amend its articulation to assist stakeholders and employers to understand its derivation better as set out below.

"Test 1 aims to ensure that the scheme's promised benefits can always be funded, with a high degree of confidence using a low risk investment portfolio from within a level of future contributions which could be credibly paid in extremis from the sector's operating cash flows. Thus the security of the promised pension payments is ensured by providing the sector or the trustee with an option to reduce the level of risk taken in providing pensions without the need to sell or mortgage assets to fund the scheme. The test is applied over a suitable control period, projecting forward the agreed benefit levels. It takes a low-risk portfolio of assets as its reference point for "self-sufficiency" consistent with the aim of giving a high confidence that the scheme's planned funding plus future contingent contributions in extremis would provide the accrued benefits in full."

The trustee would welcome views on whether this re-articulation of Test 1 provides greater clarity of how the covenant assessment identifies the level of contingent contributions being available to support the scheme's funding *in extremis* which is very different to the level contribution employers may wish to pay to regularly fund a promised level of benefits.

USS proposes the following inputs to the methodology for determining the maximum reliance on employers and seeks views from employers to confirm the approach to be taken.

Table 2 - The inputs into Test 1

Description of input	2014 assumption	2017 proposal
Reliance Horizon: Period over which reliance is measured i.e. the desired relationship between technical provisions and self-sufficiency is established	20 years i.e. at 31 March 2034 consistent with the covenant horizon assessment of at least 20 years	To maintain the period at 20 years
Level of contingent contributions	7% = 25% (<i>in extremis</i> contributions) of pensionable pay less 18% (regular contributions) agreed to fund the benefits	7% (maximum <i>in extremis</i> contributions less regular contributions)
Period over which contingent contributions are payable	15-20 years	Base case of 20 years with a range of 15-25 years being discussed
Growth in reliance over time	CPI inflation	Either CPI or salary inflation
Return on a “self-sufficient” low-risk investment portfolio	Gilts + 0.5%	A range of gilts +0.5% to +0.75%

[Section four](#) explains that adopting the same approach as at the 2014 valuation (7% contingent contributions over a period of 20 years) would result in a maximum reliance of £13bn in 20 years’ time. Increasing both the period over which contingent contributions are payable (to 25 years) and the acceptable amount of growth in reliance over time (to salary growth rather than CPI) would increase the maximum reliance in 20 years to as much as £25bn in real terms.

As an illustrated example, an increase in the maximum reliance which can be placed on the sponsoring employers in 20 years’ time of £4bn in real terms would result in:

- The required contribution rate for future service benefits falling by around 1.5%; and
- The deficit reducing by approximately £2bn, which corresponds to a reduction of around 1% on the deficit contribution rate.

In addition, changing the assumed return on a “self-sufficient”, low-risk investment portfolio from gilts plus 0.50% to gilts plus 0.75% results in:

- The required contribution rate for future service benefits falling by 2%; and
- The deficit reducing by approximately £3bn, which is a reduction of 1.5% on the deficit contribution rate.

2.4 Financial inputs to the methodology

The key financial inputs required for the valuation are discussed below with the range of inputs being considered for 2017 based on two different possible approaches. The first is that advised by Mercer, the scheme's investment advisers and scheme actuary, and the second results from USS's own investment management and in-house risk team's views. These approaches are presented alongside the assumptions for the 2014 valuation for ease of reference.

The different approaches are explained in [section five](#) but result from different views on the likely future return on each major asset class. Mercer has derived its expected returns for these assets using market yield curves as the starting point, making adjustments to reflect its views on the existence of risk premia (e.g. an inflation risk premium). In the Mercer approach there is limited reversion of interest rates beyond that already factored in to the yield curve. USS's view, by contrast, allows for long term interest rates to revert to something closer to the market yields that were prevailing at the 2014 valuation. The period assumed for this reversion is 10 years.

The process to arrive at an appropriate discount rate structure is the same under both approaches and involves:

- Determining a best estimate of the expected investment returns of the current investments held by the scheme;
- Adjusting the return to the current investments to allow for changes in the required asset allocation held over time to remain within the parameters of Test 1;
- Subtracting an appropriate margin for prudence from the expected return.

Table 3 - Expected and investment prudent returns (%)

	2014 valuation expected returns	Mercer December 2016 expected returns	December 2016 USS Investment Management expected returns	
			High prudence	Low prudence
Best estimate return based on current Reference Portfolio	4.4	4.8	5.2	5.2
Best estimate return allowing for impact of Test 1	3.9	4.1	4.6	4.6
Estimated returns adjusted for prudence (Discount rate)	3.1	3.3	3.2	3.6

The financial implications of these different expected return assumptions can be significant. The impact of using either the best estimate (allowing for Test 1) or prudent investment return is shown in Table 4 below. All other assumptions used to calculate the deficit and required contribution figures below are the same as those used in the 2014 valuation.

Whilst the Pensions Regulator requires the liabilities at the valuation date to be assessed on a prudent basis, there is no such requirement on the calculation of future contribution requirements, either the required contribution rate for future service benefits or that for deficit recovery. At the 2014 valuation an additional allowance above the prudent investment return was incorporated in determining the deficit recovery contribution. The additional investment return was half the difference between the prudent and best estimate return. No additional investment return above prudent return was allowed for in the future service contribution. It is possible to set future contribution rates using assumptions that are less prudent than those used to calculate liabilities. However it would need to be recognised that this represents an increase in risk associated with funding the scheme which has an iterative impact on the valuation result as the reliance on the sector is increased.

Table 4 - Liabilities and contribution rates using different discount rates adjusted for prudence

Assumptions used for discount rate	2014 valuation expected returns	Mercer December 2016 expected returns	December 2016 USS Investment Management expected returns	
			High prudence	Low prudence
Liabilities				
Best Estimate	£60bn	£57bn	£53bn	£53bn
Prudent estimate	£71bn	£68bn	£69bn	£64bn
Employer future service contribution				
Best Estimate	21%	19%	14%	14%
Prudent estimate	28%	26%	25%	21%
Deficit recovery contribution over 17 years				
Prudent estimate	8%	4%	5%	2%
Total required employer contribution				
Prudent estimate	36%	30%	30%	23%

The sensitivity of the deficit and required contribution figures are provided only as an illustration. Employers are reminded that these estimates are provided to allow an understanding of the financial significance of each variation.

The trustee has not yet considered a set of inputs in total and so no inference should be drawn on what combination of inputs is considered suitable by the trustee. By law, the trustee must adopt a set of assumptions that contain a level of prudence deemed reasonable in the context of the level of investment risk being taken and the strength of the employer covenant. The final decision on the discount rate used will need to reconcile views on reliance, expected returns and prudence.

Salary increases are less important in the new hybrid structure than they were when benefits at retirement were linked to final salary. They do however drive the overall build-up of the scheme's liabilities through their impact on future benefit accruals in USS Retirement Income Builder. Longer term it is proposed to assume that salaries will grow in line with general economic growth. The trustee would welcome comments from employers on how salaries will develop both in the short and longer term.

In terms of inflation, as measured by CPI, an approach similar to that adopted at the 2014 valuation is being considered. This is discussed in [section five](#).

The trustee has yet to consider a full set of revised assumptions for the 2017 valuation. As a result there is no combination of these assumptions that is ready for discussion. At this stage, USS seeks employers' views taking into account their own perspective on the future economic outlook and their own appetite for accepting risk. The USS approach could give rise to lower funding contributions than those required under the Mercer approach depending on the final approach taken to prudence. Lower contributions means an increased chance of contributions having to rise in future were these forecasts not met.

2.5 Demographic inputs to the methodology

The trustee has still to consider the appropriate mortality assumptions although other demographic assumptions have been reviewed. Proposed changes are being considered to the distribution of the ages at which members retire, the proportion of female members who are married and the distribution of withdrawal from the scheme. All the proposed changes are based on the scheme's experience and none will have a material impact on the results of the valuation.

Further details on the remaining assumptions are set out in [section six](#).

2.6 Summary comments on the initial view of the range of inputs being considered

The trustee is at an early stage of considering the inputs to be adopted for the 2017 valuation. All inputs considered to date have been reviewed from a first principles basis. The methodology is well defined in the VDF paper, in this document we have set out proposed calibrations and inputs to it.

The review of the employer covenant is the foundation for the whole valuation process. The trustee can only take on a level of risk that the sponsoring employers, as a collective, are willing to bear. Until an agreed position is reached with the employers through UUK, the trustee can only make progress setting the inputs to each assumption contingent to an assumed view on the covenant being ratified. The trustee and UUK are working to a plan that sees this completed as part of the formal consultation with UUK in the summer.

Markets continue to be volatile, with significant differences in expected returns evident from studies performed at the end of September 2016 and at the end of December 2016. The trustee continues to monitor market indicators and forecasts. USS plans to narrow the range of assumptions being considered to provide a coherent, reasonably prudent, view of the scheme's funding position over the coming months.

The analysis provided in this paper illustrates the significance of variations in key inputs and assumptions. At present it is too early to say what a reasonable range for potential valuation results could be. The trustee has yet to consider assumptions collectively, meaning many different combinations of the various inputs are still possible. The trustee wishes to be clear that in presenting the various sensitivity analyses, it is not making any suggestion that the final results will ultimately fall within the range of outcomes shown nor that it would necessarily accept all or any combinations of the ranges shown as being appropriate.

The trustee welcomes views from all sponsoring employers of USS and looks forward to an open, constructive engagement at the forthcoming meetings to discuss this document and, more broadly, throughout the process for the 2017 valuation.

3. An update following the employer covenant review

The covenant of the scheme's sponsoring employers is fundamental to the funding of the scheme. It reflects the degree to which the sponsoring employers' support can be relied upon to fund the scheme over time and make higher contributions should these be required in future. The trustee needs to understand the ability and willingness of sponsors to make contributions into the scheme not only on a regular, planned basis, but also on a contingent basis should certain adverse events materialise.

Understanding the employer covenant and deciding how much contingent reliance can be placed on the covenant *in extremis* is the first step in the valuation process. The trustee uses the term '*in extremis*' to mean a situation in which either or both the sponsoring employers and trustee wish to significantly reduce the risks associated with the funding of the promised benefits including moving to a lower investment risk portfolio.

Broadly speaking, the stronger the employer covenant, the more risk can be taken in the funding of the scheme: for example, in the investment strategy, or in the level of assets which the trustee holds to cover the benefits.

Simplistically, a scheme where there is a significant covenant, like USS, can afford to take more investment risk in the pursuit of higher returns and can target a lower level of assets held by the scheme to meet the benefits.

When forming a view of the covenant provided to the scheme by the sponsoring employers, consideration is given to:

- The ability of the sponsoring employers collectively to make the necessary contributions to the scheme measured by tests of the future financial performance, free cash flow and robustness (affordability);
- The time horizon over which there is visibility of the employers' ability to support the scheme. We call this the "covenant horizon";
- The assets that might be available to the scheme that are held by the sponsoring employers;
- The willingness of sponsoring employers to support the scheme, now and in the future;
- How the covenant is expected to develop over time.

The covenant review informs the trustee's consideration of the **maximum** amount of risk that it could consider taking, confident that the sponsoring employers could, if necessary, make good any funding shortfall that might result from assumptions which prove inadequate to meet the scheme liabilities.

Employers may prefer a lower level of risk to be taken because although affordable *in extremis*, they wish to reduce the chances of being required to pay higher contributions in future which could impact adversely on business plans. The question therefore of how much of the maximum risk capacity, which the employers can support, should be relied upon in the funding arrangements of the scheme is a matter for discussion with the employers.

Taking a higher level of long term risk produces a lower funding cost for future pension provision and a lower funding requirement to reduce the deficit. In the short term, this can lead to employers promising pension benefits which end up costing more than was forecast, if the predicted returns fail to occur or the appetite to take risk changes in future. Employers may wish to prioritise their risk appetite to support the funding of accrued pensions and take a different approach to the level of risk they are willing to underwrite for future pension accrual. We quantify the potential impact of different levels of prudence and risk in [section 4.4.3](#) and [5.1.2.2](#).

In [section 4.1](#) we explain how the trustee proposes to set the maximum amount of reliance it is prepared to place on the employer covenant. The employers are able to request, through the formal consultation which will take place in the summer, that the trustee take lower risk if it does not feel comfortable with the levels of risk it is being asked to underwrite. The key conclusions from the review of the covenant provided by the sponsoring employers are summarised in the following four points:

1. The covenant is uniquely robust;
2. The covenant strength is rated “strong”;
3. The covenant horizon is at least 30 years;
4. Employers have the ability to increase contributions *in extremis* should it be necessary to meet the accrued liabilities.

Overall, the trustee was advised that it would be reasonable to anticipate that the employers’ long term finances were sufficiently robust to anticipate that contributions *in extremis* of up to 25% of pensionable salary were affordable. The difference in the level of contributions that could be afforded *in extremis* and the regular contributions, we refer to as *contingent contributions*.

This is not intended to suggest 25% of pensionable salary would be an acceptable level of regular contributions, but an *in extremis* level, should future circumstances warrant it. It is clear that this would require significant changes to business plans. It is important to emphasise that this long term affordability analysis reflects the assessment of the sponsoring employers’ ability to pay increased contributions, not their willingness to make the required trade-offs to do so, nor is it intended to reflect their short term ability to change current business plans to pay additional pension contributions to support a particular level of future pension promise.

The precise approach taken by the trustee to measure the maximum reliance on the employer covenant is set out below. The trustee welcomes comments from employers on its proposals below.

4. How reliance on the employers is taken into account in the valuation

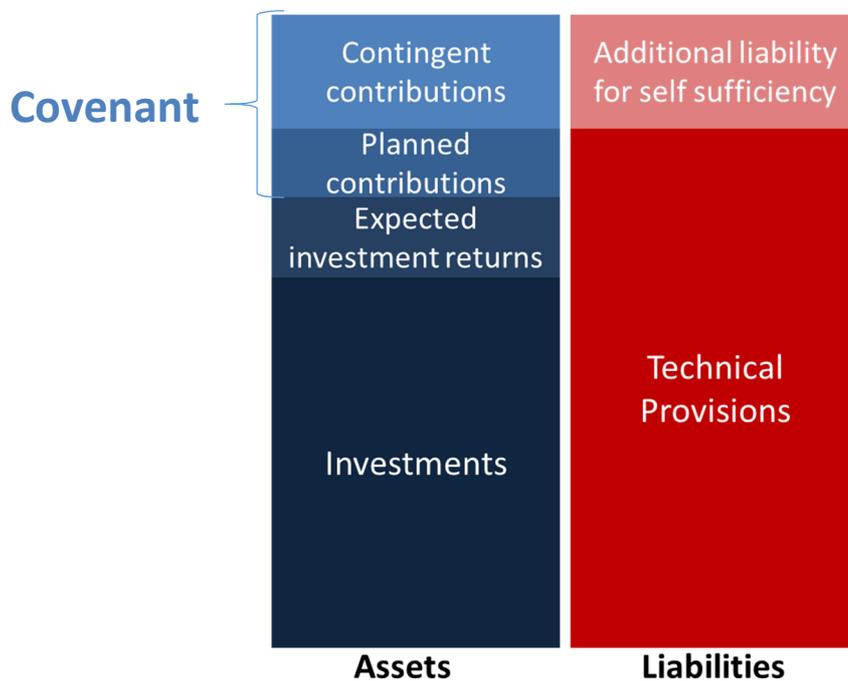
4.1 Approach taken to measure the maximum reliance on the employers' covenant

The approach taken to measure the maximum reliance the trustee can place on the employer covenant is defined by Test 1 as set out in the *Proposed Approach to the Methodology for the 2017 Actuarial Valuation: Response to the Valuation Discussion Forum* (VDF paper), which is available on the employer portal.

The first test (Test 1) requires the difference between the scheme's technical provisions and the assets required under a low-risk approach referred to as "self-sufficiency" to be capable of being covered by the employer covenant, and specifically by contingent contributions payable *in extremis*.

Technical provisions are the amount of assets the trustee aims to hold to fund the promised benefits accrued at any point in time. The technical provisions are calculated using best estimate assumptions adjusted for the desired level of prudence. The relationship between technical provisions, "self-sufficiency" and covenant is summarised in the diagram below.

Figure 1 - The relationship between the technical provisions and "self-sufficiency" liabilities, along with the actual and target (i.e. required) levels of assets.



At the 2014 valuation the trustee wished to ensure that the maximum reliance it placed on the covenant did not increase in real terms over time during the control period (taken as 20 years). The methodology developed for the 2014 valuation was constructed to ensure that the reliance on the sector should remain within limits during the course of the forward projection of future benefit accrual.

In discussions with UUK on its findings on the covenant review, USS undertook to consult on the construction and expression of Test 1, which is the principle measure of reliance on the employer covenant used in the 2017 valuation.

Table 5 - The inputs into Test 1 in the 2014 valuation.

Description of input	2014 assumption
Reliance Horizon: Period over which reliance is measured, i.e. the desired relationship between technical provisions and “self-sufficiency” is established	20 years i.e. at 31 March 2034 consistent with the covenant horizon assessment then of at least 20 years
Level of contingent contributions	7% (maximum <i>in extremis</i> contributions less regular contributions)
Period over which contingent contributions are payable	15-20 years
Growth in reliance over time	CPI inflation
Return on a “self-sufficient” low-risk investment portfolio	Gilts + 0.5%

4.2 Measurement of contingent contributions

The covenant review recently concluded that *in extremis* the maximum level of contributions the trustee can reasonably allow for is 25% of pensionable pay. In the proposed methodology the acceptable level of reliance is measured at the end of a 20-year period after the valuation date. A level of contingent contributions payable *in extremis* over a period of time (20 years in the 2014 valuation) is valued. Contingent contributions are equal to the difference between the maximum level of contributions assessed by the covenant review and the required contributions to provide the benefits (these were agreed as 25% and 18% of pension salary respectively in 2014). The trustee needs to be confident that the long term strength of the sponsoring employers’ and employers’ business models can support this level of contribution for periods of 20-40 years beyond the current valuation date.

4.3 How contingent contributions are expressed

We have considered whether a better way of expressing the sponsoring employers' ability to pay contributions *in extremis* exists than a percentage of the pensionable salary payroll of the membership. We believe that this is the most intuitive and effective way, but not the only way.

Whichever way we choose to express contingent contributions, it should be proportionate, unambiguous, universally applicable and not able to be manipulated. We have considered alternatives such as total revenues and total operating costs but different types of employers (e.g. research intensive vs. teaching) have different relationships between the pension costs and these measures.

It is simpler to achieve consistency in valuation approach to measure these *in extremis* contributions as a percentage of pensionable salary. However, its use can result in misunderstanding as the measurement of contributions *in extremis* paid over a time horizon of 20-40 years in the future can be confused with a measurement of affordability over the short-term and also with those contributions required to support any given level of benefit. By contrast, we use the term 'regular contributions' to mean the affordable level of contributions expected to be required to fund the agreed level of benefits at a particular point in time.

It should be clearly understood that if it was agreed to increase employers' regular contributions beyond the current level of 18% of pensionable salary then this would reduce the level of contingent contributions available in future as a funding buffer. The two measures (regular contributions and contingent contributions) are distinct but they interact. A lower funding buffer means lower ability to take investment risk and higher required contributions for any given level of pension benefit. A decision taken to increase employer regular contributions beyond a certain level could produce lower benefits than those that could be afforded by lower regular contributions.

4.4 Test 1 as the measure of reliance

On balance, USS prefers to keep the current measure and to change the articulation of Test 1 as follows.

"Test 1 aims to ensure that the scheme's promised benefits can always be funded, with a high degree of confidence using a low risk investment portfolio from within a level of future contributions which could be credibly paid in extremis from the sector's operating cash flows. Thus the security of the promised pension payments is ensured by providing the sector or the trustee with an option to reduce the level of risk taken in providing pensions without the need to sell or mortgage assets to fund the scheme. The test is applied over a suitable control period, projecting forward the agreed benefit levels. It takes a low-risk portfolio of assets as its reference point for "self-sufficiency" consistent with the aim of giving a high confidence that the scheme's planned funding plus future contingent contributions in extremis would provide the accrued benefits in full."

Incorporating Test 1 in the methodology for the 2017 valuation requires agreement on the four inputs highlighted in [Table 1](#), in particular:

- Reliance Horizon: The period over which the desired relationship between technical provisions and “self-sufficiency” is established;
- The level of contingent contributions;
- The period over which contingent contributions are payable;
- The acceptable level of growth in reliance over time;
- Return on a “self-sufficient” low-risk investment portfolio;

Each of these is discussed below.

4.4.1 Reliance horizon – the period over which the desired relationship between technical provisions and “self-sufficiency” is established

As indicated above, at the 2014 valuation it was agreed that the desired relationship between technical provisions and a low-risk “self-sufficiency” portfolio should be established in 20 years’ time. The options for the 2017 valuation are:

- Retain the outstanding period from the 20 years at the 2014 valuation, i.e. use 17 years;
- Maintain the period at 20 years;
- Extend the period in view of the covenant review resulting in greater confidence that its horizon extends beyond 30 years.

USS believes it would be appropriate to operate this test with measurement both now and at the 20 year point (i.e. the second option above). USS prefers a stable and comparable measure of future projection of benefits to exist from valuation to valuation allowing a long term view to be taken to measuring the costs of benefits accruing.

4.4.2 The level of contingent contributions and the period over which contingent contributions are payable

The initial conclusions of the covenant review confirmed that:

- Employers could contribute up to 25% of pensionable salaries *in extremis* if pension payments were prioritised;
- There is visibility of the covenant for at least 30 years.

Whilst these conclusions are consistent with those from the 2014 covenant review, we know some employers have challenged the maximum level of contributions.

A lower buffer has implications for the reliance that can be placed on the employers and the amount of risk the trustee is prepared to accept in funding the scheme. The explanations provided in this discussion document are intended to assist understanding by making the distinction clearer between a sustainable level of contribution to fund the scheme and a buffer of contingent contributions only to be used *in extremis*.

In view of the result of the covenant review, the period over which contributions are payable in Test 1 could potentially be extended. However, given the purpose of Test 1, the trustee is minded to continue to use 20 years for the period over which contingent contributions are payable, alongside illustrations of the impact on reliance of changing this period in the range of 15-25 years.

Discussions with UUK on the covenant review are expected to conclude as part of the formal consultation in the summer on the valuation results. In the meantime, USS is proceeding on the basis that the employers will be able to provide the same level of *in extremis* contribution (25%) as allowed for when calculating reliance in 2014.

4.4.3 Growth in reliance over time

The decision taken in the 2014 valuation was that reliance on the employers should not increase in real terms over time, as no real growth in the sector was assumed or allowed for. This is equivalent to rolling forward the reliance with inflation at the CPI rate. Use of CPI is potentially inconsistent with the assumption on general salary growth which assumes salaries grow in line with economic growth.

The decision to limit the growth in reliance to inflation in 2014 was in part based on the view that the employers' covenant at that point of time was as strong as it ever would be. Given the clearer view emerging from the most recent covenant review supports further growth of the sector it may be appropriate to reconsider the allowance for future growth in reliance. Allowing reliance to increase in line with increases in salaries would be consistent with other elements of the valuation and reflect the economics of the sector. It would also represent a reduction in prudence compared to the 2014 valuation.

The table below summarises the amount of reliance that is available from the sponsoring employers by assuming different periods over which additional contributions would be payable and how the acceptable level of reliance grows.

Table 6 - The amount of reliance under various assumptions. The figures reflect the assumptions used in 2014 but updated for 2017 market conditions.

Amount of reliance supportable by the sponsoring employers dependent on:			
<ul style="list-style-type: none"> • Size of contingent contributions (7% = 25%-18%); • Period over which contingent contributions are payable; • Growth of reliance over time. 			
Period over which additional 7% contributions are payable	15 years	20 years	25 years
Present value (PV) at time zero of 7% of payroll	£10bn	£13bn	£18bn
Future value in 20 years' time of above PV in real terms rolled forward with CPI	£10bn	£13bn	£18bn
Future value in 20 years' time of above PV in real terms rolled forward with RPI	£12bn	£15bn	£21bn
Future value in 20 years' time of above PV in real terms rolled forward with salary growth	£14bn	£19bn	£26bn

The values in the above table are discounted using gilts plus 0.50% (a discount rate that corresponds to “self-sufficiency”) and are expressed in real CPI terms. The gap between RPI and CPI is 0.80% and general salary growth is assumed to be RPI plus 1.00%. These assumptions are consistent with those adopted at the 2014 valuation. Adopting the same approach as at the 2014 valuation would result in a maximum reliance of £13bn. The table above indicates that there is potential to increase the reliance.

The greater the level of reliance placed on the sector, then the lower amount of technical provisions that are required to be sought. In isolation, this allows a greater degree of risk to be taken in funding the benefits leading to a lower predicted cost but increasing the risk of higher contributions being called upon in future.

An increase in the reliance which can be placed on the sponsoring employers in 20 years' time of £4bn in real terms would result in:

- The required contribution rate for future service benefits falling by around 1.5%;
- The deficit reducing by approximately £2bn which is a reduction of around 1% on the deficit contribution rate.

4.4.4 Return on a “self-sufficient” low-risk investment portfolio

“Self-sufficiency” for the purposes of the valuation is intended to be a measure of the value of assets required by the trustee to meet all accrued pension benefits with only a “low” probability of requiring further contributions from employers.

The trustee has considered three different approaches that could be taken in determining the assets required for “self-sufficiency”. Broadly speaking these are:

- **Buy-out:** This is effectively the cost of securing all the liabilities with an insurer. In this case the probability of requiring further contributions is zero;
- **Gilts basis:** In this approach, the scheme is assumed to hold government bonds to match the benefit promised to the members. This approach also sets a very high bar and would leave a very low – but not zero – probability of further contributions being required;
- **Low-risk investment portfolio:** This approach involves a portfolio of (mostly) fixed income assets from which the cash flows are expected to meet a large proportion of the promised benefit payments. The portfolio of assets would be similar to that held by an insurance annuity portfolio, but noting that the scheme has longer duration liabilities corresponding to deferred and active members.

There is considerable latitude in this approach as to how to interpret “low-risk” and, therefore, in the associated investment portfolio and expected return. It was the low-risk investment portfolio approach that was adopted at the 2014 valuation, with the assets required being measured on a basis of gilts plus 0.50%.

In the 2014 valuation, the CPI and mortality assumptions for “self-sufficiency” were the same as those adopted for the technical provisions with the exception that no allowance was made for the inflation risk premium in calculating expected inflation (for reasons of prudence).

Further work is being undertaken on the appropriate mortality assumptions after which a recommendation will be provided to the trustee. In the meantime it is proposed to continue to use the assumptions adopted at the 2014 valuation for mortality. In respect of the CPI assumption, it is proposed to use the prudent approach detailed in [section five](#) without allowance for the inflation risk premium; this assumption may be revisited later. This results in RPI being calculated as the market implied break-even inflation. CPI is then RPI less the assumed difference between RPI and CPI, which was assumed to be fixed at 0.80% in 2014.

USS has an opportunity to invest in a broader set of assets than insurers, this is because such assets are inefficient for insurers because of their regulatory capital requirements. The trustee has considered a range of views from its advisers and from insight gained by the executive from experts in the market about what constitutes a low-risk portfolio and the level of return that could be expected from such a portfolio. The key considerations taken into account in reaching a view are noted below.

The starting point for considering an acceptable “self-sufficiency” portfolio is a UK insurance annuity portfolio, although “self-sufficiency” provides less certainty and slightly higher risk. An insurance portfolio must meet its liabilities at a 99.5% confidence level, whereas we would propose that “self-sufficiency” suggests a confidence level closer to 95% or 97.5%. Discussions with UK insurers and advisors have confirmed that UK insurance annuity portfolios target an investment return of up to gilts plus 1.50% with the following asset allocation:

- Gilts and interest rate swaps: 20-40%;
- Credit (mostly private, illiquid investments): 60-80%;
- Average rating A- to BBB+.

The trustee has considered how this might be adapted in the case of USS. The pensioner liability of the scheme is very similar to an in-payment annuity book in terms of economic exposure but with some differences as discussed below:

1. An annuity book requires higher capital due to insurance regulation, which on the face of it gives the annuity provider more risk capacity than the scheme:
 - ⇒ This would imply reducing the target return for the scheme below gilts + 1.50%.
2. A closed pension plan has a longer duration than an annuity book by virtue of the deferred members:
 - ⇒ This has the effect of increasing the risk associated with the deferred part of the liability, which would mean making a compensating reduction in risk elsewhere;
 - ⇒ The net effect is likely to be a reduction in the appropriate target return below gilts + 1.50%.
3. A pension plan is not restricted by insurance regulations and can therefore benefit relative to an insurer by:
 - ⇒ Holding more risky assets (an allocation of 10-20% risky assets is helpful in terms of portfolio efficiency even for a low-risk portfolio);
 - ⇒ Being much more diversified;
 - ⇒ These two points have the effect of increasing the appropriate target return well above gilts + 1.50%.
4. The costs of running the pension plan will, except *in extremis*, be met by the sponsors, whereas an annuity provider must meet its costs in part from its investment returns:
 - ⇒ This has the effect of reducing the appropriate target return above gilts + 1.50%.

The net effect of the above is that for “self-sufficiency” the scheme could hold a portfolio with the following structure:

- Gilts and swaps – moderate allocation;
- Private credit – large allocation;
- Public credit – small allocation;
- Risky assets – small allocation.

On balance, USS believes “self-sufficiency” should be measured using gilts plus a margin (which reduces over time) and reflects the range of assets that could be held by a low-risk portfolio. USS

is consulting on measuring “self-sufficiency” on the basis of a discount rate of between gilts plus 0.50% and gilts plus 0.75%. In combination with the ability to raise higher contingent contributions *in extremis* this approach can provide a high level of confidence that the accrued benefits can be met in full.

Changing the measure of “self-sufficiency” from gilts plus 0.50% to gilts plus 0.75% results in:

- The required contribution rate for future service benefits falling by 2%;
- The deficit reducing by £3bn which is a reduction of 1.5% on the deficit contribution rate.

4.5 The other two tests

In addition to Test 1, alongside the completion of the 2014 valuation, USS implemented two further funding tests.

Test 2 aims to measure the degree of stability in contributions (and by corollary benefit levels) inherent in the funding approach. It is desired that there is a high level of confidence that contributions can be kept within reasonable bounds. However, Test 1 requires the trustee to keep within a defined distance of a “self-sufficiency” measure based on a portfolio of assets of much lower risk. That limits the ability to manage contribution/benefit volatility over the short term when – as is the case now – Test 1 is at its extreme or in breach and employers are already paying contributions at the very limit of its desired budget levels. The levels of confidence are highly sensitive to different probability models as well as different assumptions.

USS proposes Test 2 is replaced by ongoing monitoring of the required contribution rate for the current benefit using a model that calibrates to the underlying internal rate of return assumptions used by the trustee rather than a fixed margin over gilts. The current approach which assesses a probability of contributions needing to increase is not a sufficiently helpful indicator of future contribution requirements being simply a prediction involving many unknown elements. USS feels that estimating the required contribution using a model calibrated to the latest view of the expected return on assets will be a more reliable indicator of the employers’ short term risk exposure.

Test 3 manages the extreme tail risks outside those covered by Test 1 to make sure that the employers’ collective balance sheet is sufficient to cover the benefits promised to date. USS proposes to leave Test 3 unaltered.

4.6 Summary

USS proposes the following aspects of the methodology and seeks views from employers as follows.

Reliance:

1. The methodology will continue to use a measure for the maximum reliance on the employer covenant based on contingent contributions expressed as a percentage of USS pensionable salary;
2. The basis for measuring the amount of reliance on the sponsoring employers will be measured as the difference between the technical provisions and the assets required for “self-sufficiency” (as defined above);
3. The amount of reliance that can be supported by the sponsoring employers, will be calculated as the value of 7% (= 25% – 18%) of payroll over a 20 year period;
4. The amount of reliance placed on the employers will increase over time in line with either general salary growth or CPI (the 2014 assumption), to be determined following feedback to this document and ongoing discussions with employer and member representatives.

“Self-sufficiency”:

5. “Self-sufficiency” will be measured in terms of a low-risk investment portfolio;
6. At this stage it will be assumed that the discount rate associated with such a low-risk investment portfolio will be in the range of gilts plus 0.5% to gilts plus 0.75%;
7. For now, mortality and CPI assumptions for “self-sufficiency” are assumed to be unchanged from the approach adopted at the 2014 valuation.

Tests:

8. The three tests used in 2014 valuation will be implemented with the modifications discussed above.

5. Financial inputs to the methodology

The key financial inputs required for the 2017 valuation are noted below.

- Best estimate investment returns for the current and future benchmark assets held (known as Reference Portfolio);
- The margin for prudence that will be deducted from the expected investment return of the Reference Portfolio in order to determine the liability discount rate;
- The expected annual increase in inflation as measured by CPI, as most of the scheme's liabilities are linked to CPI (albeit with various caps);
- The expected aggregate salary growth of active members. This impacts how benefits grow and the absolute level of reliance which can be placed on the employer covenant.

The trustee has considered inputs to these assumptions along with preliminary valuation data to illustrate the impact of these financial input assumptions.

Additionally, the following key assumptions need to be set as part of determining the reliance on employers in setting the measure of "self-sufficiency" used.

- The best estimate investment return achievable with a portfolio of assets appropriate for funding the scheme on a "self-sufficiency" basis;
- The margin for prudence that will be deducted from the expected investment return of the "self-sufficiency" portfolio to assess the amount of reliance on the employer covenant.

These aspects were covered in the previous section and are noted here for completeness.

The trustee will review the market outlook at and immediately after the valuation before considering its final position.

5.1 Expected investment returns

The discount rate which is used to calculate the scheme's liabilities is a reflection of the future expected investment strategy of the scheme, the expected investment return for each asset category that will form part of that strategy and an adjustment for prudence. In developing the investment strategy, it is a fundamental requirement to understand the expected return, together with the risk characteristics of that return, for each asset class.

5.1.1 The approach to forecasting expected returns

Recognising that all forecasts are subject to considerable uncertainty, assumptions about expected returns on assets are developed in a process that uses multiple approaches and different perspectives to “triangulate” a self-consistent set of best-estimate forecasts. The approaches include going back to first principles and looking at historical data, the long-term economic outlook, fundamental drivers of returns, different models for future asset valuation and the expected return forecasts developed by other major market participants. As part of this process the USS in-house investment team develops forecasts for returns based on a fundamental building blocks (FBB) model. These are also checked against other models, such as an implied returns (IR) model.

The process by which the trustee decides on a preferred set of expected returns involves both detailed in-house analysis by experienced investment professionals and a review of the expected returns developed externally by major international consultants and asset managers. This process combines the historical perspective of the risk premia of different asset classes with a forward-looking assessment that takes account of the current economic environment and how it may evolve in the future.

Historical data are an important input into the final decision on expected returns, but the precise connection between the two is indirect and as much a matter of professional judgement as it is economic and statistical analysis. In developing the capital markets assumptions, care is taken to establish a self-consistent set of risk premia for all asset classes (including covariance assumptions), which are also consistent with the long-term outlook for economic growth and inflation. Comparison with the assumptions developed by consultants and asset managers helps ensure consistency and that the output is reasonable.

Without wishing to put undue weight on any one approach, we can illustrate the types of models used in the triangulation process for expected returns with a particular example. Equity returns can, for instance, be forecast based on a number of fundamental drivers, including inflation, the evolution of price multiples (price to earnings ratio), companies’ dividend pay-out policies and real earnings growth. The latter can be modelled as a function of economic growth. Other relevant variables include the expected evolution of profit margins, which is driven by fundamental factors such as taxation and competition policies, as well as the wedge between aggregate corporate profits and earnings per share accruing to shareholders, which can arise as a result of dilution via share issuance and differential earnings growth of listed vs. unlisted companies. An alternative approach, which generally gives a similar result, involves constructing a forecast directly based on expected cash flows accruing to shareholders (i.e. dividend yield and its expected evolution over time), real dividend growth and inflation. Obtaining similar results from different approaches is a crucial element of the process of triangulation.

For fixed income assets (e.g. gilts and corporate bonds) the process is similar but there are fewer building blocks. Expected returns on fixed income assets can be estimated from forecasts of future yield levels. The expected return on a long-maturity corporate bond, for example, will be determined by the aggregate impact of three components. The first is the regular income coming

from the receipt of the bond’s coupon, which is determined by the market yield at the time the bond is issued. The second component is the capital appreciation or depreciation coming from the change in yield since issuance, taking into account the reduction in the bond’s maturity with the passing of time. The final component is a downward adjustment for the expected loss due to default, reflecting the credit quality (default probability) of the issuer. The key element in this process is the forecast of the future yield level, which can be performed in different ways.

5.1.2 Expected returns for the 2017 valuation

USS’s investment team has calculated the expected returns as at 31 December 2016 on the current and future Reference Portfolios and the approach has been reviewed by USS’s Investment Committee. USS has also taken advice from Mercer on its approach to expected returns which uses a model based on risk premia in excess of cash returns for growth assets such as equities to estimate the future outperformance of the Reference Portfolio relative to index-linked gilts. The USS approach is based on a fundamental building block (FBB) methodology with expected returns being expressed as premia relative to CPI. The USS approach has been discussed in detail and approved by the Investment Committee.

Mercer, the trustee’s actuarial and investment advisor, has independently developed a set of expected return assumptions using different but related methods to USS. The expected returns for these two approaches can be directly compared by translating returns relative to CPI and relative to gilts.

Figure 2 below details the expected returns over a 20 year period for the major asset classes which make up the scheme’s Reference Portfolio.

Figure 2 - Expected 20 year return above CPI per year

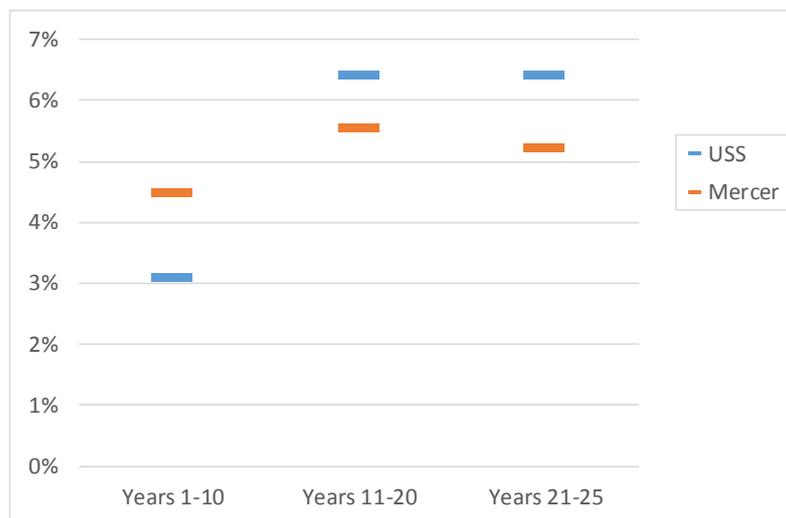


The expected return of the Reference portfolio over a 20 year period under both Mercer’s and USS’s approach is CPI plus 2.3% a year.

There is, however, a difference in the evolution of the expected returns over time, driven by the different underlying economic assumptions of the two organisations. Broadly speaking, the main difference lies in the forecasts for gilt yields. Under the Mercer approach there is limited reversion beyond that already factored in to the yield curve. USS's approach has a reversion of gilts yields (and for that matter all other long term investment parameters) to a particular level over a 10 year period. The yield in ten years' time available on 20 year index linked gilts would be of the order of CPI *plus* 0.6%. This may be compared to the 20 year forward yield in 10 years' time which equates to CPI *minus* 0.6%, which corresponds to a 1.2% difference.

The difference in the USS and Mercer expected returns for the Reference Portfolio are shown in the chart below where the returns over different periods are compared. Note that these are subject to change between the time they were formulated, 31 December 2016, and the valuation date of 31 March 2017.

Figure 3 - Expected reference portfolio return



5.1.2.1 Effect of Test 1 on expected returns

In order to remain within the bounds of Test 1 (the reliance on the sector should not be greater than the value of the contingent contributions over a period), it is necessary to reduce investment risk over time.

Mercer's view of the term structure of expected returns is a different shape from that formulated by USS, as illustrated in the figure and table above. This means that it could be appropriate to allow for differences in the way that the investment strategy is de-risked. In particular, Mercer's views on the shape of future expected returns suggest that a linear allowance for de-risking to the end of the covenant horizon could be suitable. USS's views however are based on a lower level of return over the first 10 years, with higher returns thereafter, and therefore no or lower de-risking in the first 10 years but at a faster pace thereafter could be more appropriate. The figures in [table 7](#) below allow for these two different approaches.

5.1.2.2 Discount rate for liabilities

In determining the discount rate for valuation purposes the expected returns are reduced to allow for prudence. At the 2014 valuation, a reduction from the expected return on the initial Reference Portfolio of just over 1% was made and the scheme actuary has suggested a similar adjustment this time in respect of the Mercer expected return. This reduction corresponds – in his view – to approximately a 65% confidence level of achieving the investment return at least equal to the discount rate, as opposed to 50% in the case of the expected return.

The scheme actuary currently suggests that the adjustment for prudence on the USS Investment Management projected expected returns should (i) vary with the divergence of current gilt yields from the market-implied break-even yields (i.e. forward yields) and (ii) allow for de-risking in years 10 to 20 as described above. This would result in a lower level of prudence being taken in the discount rate for years 1 to 10 increasing in years 10 to 20, with the greatest adjustments in years 20-plus where the greatest divergence from the forward gilt curve occurs. The approach to prudence is still being refined.

Looking at the two approaches being developed and the different approaches to prudence, USS is keen to hear employers' views on using a structure with a single equivalent rate in the range of 3.1% to 3.6% p.a. as at December 2016.

Table 7 - Expected and investment prudent returns (%)

	2014 valuation expected returns	Mercer December 2016 expected returns	December 2016 USS Investment Management expected returns	
			High prudence	Low prudence
Best Estimate return based on current Reference Portfolio	4.4	4.8	5.2	5.2
Best Estimate return allowing for impact of Test 1	3.9	4.1	4.6	4.6
Estimated returns adjusted for prudence discount rate	3.1	3.3	3.2	3.6

The financial implications of these different expected return assumptions can be significant. The impact of using either the best estimate (allowing for Test 1) or prudent investment return is given in the table below. All other assumptions used to calculate the figures below are the same as used in the 2014 valuation.

Whilst the Pensions Regulator requires the liabilities at the valuation date to be assessed on a prudent basis, there is no such requirement on the calculation of contribution requirements, either the required contribution rate for future service benefits or that for deficit recovery. At the 2014 valuation an additional allowance above the prudent investment return was incorporated in determining the deficit recovery contribution. The additional investment return was half the difference between the prudent and best estimate return. No additional investment return above prudent return was allowed for in the future service contribution. It is possible to set future contribution rates using assumptions that are less prudent than those used to calculate liabilities. Albeit that it would need to be recognised that this represents an increase in risk associated with funding the scheme.

Table 8 - Liabilities and contribution rates using different rates adjusted for prudence

	2014 valuation expected returns	Mercer December 2016 expected returns	December 2016 USS Investment Management expected returns	
			High prudence	Low prudence
Liabilities				
Best Estimate	£60bn	£57bn	£53bn	£53bn
Prudent estimate	£71bn	£68bn	£69bn	£64bn
Employer future service contribution				
Best Estimate	21%	19%	14%	14%
Prudent estimate	28%	26%	25%	21%
Deficit recovery contribution over 17 years				
Prudent estimate	8%	4%	5%	2%
Total required employer contribution				
Prudent estimate	36%	30%	30%	23%

The sensitivity illustration of this assumption is just that and readers are reminded that these estimates are provided to allow an understanding of the financial significance of each variation. The trustee has not yet considered a set of inputs in total and so no inference should be drawn on what combination of inputs is considered suitable by the trustee. By law, the trustee must adopt a set of assumptions that contain a level of prudence deemed reasonable in the context of the level of investment risk being taken and the strength of the employer covenant. The final decision on the discount rate used will need to reconcile views on reliance, expected returns and prudence.

5.2 Inflation

The majority of the scheme's liabilities are linked to CPI albeit subject to various caps. There is currently no material UK investment that is explicitly linked to CPI and as such future breakeven levels of CPI need to be inferred from other market measures of inflation. The UK Government issues both nominal and inflation linked bonds, the latter being linked to RPI, and as such market implied break-even inflation (forward inflation rates) can be measured by the difference between them. This difference can be interpreted as corresponding to two components:

1. a market-implied expectation for future inflation plus;
2. an inflation risk premium (IRP).

The IRP compensates nominal bond holders for bearing the risk associated with unexpected inflation. Hence taking the difference between nominal and index linked bond yields is expected to overstate future inflation expectations. Given the structure of the UK gilt market, the IRP is currently expected to incorporate a significant illiquidity premium.

Estimates of IRP vary considerably from 0% to 1%. At the 2014 valuation an IRP of 0.20% was allowed for to reflect a best estimate of 0.3% reduced to reflect the level of target inflation hedging. The scheme actuary advises that the IRP should continue to be limited to 0.30%, given general market practice and the expected range from research papers.

The level of the IRP is more important when assets returns are based on the Mercer approach as opposed to the USS approach, the latter being driven from CPI benchmarks.

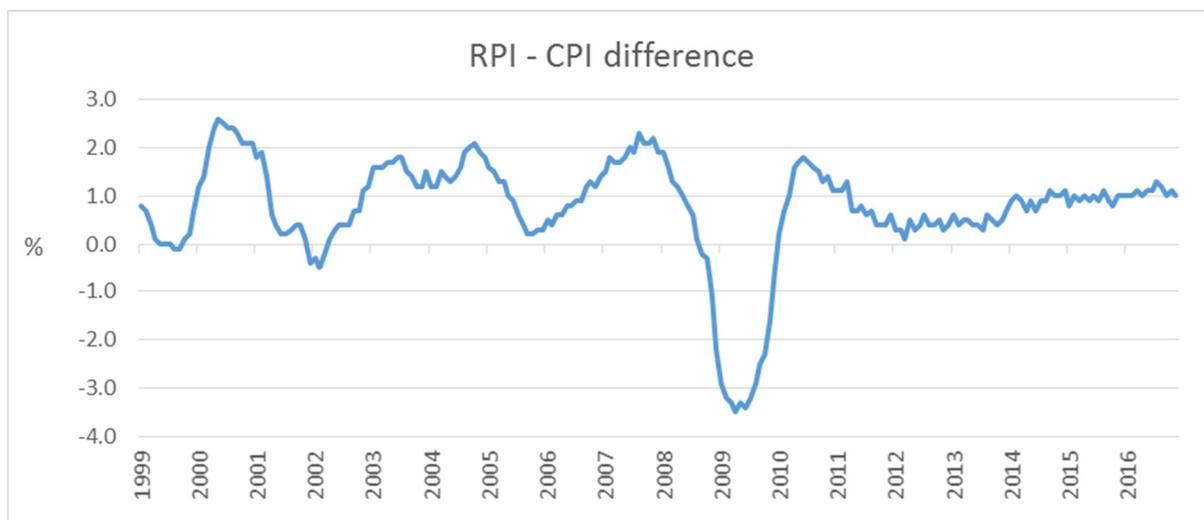
Once the forecast for RPI is agreed, there is still the need to develop a forecast for CPI. The difference between RPI and CPI arises from two main sources, in particular:

- The mathematical construction of the indices: RPI is an arithmetic mean whilst CPI is geometric;
- The components of the two indices are different.

The differences in the mathematical construction of the two indices are expected to give rise to a differential of between 0.80% and 1% between CPI and RPI (Office for Budget Responsibility: November 2011).

The average observed difference between RPI and CPI, which includes both the formula effect and the different components, over the period since 1999 has been 1%, although the variation has been considerable, as can be seen from the graph below.

Figure 4 - Graph of the difference between RPI and CPI since 1999 (% per year).



A separate regression analysis by USS also estimates the size of the gap at circa 1% for stable interest rate environments.

The adjustments USS wishes to gather employer feedback on are therefore summarised below:

	Best estimate	Prudent
Inflation risk premium	0.3% per year	0.3% per year adjusted to reflect inflation hedging
RPI-CPI variation	1.0% per year	0.8% - 0.9% per year

5.3 Salary growth

Salary growth is a less important assumption now than when the scheme provided benefits linked to final salary; however, salary growth remains relevant in that it impacts on the amount of benefit that accrues each year and the build-up of liabilities over time. It also helps determine the absolute amount of reliance that the trustee is prepared to place on the sponsoring employers when funding the scheme (see [section four](#)). The higher the level of salary growth assumed, then the less prudent the approach, as the amount of reliance which the sponsoring employers can support is determined as a percentage of future salaries.

At the 2014 valuation after discussions with UUK and UCU it was agreed to assume that general pay growth (GPG) would increase:

- In line with CPI in the year following the valuation;
- At CPI plus 1% in the subsequent year; and
- At RPI plus 1% thereafter.

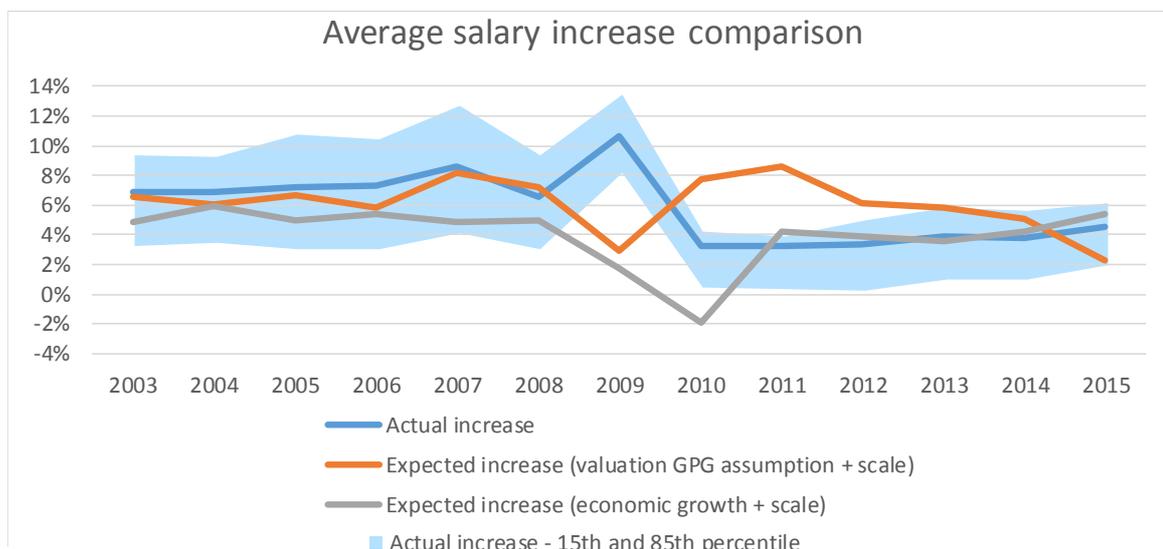
In addition to the general increases, a merit scale which varies by age was applied to individuals' salaries. The merit scale applied has been developed after reviewing individual members' salary progression after deducting general salary increases. It is worth noting that these assumptions related to final pensionable salary, which is defined under the rules of the scheme differently from salary, and was effectively underpinned by RPI. As such it may be expected that a lower assumption could be adopted for salary increases going forward as this underpin is no as longer relevant.

Ignoring individual salary increases due to promotion and increasing responsibility, salaries in the longer term maybe expected to increase in line with the growth in the economy. Although it should be recognised that there can be times when salaries in general grow faster or slower than this as the share of economic growth between labour and providers of capital varies. There is evidence that suggests since the 1980s a greater share has been directed to providers of capital. Further there will be times when the salaries of certain occupations grow faster or slower than others due to demand and supply effects.

We have analysed USS's membership data and salary progression over the period from 2002 to 2015. The analysis has been undertaken at an individual level and then aggregated.

Figure 5 shows the average salary increase experienced by members against that expected from the valuation assumptions which assume a general salary increase of RPI plus 1% plus a merit/promotional scale (reduced for short term allowances in recent years). In addition, the implied increases based on economic growth plus the merit/promotional scale has been included.

Figure 5 - Actual realised increase in salaries compared with expectations.



It can be seen that:

- Up to 2008 the expected increases are fairly consistent with actual increases;
- Since 2010 increases have been generally below expected;
- Up until 2011 actual increases have exceeded economic growth;
- Since 2011 increases have been broadly consistent with economic growth.

For the 2017 valuation it is proposed to consult with both UUK and UCU on their view of the short-to medium term outlook for general salary increases and continue to use longer-term economic growth for the longer-term salary assumption.

USS proposes that longer term salary growth is CPI plus 2%. In addition, USS proposes to continue to apply the merit scale when projecting individual liabilities.

5.4 Recovery Plan Assumptions

The expected return to be allowed for in the recovery plan also needs to be considered separately as this does not have to be the same as the prudent discount rate used in the calculation of the technical provisions. There is more regulatory latitude in the assumptions for the recovery plan.

In the 2014 valuation it was agreed that the determination of the deficit contributions would use an investment performance assumption that was higher than the prudent discount rate by an amount equal to 50% of the difference between that discount rate and the best estimate expected return. This effectively reduced the level of prudence in the valuation.

For the 2017 valuation, the trustee is considering a number of ways of allowing for expected performance above the prudent discount rate. The assumption used here will need to be considered alongside the length of the recovery period. At this stage, the trustee has not considered its approach.

5.5 Summary

USS proposes the following be considered in production of the preliminary valuation results and seeks additional views from employers as follows:

Expected investment returns:

1. Initial figures to be developed based on both USS Investment Management's and Mercer's views of expected investment returns;
2. These views differ in the extent to which reversion of gilt yields additional to that priced into the market is allowed for. Views on the appropriateness of each approach given risk tolerance and appetite, and any additional views, would be welcome.

Discount rates:

3. Initial figures to be developed based on the scheme actuary's preliminary advice on appropriate prudent margins to the expected returns, supplemented with USS Investment Management's views when these are available;
4. Recognising a lower level of prudence in the technical provisions discount rate gives rise to a greater level of funding risk, and therefore a higher probability that contributions will need to be increased in the future. Employers' views on the appropriate level of prudence to be adopted would be welcome.

Inflation:

5. Initial figures to be developed based on prudent assumptions for the RPI / CPI gap of 0.80% - 0.90% per year with an inflation risk premium of 0.30% per year (to decrease over time as the investment strategy de-risks).

Salary growth:

6. USS welcomes views from employers on short to medium term expected salary growth;
7. In the longer term USS proposes that general salary growth be based on expected economic growth of CPI + 2%. This assumption is used in projecting the growth of the scheme;
8. Projections for individual members will incorporate the general salary growth allowance plus the promotional / merit scale used in previous valuations.

Recovery plan assumptions:

9. Any specific views would be welcome.

6. Demographic inputs to the methodology

6.1 Summary of demographic input assumptions

The main demographic assumptions involved in the actuarial valuation process are:

- Mortality;
- Normal health retirements;
- Ill-health retirements;
- Proportion married;
- Withdrawals from the scheme.

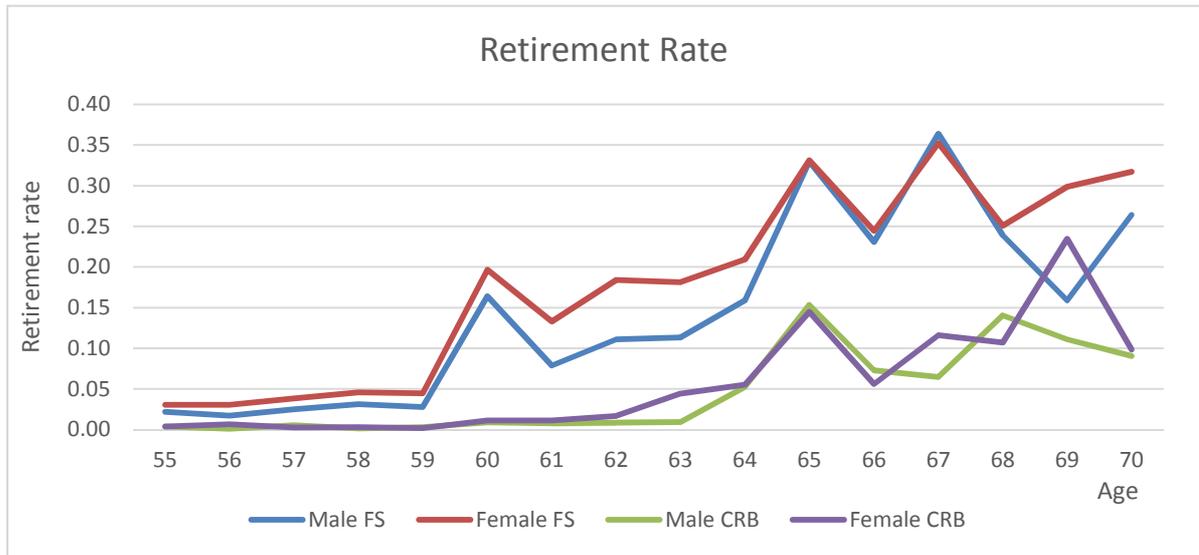
The mortality experience of the scheme and appropriate longevity assumptions are still being considered, these will be addressed separately. As an indication of the sensitivity, a one-year increase in life expectancy leads to broadly a £1bn increase in liabilities, and a 1% - 1.5% increase in future service contribution rate.

We have carried out analysis of the other areas listed above, comparing the scheme's experience over the period 1 April 2013 to 31 March 2016, with the assumption made at the 2014 valuation.

6.2 Normal health retirements

Currently a retirement age of 62 is assumed for pre-2011 benefits for active members (these can be taken unreduced from age 60 with employer consent). Post-2011 benefits are assumed to be taken at age 65. In practice, the member will retire at one age and we therefore propose to introduce an assumption for final salary members to allow for different rates of retirement over the ages between ages 60 and 64 to better reflect actual experience, with all other members retiring at age 65.

Figure 6 - Retirement Rate: the rates at which members have retired (here FS denotes former final salary members and CRB denotes members of the former CRB section)



Our proposed rates of retirement for ex-final salary members are shown below.

Table 9 - Retirement decrement table proposed for 2017 valuation

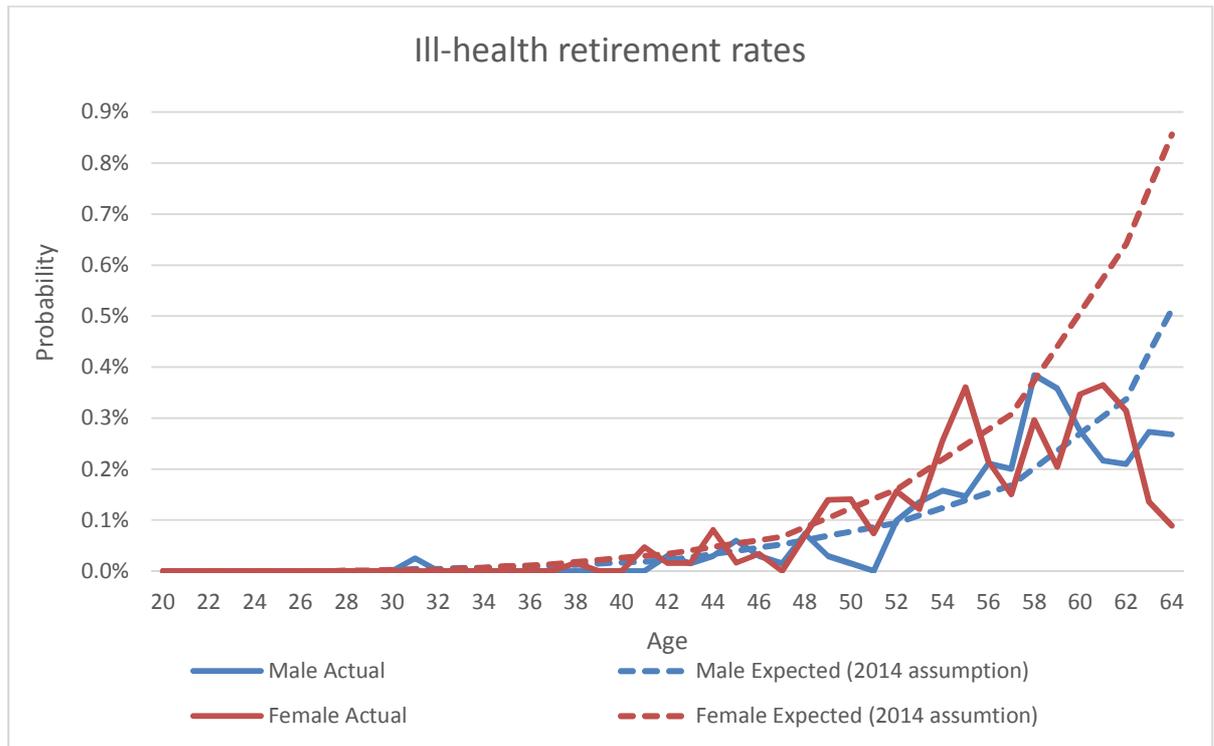
Age	Proportion of members retiring upon reaching the age
60	0.30
61	0.10
62	0.15
63	0.15
64	0.20
65	1.00

We have not carried out full calculations on the impact of this change but anticipate no material change to the future service rate, and broadly cost neutral on the liabilities.

6.3 Ill-health retirements

The analysis we have carried out suggests that the current assumption remains appropriate and we therefore propose no change.

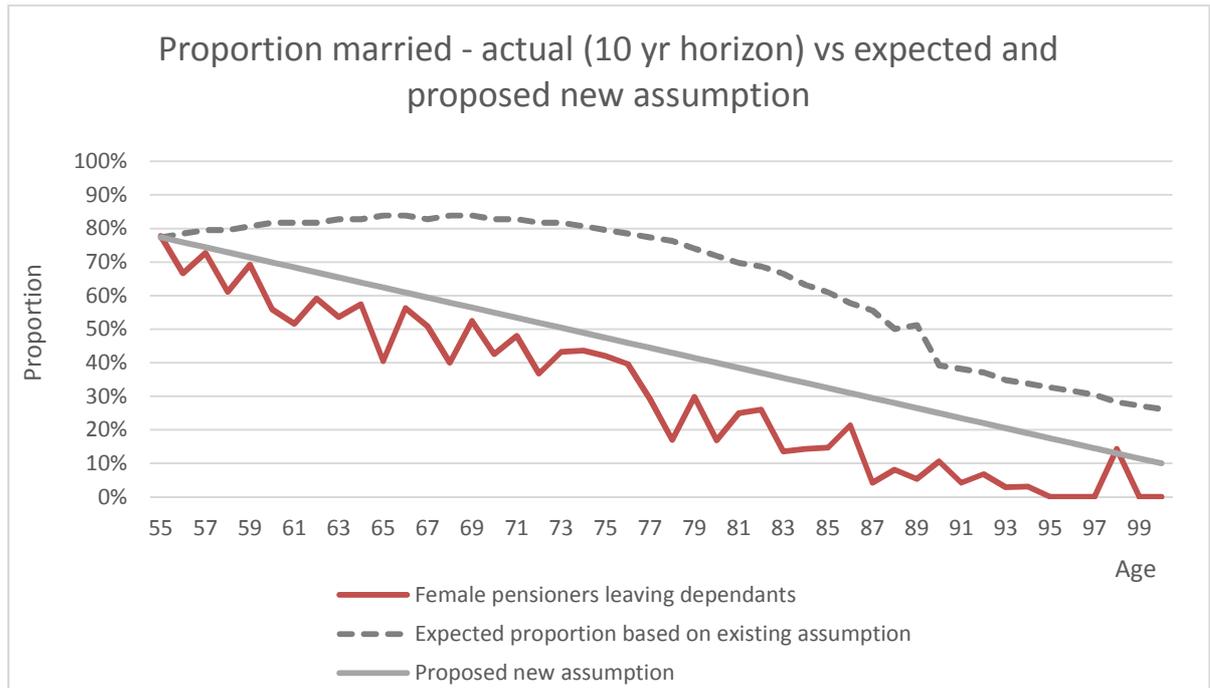
Figure 7 - Ill-health retirement rates: A comparison between the actual and expected rates of ill health retirement over the 2013/16 period



6.4 Proportion married

Our analysis shows that the male proportion married assumption is a good fit, however the current assumption appears to overstate the level of female pensioners who leave a dependant. Due to lower amounts of data available, we have based the analysis on a 10 year horizon, and the findings are shown below, along with the revised assumption we propose.

Figure 8 - Proportion married: Analysis over 10 years of female pensioners leaving dependants, and proposed new assumption



The new assumption proposed retains a small margin for prudence.

We expect the change to lead to a small (less than 1%) reduction to both the future service costs and the liabilities.

6.5 Withdrawals from the scheme

The assumption on members who withdraw from active service and become deferred members of the scheme or transfer out, is one which is no longer material for the liabilities or the contribution rate (because all benefits receive broadly the same revaluation regardless of the member's status). We are proposing a change to the assumption based on our analysis in order to be able to project the scheme forward more accurately, and this is shown in the charts below.

Figure 9 - Withdrawal rates: A comparison between the assumption for the 2014 valuation and realised rates.

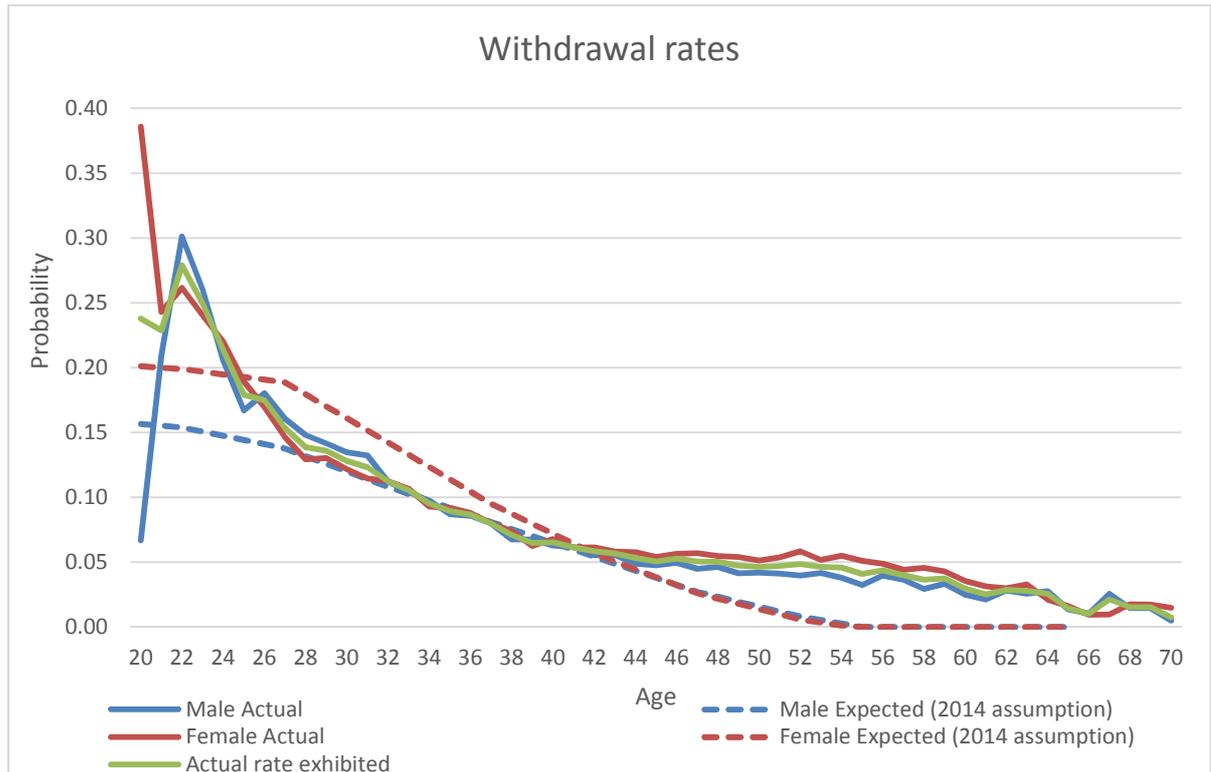
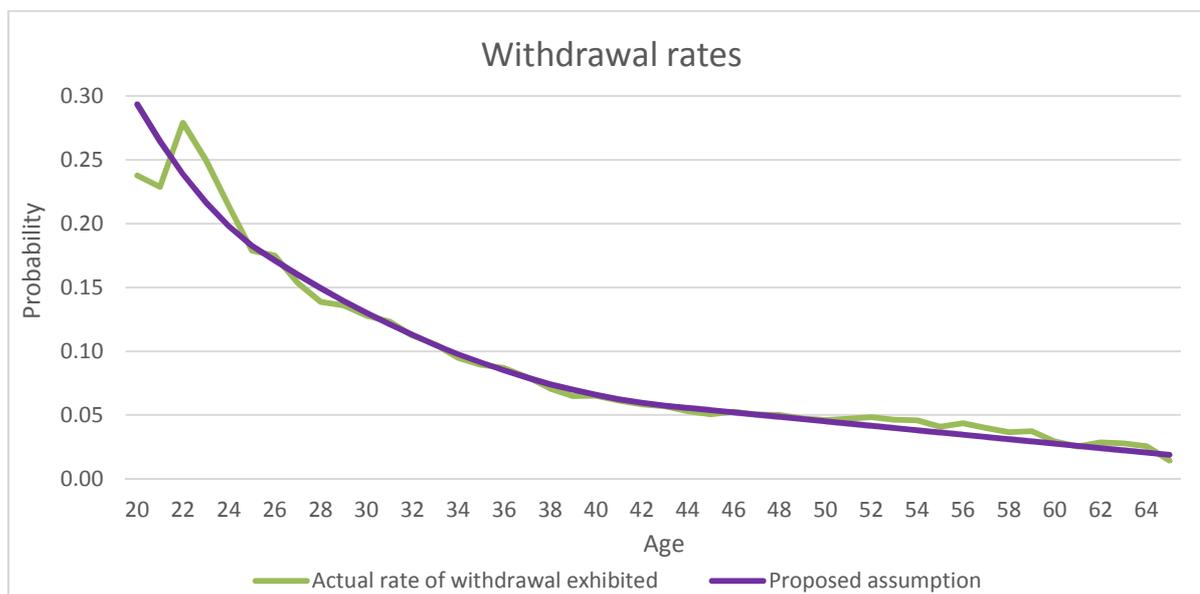


Figure 10 - Proposed withdrawal assumption: A comparison between the new proposed assumption and the rates exhibited (note members are assumed to retire at 65)



As noted above this assumption will not have a direct impact on the liabilities or the contribution rates.

6.6 Summary

USS proposes the following regarding the demographic inputs to the methodology and seeks additional views from employers as follows:

Mortality:

1. This is still being investigated however views from employers are welcomed.

Normal health retirements:

2. A change to the assumption for ex-final salary active members is proposed. This is not expected to have a significant impact on the liabilities or contribution rate.

Ill-health retirements:

3. No change to the assumption made at the 2014 valuation is proposed.

Proportion married:

4. A reduction to the assumption for the proportion of female members who are married is proposed. This would lead to a small reduction in both liabilities and contribution rates.

Withdrawals from the scheme:

5. A change to the assumption is proposed however this has no direct impact on the liabilities or contribution rate.