Government Actuary's Department

# Firefighters' Pension Schemes (Scotland)

Actuarial valuation as at 31 March 2012

Advice on assumptions


Date: 4 March 2015

Authors: Ian Boonin FIA

Michael Scanlon FIA

# Contents

# 1 Executive summary

*This report contains our recommendations for the best estimate assumptions to be set by the Scottish Ministers for the 2012 valuation of the Firefighters' Pension Schemes (Scotland).*

1.1 HM Treasury's Public Service Pensions (Valuations and Employer Cost Cap) Directions 2014 require that a valuation of the Firefighters' Pension Schemes (Scotland) is carried out as at 31 March 2012. The assumptions to be adopted for this valuation will be set by the Scottish Ministers, having obtained advice from the scheme actuary. The assumptions must be the Scottish Ministers' best estimates and not include margins for prudence or optimism.

1.2 This report sets out the Government Actuary's Department's (GAD's) formal advice in its capacity as the appointed scheme actuary to the Scottish Ministers on the actuarial assumptions to be adopted. The advice covers the main assumptions to be set by the Scottish Ministers and is summarised in Table 1. Assumptions may also be required in other areas and we will provide separate advice on additional assumptions as required.

1.3 We consider that recent experience generally provides the most reliable evidence when determining best estimates of future experience and have adopted this approach throughout this advice unless noted otherwise. In some areas the data available to analyse the experience of the Scottish Schemes is scarce compared with the corresponding English Schemes. Where there is no reason to believe experience across the memberships of the two Schemes is materially different, we have also considered the conclusions reached based on the English Schemes' experience in formulating our recommendations for the Scottish Schemes.

1.4 There is little recent experience available to determine some assumptions. In these cases we have recommended assumptions having regard to the assumptions adopted previously and other relevant data, as set out in Table 1.

1.5 The actuarial valuation of the Firefighters' Pension Schemes (Scotland) as at 31 March 2009 was started but it was not completed. An assessment of the actuarial liability of the Scottish Schemes as at 31 March 2009 was carried out based on the assumptions recommended for the 2009 valuation, with a small number of changes. Most of the assumptions put forward in this report differ from those used for that assessment. The most significant changes are:

- Heavier mortality assumptions (i.e. shorter life expectancies) compared with the previous recommendations
- Changes to age retirement assumptions: assumed earlier retirement for protected members of the 1992 Scheme, but later retirement for members joining or moving to the 2015 Scheme
- A reduction in the assumed proportion of members who are married or partnered.

1.6 The following sections and appendices provide more detail on the advice, supporting analysis and the financial impact of the assumptions on the results. They also contain important background information about the context of this advice and its limitations.

1.7 The Scottish Ministers are now asked to set the actuarial assumptions to be adopted for the valuation as required by the HMT Directions, consulting with HM Treasury as appropriate, and to confirm those assumptions to GAD. We would be happy to provide further analysis to the Scottish Ministers, if required.

**Table 1: Summary of recommended assumptions consistent with the 'best estimate' requirement**

| Assumption[1] | Summary of recommended assumptions | Rationale for recommendation | Approximate impact on total contribution rate of change from 2009 assumptions | |
|---|---|---|---|---|
| | | | Past service | Employer cost cap |
| **Pensioner baseline mortality[2]** | Aligned to standard SAPS table as at 2012[3,4] | | | |
| Current pensioners | 132% × S1PMA as at 2012 | In line with 2007-12 experience. *See graph C1 p61* | | |
| Future pensioners (normal health) | 132% × S1NMA as at 2012 | In line with 2007-12 experience, adjusted to remove allowance for future ill health pensioners, who are assumed to live less long | -4.6% | -0.7% |
| Future pensioners (ill health) | 100% × S1IMA as at 2012 | In line with experience of UK self-administered pension schemes | | |
| Dependants | 131% × S1DFA as at 2012 | In line with 2007-12 experience. *See graph C2 p62* | | |

[1] Our recommendations are for the same assumptions to be used for males and females in all areas. Because the majority of members are male, there is insufficient data to analyse female members separately.
[2] As directed by HMT, improvement in mortality from 2012 are assumed to be in line with those underlying the most recent ONS population projections
[3] SAPS tables are published by the Actuarial Profession and are based on the experience of self-administered pension schemes over the period 2000 to 2006. The 'S1' series has separate standard tables based on experience of male pensioners who have retired in normal or ill health (S1PMA), male members retiring in normal health (S1NMA) and in ill health (S1IMA) and for female dependants (S1DFA).
[4] Adjusted to take account of improvements in mortality applying to the UK population between 2002 (the base year for the SAPS tables) and 2012

| Assumption[1] | Summary of recommended assumptions | Rationale for recommendation | Approximate impact on total contribution rate of change from 2009 assumptions | |
|---|---|---|---|---|
| | | | Past service | Employer cost cap |
| **Age retirement** | | | | |
| 1992 scheme protected and taper protected | Retirement depends on age and service, with many retiring at the earlier of 30 years service and age 55. | In line with 2007-2012 experience in Scotland *see graph D2 p65.* | | |
| 1992 scheme unprotected members | No retirements before age 55. Age and service based rates, with many retiring at age 55, for example for members joining before age 25, over 99% retire at age 55, for members joining at age 30, about 93% retire at age 55. | 1992 scheme benefits are available before age 55. However, there is a significant disincentive of leaving the 2015 scheme before age 55 (retirement age effectively increases from 60 to SPA).<br>The minimum past service in 2015 for these members is 9 years. 1992 scheme benefits are still a very sizeable amount even if only in respect of service up to 2015, from which point accruals will be under the 2015 scheme. So it is reasonable to expect high take-up of age retirement at 55 for these members.<br>There is, however, no relevant evidence yet for Scotland. | +0.4% | N/A |

| Assumption[1] | Summary of recommended assumptions | Rationale for recommendation | Approximate impact on total contribution rate of change from 2009 assumptions | |
|---|---|---|---|---|
| | | | Past service | Employer cost cap |
| **Age retirement continued** | | | | |
| 2006 scheme (ie generally post-06 entrants) (protected, taper protected and unprotected) | Retire at age 60 | Retirement before age 60 would significantly reduce the value of benefits accrued in the 2006 scheme (retirement age effectively increases from 60 to SPA).<br>There is, however, no relevant evidence yet for Scotland or England. This assumption is aligned to England. | No change in assumption | N/A |
| New entrants from 2015 | About 25% retire at age 55, remainder retire at 60 | No relevant evidence. Proposal makes a reasonable allowance for the take up of benefits at the earliest time at which they become available and is consistent with Police Scotland and Fire England. To be kept under review. | No past service | New assumption |

| Assumption[1] | Summary of recommended assumptions | Rationale for recommendation | Approximate impact on total contribution rate of change from 2009 assumptions | |
|---|---|---|---|---|
| | | | Past service | Employer cost cap |
| **Ill-health retirement** | | | | |
| Incidence | Increasing by age: around 0.02% at age 25, 0.26% at age 45 | Broadly in line with 2007-2012 experience, with assumption aligned to England because of reasonable fit to experience. Not adjusted for further improvements in health. *see table E1 p69 and graph E2 p69* | +0.1%[5] | -0.3% |
| Higher/lower tier split | 40% on higher tier[6] | In line with 2010-2012 experience in England due to lack of data in Scotland *see paragraph E7 p70* | | |

[5] Does not take account of the reduced ill-health charge adjustment which will arise as a consequence, which will offset the overall impact on employer contributions to the scheme to some extent. It also does not take account of any deficit or surplus which will have emerged as a result of ill-health rates being different to those assumed over the period 2009 to 2012.

[6] Higher tier ill-health benefits are granted to those in more serious ill-health than those granted only lower tier benefits.

| Assumption[1] | Summary of recommended assumptions | Rationale for recommendation | Approximate impact on total contribution rate of change from 2009 assumptions | |
|---|---|---|---|---|
| | | | Past service | Employer cost cap |
| **Withdrawal** | | | | |
| 1992 scheme (ie generally pre-06 entrants) | Withdrawals decreasing with age: 1.1% at age 25, 0.3% at age 45 | No grounds to change assumption based on 2007-2012 withdrawal experience *see table F1 p71 and paragraph F.4 p71* | No change in assumption | |
| 2006 scheme (ie post-06 entrants), and new entrants from 2015 | Regular firefighters: rates decreasing with age: 1.8% at age 25, 1.4% at age 45; Retained firefighters: withdraw at four times these rates | Rates for Regular firefighters are as adopted for 2009 assessment and scheme reform. Little evidence to support or dispute previous assumption. | Immaterial | -0.4% |
| | or[7] | | | |
| | Regular firefighters: rates consistent with 1992 scheme; Retained firefighters: withdraw at nine times these rates | Rates for Regular firefighters in the 1992 scheme and 2006 scheme are the same. | +0.1% | +1.2% |

[7] There is little evidence on the rates of withdrawal of Regular firefighters in the 2006 scheme. In the light of this uncertainty, we have provided two possible alternative assumptions, with rationales. SPPA have confirmed that they propose to adopt the second alternative above.

| Assumption[1] | Summary of recommended assumptions | Rationale for recommendation | Approximate impact on total contribution rate of change from 2009 assumptions | |
|---|---|---|---|---|
| | | | Past service | Employer cost cap |
| **Death before retirement** | Increasing by age: 0.02% at age 25, about 0.05% at age 45, 0.3% at age 65 | Broadly in line with 2007-2012 aggregate experience in Scotland and England, with assumption aligned to England because of reasonable fit to aggregate experience, not adjusted for future improvements in mortality *see table G1 p73* | Immaterial | Immaterial |
| **Promotional salary scale** | | | | |
| Regular firefighters | Service based scale: about 1.2% a year between 4 and 30 years, after 30 years a lower scale is used | In line with scheme data as at 31 March 2012 with 2009 assessment assumption retained because of reasonable fit to experience *see graph H2 p75* | -0.3% | Not a feature of the scheme |
| Retained firefighters | Age related scale: about 1% a year up to age 50, 0.4% a year thereafter | In line with scheme data as at 31 March 2012 , with assumption aligned to England because of reasonable fit to experience *see graph H3 p77* | | |

| Assumption[1] | Summary of recommended assumptions | Rationale for recommendation | Approximate impact on total contribution rate of change from 2009 assumptions | |
|---|---|---|---|---|
| | | | Past service | Employer cost cap |
| **Commutation** | | | | |
| 1992 scheme protected | 25% of pension commuted | Maximum permitted under reguations | New assumption | N/A |
| Former 1992 scheme members in 2015 scheme | Nil commutation from 2015 scheme | Reasonable approach given that 1992 scheme offers a greater lump sum for pension given up, compared with 2015 scheme | New assumption | N/A |
| 2006 scheme | 15% of pension commuted | Required by draft HMT directions | Directed | |
| New entrants from 2015 | 15% of pension commuted | Required by draft HMT directions | Directed | |
| **Family statistics** | | | | |
| Proportion married/partnered | 75% married, 80% partnered at retirement (consistent assumptions for existing pensioners) | In line with ONS statistics for UK population | -2.9% | -0.3% |
| Age difference | Member 3 years older than partner | In line with ONS statistics for UK population | No change in assumption | |
| Remarriage | No allowance | In line with 2009 assumptions | No change in assumption | Not a feature of the scheme |

# 2 Introduction

*This report contains our advice to the Scottish Ministers but will be of interest to other parties who should note the limitations.*

2.1 Under section 12 of the Public Service Pensions Act 2013 (the "2013 Act'), scheme regulations must set an "employer cost cap". This is a rate, expressed as a percentage of pensionable earnings of members of the scheme, to be used for the purpose of measuring changes in the cost of the scheme. The employer cost cap is to be set in accordance with the HMT Directions.

2.2 HM Treasury's Public Service Pensions (Valuations and Employer Cost Cap) Directions 2014[8] (the 'HMT Directions') require that a valuation of the Firefighters' Pension Schemes (Scotland) (the 'Scottish Schemes') is carried out as at 31 March 2012 for the purpose of setting the employer cost cap. The HMT Directions require that the valuation report includes the following information:

- The proposed employer cost cap (direction 53)
- The employer contribution rate (direction 50, 22(f), 29).

2.3 The HMT Directions require that the assumptions to be adopted for this valuation, except for those assumptions specified in the HMT Directions, will be set by the Scottish Ministers, having obtained advice from the Government Actuary's Department (GAD) in its capacity as the appointed scheme actuary to the Scottish Ministers (direction 19(a)). They also require that the assumptions must be the Scottish Ministers' best estimates and not include margins for prudence or optimism (direction 19(c)).

2.4 This report is addressed to the Scottish Ministers and contains our formal advice on the appropriate assumptions to be adopted for the 2012 valuation, as required by the HMT Directions. The purpose of this advice is to enable the Scottish Ministers to determine the required best estimate assumptions.

2.5 The advice is provided in accordance with the HMT Directions. We may also revise this advice if material new evidence comes to light. GAD may revise this assumption for any other new relevant information emerging.

2.6 The advice also has regard to HMT's suggested approach[9] for setting assumptions in the absence of direct evidence.

[8] This report has been prepared in accordance with the HMT Directions 2014 (as amended).

[9] *Determining assumptions for the 2012 valuations where there is a limited underlying evidence base* dated 23 August 2013.

2.7 The advice covers the main assumptions to be set by the Scottish Ministers. In particular, we consider eight sets of assumptions in this report:

- Pensioner mortality
- Age retirement from service
- Ill-health retirement from service
- Voluntary withdrawal from service
- Death before retirement
- Promotional pay increases
- Commutation of pension for cash at retirement
- Family statistics.

2.8 Assumptions may also be required in other areas, e.g. relating to the projection of the membership to 2015. We will provide separate advice on additional assumptions as required.

2.9 The Scottish Ministers are now asked to set the actuarial assumptions (listed in paragraph 2.7) to be adopted for the valuation as required by the HMT Directions, consulting with HM Treasury as appropriate, and to confirm those assumptions to GAD. We would be happy to provide further analysis to the Scottish Ministers, if required.

2.10 The actuarial valuation of the Firefighters' Pension Schemes (Scotland) as at 31 March 2009 was started but it was not completed. We have analysed the experience of the Scottish Schemes' membership over the five-year period between 31 March 2007 and 31 March 2012, in order to inform the advice contained in this report.

2.11 Individual Fire and Rescue Authorities (FRAs) or their appointed administrators supplied data on the experience of the Scottish Schemes' membership over the five-year period to 31 March 2012. We carried out some basic validation checks on the data before using it to analyse the Scottish Schemes' experience in order to develop our advice on the assumptions. The data used to arrive at each of the assumptions are summarised in their respective appendices. In preparing our advice, we have relied upon the general completeness and accuracy of the data provided.

2.12 We consider that recent experience generally provides the most reliable evidence when determining best estimates of future experience and have adopted this approach throughout this advice unless noted otherwise. The Scottish Ministers should consider whether there is any reason why this approach would be inappropriate. We would be happy to revisit our advice to take account of any evidence relevant to expected future experience of the Scottish Schemes' membership.

2.13 There is little recent experience available to determine some assumptions. In these cases we have recommended assumptions having regard to the assumptions adopted previously and other relevant data, as set out in Appendix A.

2.14 For a number of assumptions considered in this report the experience data available from the Scottish Schemes is not sufficient to set a robust assumption. Placing full reliance on the Scottish Schemes' recent experience might lead to assumptions which vary significantly between valuations simply as a result of random variation in the experience. This could lead to unstable valuation results, potentially threatening the cost cap. To mitigate this risk we have made use of the experience of the Firefighters' Pension Schemes (England) (the 'English Schemes'). We have adopted the following approach where there is insufficient evidence from the Scottish Schemes to set a robust assumption directly.

- If the Scottish experience is very similar to the experience in England then the assumption recommended for the English Schemes has been recommended for the Scottish Schemes as well.
- If the Scottish experience differs from England but the underlying experience in the two regions could reasonably be the same with the differences resulting only from natural random variation then the experience in the two regions has been aggregated. The recommended assumption for the Scottish Schemes is then based on this aggregate data. As the English Schemes are much bigger, the resulting assumption is typically that recommended for the English Schemes.
- If the difference between the experience in Scotland and England cannot reasonably be the result of natural random variation then the recommended assumption will reflect the experience in Scotland. It may still be possible to make use of the experience in England if the experience in Scotland has a similar pattern by age but the overall level is higher or lower. This does not mitigate the risk of the assumption changing significantly between valuations but is better than adopting an assumption which seems clearly inappropriate.
- If no analysis of Scottish experience has been possible then the assumption recommended for the English Schemes has been recommended for the Scottish Schemes.

2.15 The report is also being made available to:

- The Scottish Public Pensions Agency (SPPA) acting on behalf of Scottish Ministers;
- The Scottish Firefighters' Pensions Forum, as part of the consultation process relating to the valuation of the Scottish Schemes; and
- HM Treasury, as part of the process for granting their approval to the assumptions proposed by the Scottish Ministers.

2.16 We are content for the Scottish Ministers to release this report to third parties, provided that:

- It is released in full

- The advice is not quoted selectively or partially
- GAD is identified as the source of the report, and
- GAD is notified of such release.

2.17 Third parties whose interests may differ from those of the Scottish Ministers should be encouraged to seek their own actuarial advice where appropriate. Other than the Scottish Ministers, GAD has no liability to any person or third party for any act or omission taken, either in whole or in part, on the basis of this report.

# 3 General considerations

*This section sets out a number of general considerations common to the setting of the different assumptions considered in this report.*

3.1 The key considerations taken into account in formulating the advice in this report are explained in this section.

**The HMT Directions**

3.2 The advice in this report reflects the requirements of the HMT Directions that assumptions should be set as the Scottish Ministers' best estimate of future experience and should contain no margin for prudence or optimism. They should be set having regard to the:

- Assumptions set for previous valuations
- Analysis of demographic experience up to the valuation date, taken as experience over the five-year period up to the valuation date for the purposes of our advice
- Historic long-term trends and emerging evidence which may illustrate long-term trends in the future.

**Setting assumptions where there is insufficient evidence**

3.3 Since all the reformed public service schemes have certain characteristics for which there is no, or insufficient, direct evidence on which to base assumptions HMT issued a document setting out the approach that schemes should take when setting these assumptions.

**Different populations**

3.4 The HMT Directions require the 2012 valuation to cover both the existing 1992 Scheme and 2006 Scheme, and the new 2015 Scheme to be established under the 2013 Act. This means the 2012 valuation needs to consider assumptions appropriate to both the existing Scottish Schemes and the new 2015 Scheme. It also needs to cover both the assessment of the employer contribution rates payable over the period 2015 to 2019 and the employer cost cap. Setting the employer contribution rate requires assumptions about anticipated member behaviour and characteristics during 2015 to 2019 as well as assumptions about member behaviour and characteristics in the longer term.

3.5 From 2015 there will be 3 distinct groups of members.

- Those with full protection and thus remaining in their existing Scottish Schemes to retirement. The introduction of the 2015 Scheme is not expected to have any impact on this group's behaviours.
- New members to the 2015 Scheme. These members' behaviours are expected to be influenced only by the provisions of the 2015 Scheme.
- Members with service in both the existing and 2015 Scheme (including members with tapered protection). Over time, as the proportion of 2015 Scheme service increases, the behaviours are expected to become increasingly influenced by the provisions of the 2015 Scheme.

3.6 The two existing Scottish Schemes are the 1992 Scheme and the 2006 Scheme. Within the 2006 Scheme members are separately identified as either Regular firefighters or Retained firefighters. There are no Retained firefighter members of the 1992 Scheme.

**2009 valuation of the Firefighters' Pension Schemes (Scotland)**

3.7 The actuarial valuation of the Firefighters' Pension Schemes (Scotland) as at 31 March 2009 was started, including an analysis of experience and a recommended set of assumptions, but it was not completed. An assessment of the actuarial liability of the Scottish Schemes as at 31 March 2009[10] was carried out based on the assumptions originally proposed for the 2009 valuation, with a small number of changes. This assessment is referred to in this document as 'the 2009 assessment' and the assumptions used in the assessment as 'the 2009 assumptions'.

3.8 The initial value of the notional fund for the Scottish Schemes is set in the HMT Directions based on the 2009 assessment.

**Scheme reform**

3.9 As part of the process of scheme reform, GAD was asked to calculate a cost ceiling and assess scheme specific proposals against that cost ceiling. Our draft report 'Assessment of cost ceiling and scheme-specific proposals – data, methodology and assumptions' of 13 May 2013 sets out our advice to SPPA on the assumptions of the scheme reform work. These assumptions are referred to in this document as 'the scheme reform assumptions'.

[10] See *Firefighters' Pension Schemes Scotland: Assessment of actuarial liability as at 31 March 2009* dated 26 September 2014.

### Valuation of the Firefighters' Pension Schemes (England)

3.10 The previous completed actuarial valuation of the English Schemes was carried out as at 31 March 2007, and GAD's report on that valuation is dated 23 October 2009. This valuation is referred to in this document as the 'English 2007 valuation' and the assumptions used in the valuation as the 'English 2007 assumptions'. In many cases, the 2009 assumptions were the same as the English 2007 assumptions.

3.11 A valuation of the English Schemes' is being carried out as at 31 March 2012, as required by the HMT Directions. GAD has recommended assumptions to be used for this valuation[11]. This valuation is referred to in this document as the 'English 2012 valuation' and the assumptions used in the valuation as the 'recommended English 2012 assumptions' or just the 'English 2012 assumptions'.

### Relative importance of assumptions

3.12 The HMT Directions require the employer contribution rate and employer cost cap to be determined to the nearest 0.1% of pensionable payroll. This is a required level of accuracy for a particular calculation and based on a particular set of assumptions. In each of the remaining sections in this report we conclude by providing an approximate indication of the impact of the change being recommended to the assumptions[12] on each of:

- **'Past service' –** This is the indicative impact on the employer contribution rate of any surplus or deficit created by moving from the 2009 assumptions to the recommended 2012 valuation assumption (assuming that the surplus or deficit will be expressed as an employer contribution rate payable over 15 years from 2015). This impact is on employer contribution rates only and does not impact on the cost cap mechanism.
- **'Employer cost cap' –** This is the indicative impact on the employer cost cap of adopting the recommended 2012 valuation assumption as opposed to the 2009 assumption.

3.13 The assumptions adopted will also impact on the employer contribution rate payable in respect of future accrual (both for members with or without transitional protection).

[11] See *Firefighters' Pension Schemes: Valuation as at 31 March 2012 Advice on assumptions* draft dated 8 October 2013.

[12] In many cases we show the impact of the recommended assumptions relative to those proposed for the 2007 valuation of the Scheme. Further details of the assumptions used for the 2007 valuation of the Schemes are contained in our final valuation report *Firefighters' Pension Schemes in Scotland: Actuarial valuation as at 31 March 2007.*

3.14 The figures have been calculated using approximate methods and should be used as a guide to the broad magnitude of the impact of the change being considered. Furthermore the impacts of different changes are not independent so the impact of multiple changes will not necessarily be the sum of the individual impacts. Changes are considered immaterial if their expected impact on the contribution rate is less than 0.05%. In 2009 there was little liability in respect of service in the 2006 Scheme, so changes to the assumptions that affect only the 2006 Scheme have little impact in these calculations on the liability at 2009.

3.15 Where relevant we also indicate in each of the following sections the relative importance of each set of assumptions to each of the three groups of members identified in paragraph 3.5.

**Cost cap assumptions**

3.16 The HMT Directions require the calculation of a proposed employer cost cap using the long-term assumptions adopted for the 2012 valuation, but adjusted as though no members have any benefits accrued in the 1992 or 2006 Schemes, and no members have any transitional protection (direction 48).

3.17 Under this requirement, the assumptions used to determine the proposed employer cost cap will be those applicable to new entrants to the 2015 Scheme.

3.18 The assumptions adopted for the 2012 valuation are of particular importance as they will be used to set both the employer cost cap (direction 53) and the prior value of the cost cap fund (direction 30), both of which will be used to measure changes in the cost of the Scottish Schemes.

3.19 If experience differs from the assumptions adopted to calculate the employer cost cap and prior value of the cost cap fund, then this will feed into the measurement of changes in cost of the Scottish Schemes. The relative significance of assumptions in relation to the cost cap mechanism is discussed in each section.

**Males and Females**

3.20 There are relatively few female firefighters and as such it is not possible to perform any separate robust experience analysis for this group. Our analysis therefore covers both male and female members together. We recommend that the same assumptions are used for male and female firefighters in any given sub-group, based on the analysis of everyone in this sub-group. We do not have any evidence to suggest recommending different assumptions for males and females. On this basis we would not expect using the same assumptions for male and female members to have a material impact on the results.

# 4 Pensioner mortality

*This section sets out our recommendation for the pensioner mortality assumptions, the rationale for those assumptions and their financial impact.*

### Proposed assumptions for 2012 valuation

4.1 The assumptions we recommend for baseline pensioner mortality for the 2012 valuation may be summarised as follows:

**Table 4.1: Recommended mortality assumptions**

| Baseline mortality | Standard table[13] | Adjustment |
|---|---|---|
| Current pensioners (normal and ill-health) | S1PMA | 132% |
| Future pensioners (normal health) | S1NMA | 132% |
| Future pensioners (ill-health) | S1IMA | 100% |
| Dependants | S1DFA | 131% |

4.2 As specified by HM Treasury, future improvements in mortality will be assumed to be in line with those underlying the most recent ONS population projections available to us.

### Previous valuation assumptions

4.3 At the previous valuation baseline mortality was similarly based on adjusted standard tables with future improvements based on the then most recent ONS population projections. However, the 2009 assumption assumed lighter current rates of mortality (i.e. people are assumed to live longer) than our recommended 2012 valuation assumption.

[13] SAPS tables are published by the Continuous Mortality Investigation and based on the experience of self-administered pension schemes over the period 2000 to 2006. The 'S1' series has separate standard tables based on experience of male pensioners who have retired in normal or ill-health (S1PMA), male members retiring in normal health (S1NMA) and in ill-health (S1IMA) and for female dependants (S1DFA). The standard table has been adjusted to broadly allow for overall mortality improvements applying to the UK population from the mid-point of the period covered by the S1 tables to 31 March 2012.

*Comparison of expected pensioner longevity*

4.4 The table below gives a comparison of the resulting life expectancies[14] assumed and recommended for the 2009 assessment and 2012 valuation.

**Table 4.2: Comparison of life expectancies (years)**

| | 2009 assessment[15] | 2012 valuation | Scotland Population[16] |
|---|---|---|---|
| **Current pensioners (normal and ill-health)** | | | |
| Member aged 50 | 36.6 | 35.3 | 34.0 |
| Member aged 55 | 31.6 | 30.2 | 28.9 |
| Member aged 60 | 26.7 | 25.5 | 24.2 |
| Member aged 65 | 21.9 | 20.8 | 19.8 |
| **Future pensioners (normal health) – current age 45** | | | |
| Member aged 50 | 38.5 | 36.3 | 34.8 |
| Member aged 55 | 33.9 | 31.7 | 30.5 |
| Member aged 60 | 29.4 | 27.3 | 26.3 |
| Member aged 65 | 25.1 | 22.9 | 22.3 |
| **Future pensioners (ill-health) – current age 45** | | | |
| Member aged 50 | 34.8 | 34.0 | |
| Member aged 55 | 30.3 | 30.2 | |
| Member aged 60 | 25.9 | 26.4 | |
| Member aged 65 | 21.7 | 22.6 | |

[14] Cohort life expectancies based on the ages shown as at the valuation date, i.e. allowing for anticipated future improvements in mortality .
[15] The 2009 valuation adopted different assumptions for current normal health and ill-health pensioners. The life expectancies shown below are based on the average under those two assumptions weighted by the number of normal and ill-health pensioners at 2012.
[16] Cohort life expectancies are from the ONS website and the 2012 based projected data table for Scotland.

4.5 The comparison of life expectancies given in table 4.2 is complex. It reflects changes to the assumed baseline mortality and mortality improvements, as well as a change to using different mortality assumptions for people born in different years (rather than an average mortality assumption for the relevant population). Further discussion on the comparison of mortality assumptions is given in Appendix C.

**Use of the assumption**

4.6 Pensioner mortality is a key valuation assumption and is a measure of how long members retiring in normal or ill-health, or their dependants, expect to live and receive benefits.

**Results of analysis**

4.7 The proposed assumptions for pensioner mortality are based on an analysis of past mortality experience for the Scottish Schemes. We have analysed the pensioner mortality experience over the five-year period from 1 April 2007 to 31 March 2012. Further information on the data analysed and the results of that analysis are shown in Appendix C.

4.8 In order to make a recommendation of the most appropriate base table for pensioner mortality we have compared the actual mortality experience over the five-year period with that expected based on the most appropriate S1 standard table[17]. This comparison considers the key age ranges for the various types of deaths and identifies what adjustment to the standard table is required to provide the closest comparison with actual experience. The results are as shown in table 4.1. Appendix C shows this comparison by age.

**Rationale for recommended assumptions**

4.9 The recommended assumption for pensioner mortality of current pensioners (normal and ill-health), and dependants, is based on the analysis described above.

4.10 The recommended assumptions for pensioner mortality of future pensions are consistent with the assumptions for current pensioners, described above. However, different assumptions are adopted for members retiring in ill-health and normal health. It is reasonable to assume that members retiring in ill-health will have a lower life expectancy than members retiring in normal health. The assumptions adopted are as follows:

- Future pensioners (ill-health): There has been a significant reduction in the number of ill-health retirements, so the mortality experience of current ill-health pensioner may not be relevant to future ill-health pensioners. The recommended assumption is based on the experience of UK self-administered pension schemes.

[17] Adjusted to those applicable to the period the deaths occurred by applying adjustments broadly in line with future improvements applying to the UK population over the relevant period.

> Future pensioners (normal health): The recommended assumption is based on the analysis of current pensions, with a small reduction to the mortality rates so the aggregate mortality of future pensioners (considering those retiring in normal health and ill-health together) is consistent with the mortality of current pensioners.

**Financial impact**

4.11 Mortality is a key assumption which will have a significant impact on employer contributions and the employer cost cap. Assuming longer (shorter) life expectancy would increase (decrease) costs.

4.12 Our recommended 2012 valuation assumption implies shorter life expectancy than the 2009 assumption, which would reduce contribution rates. Table 4.3 shows the approximate impact of adopting our recommended assumptions (for both baseline mortality and future improvements) as opposed to those adopted for the 2009 assessment. The impacts shown reflect both the baseline mortality assumption and the assumptions regarding future improvements.

**Table 4.3: Approximate impact of recommended change in mortality assumptions**

| Mortality | Past service effect[1] | Cost of accrual[2] | | |
|---|---|---|---|---|
| | | 1992 Scheme | 2006 Scheme | 2015 Scheme[3] |
| Change from 2009 basis to that proposed for 2012 | -4.6% | -1.2% | -0.6% | -0.7% |

1 - Adjustment to contribution rate for 15 years from 2015 – this will affect the contribution rate in all three Schemes.
2 – This is the impact on the cost of benefits currently being accrued before any addition or subtraction for the past service effect.
3 - The employer cost cap will be based on the cost of accrual in the 2015 Scheme (without any allowance for any past effects).

# 5 Age retirement

*This section sets out our recommendation for the assumed patterns of retirement on grounds other than ill-health, the rationale for those assumptions and their financial impact.*

**Recommended assumptions for 2012 valuation**

5.1 We recommend that rates of age retirement are set separately for members who will continue in the 1992 Scheme after 2015, for members who will continue in the 2006 Scheme after 2015, for those who will have service in the existing and 2015 Scheme and for new entrants after 1 April 2015. Sample age retirement rates are provided in Appendix B.

*1992 Scheme members*

5.2 We recommend that the point at which 1992 Scheme members are assumed to retire depends on age and service.

5.3 For protected members (who will remain in the 1992 Scheme after 1 April 2015), we recommend rates with many retiring at the earlier of 30 years' service and age 55, in line with recent retirement patterns.

5.4 For members with taper protection, we recommend the same assumption as protected members above.

5.5 For unprotected members, we recommend rates with no members retiring before age 55, with many retiring at age 55.

*2006 Scheme members*

5.6 We recommend that 2006 Scheme members are assumed to retire at age 60. This recommendation applies to members with protection or taper protection, and to unprotected members.

*New entrants after April 2015*

5.7 We recommend that 25% of members are assumed to retire at 55 with the remainder assumed to retire at age 60.

*Deferred members*

5.8 We recommend it is assumed that deferred members will take their pension at their deferred pension age.

**Previous valuation assumptions**

5.9 Broadly similar assumptions about retirements in the 1992 Scheme and 2006 Scheme were adopted for the 2009 assessment, although assumed retirement in the 1992 Scheme was generally a little later under the 2009 assumptions.

**Use of the assumption**

5.10 Age retirement rates specify the rate at which members are assumed to retire on grounds other than ill-health and therefore potentially include allowance for retirements before and after NPA.

5.11 In the 1992 Scheme members can retire on an unreduced pension once they have completed 25 years' service if they are aged 50 or over, and most members can retire from age 55 regardless of service. There is no actuarially reduced early retirement option.

5.12 Members in the 2006 Scheme can retire unreduced at age 60 from active service and from age 65 if deferred members. Active members can take actuarially reduced early retirement from age 55 up to age 60; the reduced pension is with reference to the deferred pension from age 65.

5.13 Members in the 2015 Scheme will be able to retire from age 60 from active service and from SPA if deferred members. Active members will be able to take actuarially reduced early retirement from age 55, with reference to a pension payable from age 60.

**Results of analysis**

5.14 We analysed the pattern of age retirements from active membership over the five-year period to 31 March 2012 for the 1992 Scheme. In total there were around 850 age retirements from the 1992 Scheme over the period. The analysis compared the numbers of actual retirements to the expected number of retirements under the 2009 assumptions and the recommended English 2012 assumptions. Further information on the data analysed and the results of that analysis are shown in Appendix D.

5.15 The analysis of experience over the period showed that members are generally retiring earlier than expected based on 2009 assumptions or the recommended English 2012 assumptions.

**Rationale for recommended assumptions**

5.16 Our recommended assumptions for the protected 1992 Scheme members reflect the analysis above.

5.17 Our recommendation for 1992 Scheme members with taper protection assumes that the 1992 Scheme benefits have more influence on retirement rates than the 2006 Scheme benefits, because these members have a relatively large amount of service in the 1992 Scheme.

5.18 Our recommendation for unprotected members reflects the significant disincentive of leaving the 2015 Scheme before age 55 (retirement age effectively increases from 60 to SPA). It is assumed that the 2015 Scheme will have more influence on retirement rates than the 1992 Scheme for these members, because they have a relatively small amount of 1992 Scheme service compared with taper protected members.

5.19 There was insufficient data to perform a credible analysis of the 2006 Scheme experience. Our recommended assumption for 2006 Scheme members is the same as that used for the 2009 assessment.

5.20 There was insufficient data to inform the assumption for new entrants after 2015. The assumption is intended to make a reasonable allowance for the take-up of benefits at the earliest time at which they become available (with reduction for early payment).

5.21 This is the same assumption that was proposed for the original scheme design, under which early retirement reductions were to be set relative to deferred benefits rather than the value of benefits had the member stayed in service.

5.22 While the new design would appear to make earlier retirement more attractive there is very significant uncertainty about actual retirement rates in the 2015 scheme and we consider this proposal remains reasonable. Furthermore, as early retirement reductions will now be set by considering active service benefits, the actual rates of age retirement will not impact the cost of the scheme.

5.23 Deferred members may claim a reduced pension before their deferred pension age, but the reduction is actuarially neutral so allowing for this possibility would not have a material impact on the valuation results.

**Financial impact**

5.24 The financial significance of the age retirement assumption differs for different groups of members.

5.25 **1992 Scheme protected members** – This assumption can have a relatively significant impact on employer contribution rates via the impact on past service liability and the cost of future accrual in respect of these members. Assuming later (earlier) retirements would generally decrease (increase) costs. This assumption does not impact the employer cost cap, but would have some impact on the cost cap mechanism if experience was not in line with assumptions.

5.26 **2006 Scheme members** – This assumption has a small impact on employer contribution rates. Assuming earlier retirements would slightly decrease costs. This assumption does not impact the employer cost cap, but would have a small impact on the cost cap mechanism if experience was not in line with assumptions.

5.27 **New entrants from 2015** – As early retirement reductions will now be set by considering active service benefits, the actual rates of age retirement will not impact the cost of the scheme.

5.28 Table 5.1 shows the approximate impact of adopting our recommended assumption as opposed to that adopted for the 2009 assessment.

**Table 5.1: Approximate impact of recommended change in age retirement assumptions**

| Age Retirement | Past service effect[1] | Cost of accrual[2] | | |
|---|---|---|---|---|
| | | 1992 Scheme | 2006 Scheme | 2015 Scheme[3] |
| Changes from 2009 to 2012 proposed assumptions | 0.4% | 1.4% | No change in assumption | New assumption |
| Impact of assuming all unprotected members retire in line with assumption for fully protected members | 0.1% | Only past service effects considered | | |
| Impact of assuming all tapered members retire in line with assumption for fully unprotected members | Immaterial | Only past service effects considered | | |

1 - Adjustment to contribution rate for 15 years from 2015 – this will affect the contribution rate in all three Schemes.
2 – This is the impact on the cost of benefits currently being accrued before any addition or subtraction for the past service effect.
3 - The employer cost cap will be based on the cost of accrual in the 2015 Scheme (without any allowance for any past effects).

# 6 Ill-health retirement from service

*This section sets out our recommendation for the assumed rates of retirement on grounds of ill-health, the rationale for those assumptions and their financial impact.*

**Recommended assumptions for 2012 valuation**

6.1 We recommend that a single set of assumptions for the incidence of ill-health retirement is used for all active firefighters. Further we recommend that these same rates are assumed to apply to members in the 2015 Scheme. Assumed rates of ill-health retirement increase with age but less than 1.5% of members are assumed to retire on ill-health grounds each year, even at the highest ages. Sample rates are provided in Appendix B. The recommended rates are broadly in line with the 2007-2012 experience in the Scottish Schemes. The assumption is aligned to the recommended English 2012 assumption as that is a reasonable fit to the Scottish experience.

6.2 We also recommend assuming that 40% of members retiring on ill-health grounds who have sufficient qualifying service to be assessed for a higher-tier benefit will receive one and the remainder will receive the lower-tier benefit.

**Previous valuation assumptions**

6.3 Higher rates of ill-health retirement were assumed for the 2009 assessment. The recommended 2012 assumptions are approximately 60% of the 2009 assumptions.

6.4 For the 2009 assessment it was assumed that 25% of those retiring on ill-health grounds would receive higher-tier benefits.

**Use of the assumptions**

6.5 Ill-health retirement rates specify the rate at which members are assumed to retire on grounds of ill-health. The assumed eligibility for higher or lower-tier awards specifies the benefits which will be provided. The rates of mortality experienced after ill-health retirement are also relevant to the valuation calculations. Post-retirement mortality is addressed in section 4 of this report.

**Results of analysis**

*Ill-health retirement rates*

6.6 We analysed 54 ill-health retirements over the five-year period to 31 March 2012 from the Scottish Schemes. The analysis compared the numbers of actual retirements to the expected number of retirements under the 2009 assumptions. Details of the analysis are shown in Appendix E.

6.7 The analysis showed there were fewer ill-health retirements than assumed under the 2009 assumptions (around 60% of the expected number). In contrast, the recommended English 2012 assumption provided a much better fit to the experience.

*Split between tiers*

6.8 There was no data to analyse the split of retirements between the two tiers in Scotland. We have used the published Department for Communities and Local Government (DCLG) statistics for the years 2010-2011 and 2011-2012 from the English Schemes to determine a value for the proportion of higher tier benefit awards made. Details of this analysis are shown in Appendix E.

6.9 We do not have any data to consider whether the split between ill-health tiers varies by age or any other factor.

**Rationale for recommended assumptions**

*Ill-health retirement rates*

6.10 The recommended ill-health rates are broadly in line with 2007-2012 experience, with the assumption aligned to England because of reasonable fit to experience.

6.11 There are some differences in the rules for qualifying to receive an ill-health pension between the 2006 Scheme and the 1992 Scheme but we do not believe this will have a material effect on the number of members retiring on grounds of ill-health.

6.12 There is limited experience on which to base ill-health assumptions at ages 50 to 60 and there is no evidence not to retain the pattern at which ill-health retirements change by age adopted for 2006 Scheme members in the 2009 assessment.

*Split between tiers*

6.13 Our recommended assumption reflects the analysis above.

6.14 There are some differences in the rules for qualifying to receive a higher tier ill-health pension between the 2006 Scheme and the 1992 Scheme but we do not believe this will have a material effect on the split between tiers.

**Financial impact**

6.15 The rate of ill-health retirement is an important assumption for the valuation, but the overall financial impact is complicated by the fact that the FRAs pay a lump sum charge into their pension account in respect of each ill-health retirement from the Scottish Schemes, with their ongoing contribution rate being lowered to reflect these expected charges in respect of ill-health retirements.

6.16 Setting aside the lump sum charges, assuming lower (higher) rates of ill-health retirement would tend to decrease (increase) employer contribution rates.

6.17 The employer cost cap is unaffected by the lump sum charges. Assuming lower (higher) rates of ill-health retirement would tend to decrease (increase) the employer cost cap.

6.18 Under the recommended assumptions for rates of ill-health retirement, the assumption for the split between higher and lower tier awards has only a very small financial impact.

6.19 Table 6.1 shows the approximate impact of adopting our recommended assumption as opposed to that adopted for the 2009 assessment. It does not take account of the reduced ill-health charge adjustment which will arise as a consequence, which will offset the overall impact on employer contributions to the Scottish Schemes to some extent. It also does not take account of any deficit or surplus which will have emerged as a result of ill-health rates being different to those assumed over the period 2007 to 2012.

**Table 6.1: Approximate impact of recommended change in ill-health retirement assumptions**

| Ill-Health Dec | Past service effect[1] | Cost of accrual[2] | | |
|---|---|---|---|---|
| | | 1992 Scheme | 2006 Scheme | 2015 Scheme[3] |
| Changes from 2009 to 2012 proposed assumptions | +0.1% | -0.2% | -0.1% | -0.3% |

1 - Adjustment to contribution rate for 15 years from 2015 – this will affect the contribution rate in all three Schemes.
2 – This is the impact on the cost of benefits currently being accrued before any addition or subtraction for the past service effect.
3 - The employer cost cap will be based on the cost of accrual in the 2015 Scheme (without any allowance for any past effects).

# 7 Voluntary withdrawal from active service

*This section sets out our recommendation for the assumed rates of withdrawal from active service, the rationale for those assumptions and their financial impact.*

**Recommended assumptions for 2012 valuation**

7.1 For 1992 scheme members or former 1992 scheme members in the 2015 scheme, we recommend that the 2009 assumptions are retained. These are the same as the assumptions adopted for the English 2007 and 2012 valuations. The rates are decreasing with age: 1.1% at age 25, 0.3% at age 45.

7.2 In the absence of robust data, we have provided two possible alternative assumptions for the 2006 scheme, which are consistent with our recommendations for the English 2012 valuation.

7.3 The first alternative is to use the withdrawal rates assumed for the 2009 assessment for Regular firefighters in the 2006 scheme, with retained firefighters withdrawing at four times these rates. The rates are decreasing with age: for Regular firefighters they are 1.8% at age 25, 1.4% at age 45.

7.4 The second alternative is to use withdrawal rates for Regular firefighters in the 2006 scheme that are the same as those for Regular firefighters in the 1992 scheme, with retained firefighters withdrawing at nine times these rates.

7.5 We recommend that withdrawal rates in the 2015 scheme are assumed to be the same as those adopted for the 2006 scheme, except with no withdrawals after age 55.

7.6 The choice of withdrawal assumptions between the two alternatives set out above will have a significant impact on employer contribution rates in the 2006 scheme and the 2015 scheme, and the employer cost cap.

7.7 SPPA have confirmed that they propose to adopt the second alternative above: that is, to use withdrawal rates for Regular firefighters in the 2006 scheme that are the same as those for Regular firefighters in the 1992 scheme, with retained firefighters withdrawing at nine times these rates.

7.8 Sample rates are provided in Appendix B. The same rates apply regardless of the length of the member's service.

**Previous valuation assumptions**

7.9 In our advice to SPPA on the demographic assumptions for the 2009 valuations, two alternative assumptions were given for 2006 scheme members. The two alternatives were: the same assumption as used for 1992 scheme members; and higher rates of 2.5% a year at all ages. In the absence of evidence it was (and continues to be) not clear what impact the different benefit design (including a normal retirement age of 60) might have on member behaviour with regards to voluntary withdrawals. The assumptions adopted for the 2009 assessment were the average of the two alternative assumptions.

7.10 At the 2009 assessment separate assumptions were adopted for members who had recently entered the Scheme. Although, there is quite clear evidence that members with shorter service are more likely to withdraw, the impact of allowing for this on the valuation results is not material, therefore we do not propose to make such an allowance.

**Use of the assumption**

7.11 Withdrawal rates specify the rate at which members are assumed to leave voluntarily before retirement becoming entitled to either deferred benefits or, for those with less than 3 months' service (two years' service in the 1992 scheme), a refund of contributions, or have opted to transfer the value of their pension out of the Schemes.

7.12 There is very little evidence of members rejoining the scheme after leaving. For the avoidance of doubt, all members assumed to withdraw are assumed not to rejoin.

**Results of analysis**

7.13 We have analysed the pattern of withdrawals from active membership over the five-year period to 31 March 2012 for the 1992 Scheme.

7.14 The actual number of withdrawals analysed from the 1992 Scheme over the five-year period was 128. This is higher than the approximately 111 expected based on the 2009 assumptions. However, our analysis indicated that some members coded as withdrawals were also present in the active data as at 31 March 2012, which means that they would maintain their final salary link. (It is possible that some members who took inter-authority transfers were coded as withdrawals.) If a significant proportion of these members should have been classified as being in the 2012 active data, the number of actual withdrawals may be significantly less than the assumption.

7.15 We do not have a credible split of the data on withdrawals of the 2006 Scheme membership into Regular and Retained firefighters. Therefore we are unable to produce a credible analysis of 2006 Scheme withdrawal rates. Data for the English Schemes indicates there is a material difference in withdrawal rates between Regular and Retained firefighters. We have no reason to think that similar differences in the rates of withdrawal would not apply to Scottish firefighters.

7.16 Further information on the data analysed and the results of that analysis are shown in Appendix F.

**Rationale for recommended assumptions**

7.17 The analysis does not provide robust evidence to change the 2009 assumption, so we recommend that it is retained.

7.18 We recommend that the same withdrawal assumption is adopted for former members of the 1992 scheme accruing benefits in the 2015 scheme, since we expect that the accrued 1992 scheme benefits will influence member behaviours and, in particular, the increase in accrued benefits to reflect the expectation of double accrual.

7.19 There is little evidence on the rates of withdrawal of Regular firefighters in the 2006 scheme (especially in respect of withdrawals at older ages, where there are currently only small numbers of Regular firefighters in the 2006 scheme). In the absence of robust data, we have provided two possible alternative assumptions for the 2006 scheme, consistent with our recommendation for the English schemes.

7.20 The first alternative is to use the withdrawal rates adopted for the 2009 assessment. The rationale for this alternative is that there is little evidence to dispute this assumption. If this assumption is adopted for Regular firefighters in the 2006 scheme, we recommend that it is assumed that Retained firefighters withdraw at four times this rate, consistent with our recommendation for the English schemes.

7.21 The second alternative is to use withdrawal rates for Regular firefighters in the 2006 scheme that are the same as those for Regular firefighters in the 1992 scheme. The rationale for this alternative is that it provides consistency in the assumed behaviour of Regular firefighters in the 1992 and 2006 schemes. If this assumption is adopted for Regular firefighters in the 2006 scheme, we recommend that it is assumed that Retained firefighters withdraw at nine times this rate, consistent with our recommendation for the English schemes.

7.22 We recommend that withdrawal rates in the 2015 scheme are assumed to be the same as those adopted for the 2006 scheme, in the absence of other information and given the similarities between these two schemes.

**Financial impact**

7.23 The rate of withdrawal is an important assumption for the valuation. The rates for all groups of members impact significantly on employer contributions. The rates for 2015 Scheme members are more significant for calculating the employer cost cap. Assuming lower (higher) rates of withdrawal would increase (decrease) costs.

7.24 Table 7.1 shows the approximate impact of adopting the proposed assumptions as opposed to that adopted for the 2009 assessment.

**Table 7.1: Approximate impact of recommended change in withdrawal assumptions**

| Withdrawal | Past service effect[1] | Cost of accrual[2] | | |
|---|---|---|---|---|
| | | 1992 Scheme | 2006 Scheme | 2015 Scheme[3] |
| Changes from 2009 to 2012 proposed assumptions | +0.1% | No change in assumption | +1.0% | +1.2% |

1 - Adjustment to contribution rate for 15 years from 2015 - this will affect the employer contribution rate in all three Schemes

2 - This is the impact on the cost of benefits currently being accrued before any addition or subtraction for the past service effect

3 - The employer cost cap will be based on the cost of accrual in the FPS 2015 Scheme (without any allowance for any past effects)

7.25 The proposed assumptions imply a lower withdrawal assumption than the 2009 assessment for Regular firefighters in the 2006 scheme and the 2015 scheme, and higher withdrawal rates for Retained firefighters. This would result in a higher cost of accrual in the 2015 scheme, compared to retaining the 2009 assumption for Regular and Retained firefighters in the 2006 and 2015 schemes.

# 8 Death before retirement

*This section sets out our recommendation for the assumed rates of death before retirement, the rationale for those assumptions and their financial impact.*

**Recommended assumptions for 2012 valuation**

8.1 We recommend a single set of assumptions is used to allow for the possibility of death before retirement, i.e. applying equally to those members who remain in the existing Scottish Schemes and those who join the new Scottish Schemes. Assumed rates of death in service increase with age but less than ½% of members are assumed to die each year, even at the highest ages. Sample rates are provided in Appendix B. There were only 19 deaths in 2007-2012 in the Scottish Schemes. The assumption is aligned to the recommended English 2012 assumption as that is a reasonable fit to the aggregate experience in Scotland and England.

**Previous valuation assumptions**

8.2 A single set of rates were used for the 2009 assessment to allow for the possibility of death before retirement. These were the same as the rates which were used for the English 2007 valuation. The recommended 2012 rates are approximately 20% lower than the 2009 rates.

**Use of the assumption**

8.3 Death before retirement rates are used to allow for the possibility of death whilst in active service or whilst entitled to a deferred pension. Following such a death, a lump sum is payable plus pensions to dependants. The number of deaths observed annually, and the recommended rates to be assumed are low and thus this assumption has relatively little financial significance.

**Results of analysis**

8.4 We have analysed the deaths of active members over the five-year period to 31 March 2012. The recommended assumptions for both deaths in service and in deferment are based on this analysis. In total there were 19 deaths of active members over the period. The analysis compares the number of actual deaths to the expected number of deaths under 2009 assumptions, and under the recommended English 2012 assumptions. Given the limited number of deaths in the Scottish Schemes, we have aggregated with the experience in England. Further information on the data analysed and the results of that analysis are shown in Appendix G.

8.5 There is only a small amount of Scottish experience to consider which means that an in depth analysis by age is not possible.

### Rationale for recommended assumptions

8.7 There is only a small amount of Scottish experience to consider, so we have aggregated with the experience in England. We recommend that the recommended English 2012 assumptions are adopted for the Scottish Schemes as that is a reasonable fit to the aggregate experience in Scotland and England.

### Financial impact

8.8 The rate of death before retirement is a relatively insignificant valuation assumption. Using higher or lower rates could lead to either a small increase or small decrease in costs, depending upon how the rates varied with age. Table 8.1 shows the approximate impact of adopting the recommended assumptions.

**Table 8.1: Approximate impact of change in death before retirement assumptions**

| Death before retirement | Past service effect[1] | Cost of accrual[2] | | |
|---|---|---|---|---|
| | | 1992 Scheme | 2006 Scheme | 2015 Scheme[3] |
| Changes from 2009 to 2012 proposed assumptions | Immaterial | Immaterial | Immaterial | Immaterial |

1 - Adjustment to contribution rate for 15 years from 2015 - this will affect the employer contribution rate in all three Schemes
2 - This is the impact on the cost of benefits currently being accrued before any addition or subtraction for the past service effect
3 - The employer cost cap will be based on the cost of accrual in the FPS 2015 Scheme (without any allowance for any past effects)

# 9 Promotional pay increases

*This section sets out our recommendation for the assumed promotional pay increases of active members, the rationale for those assumptions and their financial impact.*

**Recommended assumption for the 2012 valuation**

9.1 We recommend assuming separate scales of promotional increases for Regular firefighters and Retained firefighters. The increases for Regular firefighters are dependent on service and are steeper at shorter durations of service; up to 30 years of service they are the same as the assumption adopted for 1992 Scheme members at the 2009 assessment. The increases for Retained firefighters are dependent on age. Sample values of the scales are provided in Appendix B.

**Previous assumption**

9.2 The promotional pay increases adopted for the 2009 assessment were the same as those agreed for the English 2007 valuation. We have performed our analysis in comparison with these assumptions.

9.3 Different scales of promotional increases were adopted for members of the 1992 Scheme and 2006 Scheme in the 2009 assessment. These were the same as the English 2007 assumptions. Apart from some difference in the early years of service, the main difference between the two scales was that the 1992 Scheme scale was steeper at longer service lengths (above 28 years' service) than the 2006 Scheme scale.

9.4 The 2007 valuation did not include separate assumptions for Retained firefighters, as they were only eligible to join the Scottish Scheme from April 2006.

**Use of the assumption**

9.5 For the existing sections of the Scottish Schemes, benefits are linked to salary at, or near, retirement. Members' salaries can increase through a combination of annual general pay awards and promotional pay increases. To calculate an estimate of the level of benefit payable in the future requires assumptions for both these components. The assumption for general pay awards is directed by HMT. The assumption for promotional pay increases is set by the Scottish Ministers.

9.6 Future pay progression will be more significant (in terms of expected pension) for those members with either full or tapered protection because they will continue to have benefits linked to final pensionable pay for service beyond 31 March 2015. A significant proportion of the past service liability for active members relates to members with full or tapered protection and thus the impact of experience differing from the assumptions used is likely to be most material over the next couple of valuation cycles as it relates to older existing members. This experience will impact future employer contribution rates and the cost cap mechanism. It is relatively unimportant in calculating the costs of the 2015 Scheme, which is a career average scheme.

**Results of analysis**

*Regular firefighter members*

9.7 We analysed the promotional increases implied by the current pay structure of the membership as at 31 March 2012 (for members with up to 30 years' service). Details of the analysis are contained in Appendix H.

9.8 The analysis suggested that the pay structure remains broadly consistent with the 2009 assumption for the 1992 Scheme for promotional pay increases at most durations of service (up to 30 years).

*Retained firefighter members*

9.9 It was not possible to analyse Retained firefighters' pay by length of service, since they were only eligible to join the 2006 Scheme from April 2006, and as such the date they joined the Scottish Schemes does not correspond to the date they joined the Fire and Rescue Service. Therefore, the experience for Retained firefighter members was analysed by looking at the profile of the Retained firefighter membership as at 31 March 2012 in terms of average pensionable pay at each age. We have compared this to the recommended English 2012 assumptions. Further details of this analysis can be found in Appendix H.

*General*

9.10 The results of the analysis should be treated with some caution. It is, in general, difficult to identify promotional increases separately from other elements of pay increase.

**Rationale for recommended assumptions**

*Regular firefighter members*

9.11 As there is no compelling evidence to suggest that the promotional pay increase assumptions used previously are no longer appropriate at most durations of service (up to 30 years), we propose to use the 2009 assumption for 1992 Scheme members.

9.12 There is relatively little data at durations in excess of 30 years' service. Furthermore, the data available is almost entirely in respect of the subset of the 1992 Scheme membership who chose to work beyond 30 years (at which point, if they are aged 50 or over, they could choose to retire immediately with an unreduced pension). This subset of the membership may not display the same characteristics as the membership as a whole. The scheme reforms mean that a much larger proportion of the workforce are expected to work beyond 30 years' service than in the past and therefore the promotional increase assumption at these durations should be suitable for this larger proportion of the workforce. Therefore we do not view it as appropriate to use the data available to inform the assumption for future promotional increases of members with more than 30 years' service.

9.13 This effect was also recognised at the 2009 assessment, which adopted a different salary scale for 2006 Scheme members, as it was expected that the higher Normal Pension Age in the 2006 Scheme would lead to a higher proportion of less senior Firefighters staying in service after 30 years of service. As a result of the scheme reforms, it is possible that former members of both the 1992 Scheme and the 2006 Scheme may stay in service beyond 30 years. For this reason we believe it is appropriate to adopt the same salary scale for both the 1992 Scheme and the 2006 Scheme, and for that scale to reflect a higher proportion of less senior Firefighters staying in service after 30 years of service.

9.14 The level of promotional pay increases after 30 years is uncertain, and arguments could be made for a range of possible assumptions:

- An argument could be made for promotional increases at a similar level to durations from 25 to 30 years' service, on the basis that the general level of promotional increases might be expected to be similar at durations shortly above 30 years as those shortly below 30 years.
- Alternatively, an argument could be made for no promotional increases the after 30 years' service, on the basis that most members might be expected to experience the same overall career progression as the extension of the length of time members serve would not change the number of higher-ranked roles to be filled.

9.15 Our view is that an appropriate assumption for promotional increases would lie somewhere in the range between the two scenarios set out above.

9.16 We recommend an assumption of promotional increases between durations of 30 and 35 years at broadly half of the average assumed rate of promotional increases from durations 25 to 30 years; and no promotional increases for durations of 35 years and above. The analysis and recommended assumption are shown in Graph H1.

*Retained firefighter members*

9.17 On the basis of the average age to age increases revealed by the analysis above, we have recommended that the English 2012 assumption is adopted. This assumes increases about 1% a year up to age 50, 0.5% a year thereafter. The analysis and recommended assumption are shown in Graph H3.

### Financial impact

9.18 Assumed promotional pay increases have a significant impact on final salary liabilities but has relatively little impact on CARE liabilities like those accrued in the 2015 Scheme. Assuming larger (smaller) promotional increases would increase (decrease) employer contribution rates. It would have relatively little impact on the employer cost cap, but would impact on the cost cap mechanism if experience was not in line with assumptions.

9.19 Table 9.1 shows the approximate impact of adopting our recommended assumption as opposed to that adopted for the 2009 assessment.

**Table 9.1: Approximate impact of recommended change promotional pay increase assumption**

| Promotional Pay | Past service effect[1] | Cost of accrual[2] | | |
|---|---|---|---|---|
| | | 1992 Scheme | 2006 Scheme | 2015 Scheme[3] |
| Changes from 2009 to 2012 proposed assumptions | -0.3% | -0.2% | -1.6% | Not a feature of the scheme |

1 - Adjustment to contribution rate for 15 years from 2015 - this will affect the employer contribution rate in all three Schemes
2 - This is the impact on the cost of benefits currently being accrued before any addition or subtraction for the past service effect
3 - The employer cost cap will be based on the cost of accrual in the FPS 2015 Scheme (without any allowance for any past effects)

# 10 Commutation of pension for cash at retirement

*This section sets out the assumption for the assumed levels of pension commutation at retirement, discussion of the* relevant experience of the Scottish Schemes and their *financial impact.*

### Recommended assumptions for 2012 valuation

10.1 We recommend that members are assumed to commute the following proportions of their pensions in each of the Scottish Schemes for cash. The assumptions are the same for men and women:

**Table 10.1: Recommended commutation assumptions**

| Member with service in the following Schemes | 1992 Scheme only | 2006 Scheme only | Mixed 1992 and 2015 Scheme | | Mixed 2006 and 2015 Scheme | | 2015 Scheme only |
|---|---|---|---|---|---|---|---|
| Scheme pension commuted from | 1992 | 2006 | 1992 | 2015 | 2006 | 2015 | 2015 |
| All members | 25% | 15%* | 25% | 0% | 15%* | 15%* | 15%* |

*The assumption of 15% as determined by HMT Directions.

### Previous valuation assumptions

10.2 In the 1992 scheme, members have the option to commute pension for a cash lump sum at retirement. In the past, the terms offered for this option were actuarially equivalent to the benefits (and so the rate of commutation for the 1992 scheme is not expected to impact the cost of providing the benefits). As such, for simplicity no allowance for members exercising these options was made in the 2009 Assessment.

10.3 However, in the future members in the 1992 scheme will have the option to commute pension for lump sum at the better of the actuarially equivalent rates or the rates offered to members in the 1992 scheme in England. The existence of this underpin means that the rate of commutation in the 1992 scheme will have a direct impact on the cost of providing the benefits.

10.4 2006 Scheme members can take an optional lump sum by commutation at a rate of £12 for every £1 per annum of pension foregone up to a limit of 25% of their pension. It was assumed in the 2009 assessment that 90% of the 2006 Scheme membership would commute the maximum of 25% of pension (so an average commutation rate of 22.5% of pension).

**Use of the assumption**

10.5 In the 2006 Scheme and the 2015 Scheme, members may commute part of their pension for a lump sum at a rate of £12 for each £1 of pension given up, up to a limit of 25% of their pension. In these Scottish Schemes, the assumption about the amount of pension commuted is important because the value of the pension given up, as assessed using the actuarial assumptions underlying the valuation is, on average, more than £12 and so commutation has a significant impact on total liabilities, contribution rates and the cost cap. Differences between assumed and actual experience in the 2015 Scheme will feed through into the cost cap fund but experience in the 1992 Scheme and 2006 Scheme will not.

**Results of analysis**

10.6 We analysed the commutation experience of 2006 Scheme members retiring between March 2007 and March 2012. Details of the analysis are contained in Appendix I.

**Rationale for assumptions**

10.7 The recommended assumption for commutation of 1992 scheme benefits is that firefighters commute the maximum allowable under the regulations.

10.8 We recommended that members with 1992 Scheme and 2015 Scheme service are assumed not to commute any 2015 Scheme benefits. We understand that members who have service in the 1992 Scheme and the 2015 Scheme will be able to choose which Scottish Scheme to commute pension from (within the limits relevant to each Scottish Scheme). 1992 Scheme members are entitled to commute up to a quarter of their pension on actuarially equivalent terms (in general - alternative limits apply to some members). The terms available in the 1992 Scheme offer a significantly greater lump sum than the 12:1 offered in the 2015 Scheme. We would expect this to act as a substantial disincentive to commute pension in the 2015 Scheme, especially for those members with significant amounts of service in the 1992 Scheme (where the lump sum available from the 1992 Scheme is large). Even members with the least 1992 Scheme service are likely be able to commute a lump sum from their 1992 Scheme benefits alone which is as large as the amount of lump sum assumed to be taken by new entrants into the 2015 Scheme. As such, we do not expect that former 1992 Scheme members will commute any pension from the 2015 Scheme.

### Financial impact

10.9 The only assumptions that can be set by the Scottish Ministers that will impact upon the valuation results are the commutation assumptions for 1992 scheme members and former 1992 scheme members who join the 2015 scheme. Table 10.2 sets out the potential impact of alternative assumptions to those proposed above.

**Table 10.2: Approximate impact of change in commutation assumptions**

| Commutation | Past service effect[1] | Cost of accrual[2] | | |
|---|---|---|---|---|
| | | 1992 Scheme | 2006 Scheme | 2015 Scheme[3] |
| Assume protected members commute 20% of 1992 scheme pension | 0.1% | 0.1% | N/A | N/A |

1 - Adjustment to contribution rate for 15 years from 2015 – this will affect the contribution rate in all three Schemes.
2 – This is the impact on the cost of benefits currently being accrued before any addition or subtraction for the past service effect.
3 - The employer cost cap will be based on the cost of accrual in the 2015 Scheme (without any allowance for any past effects).

# 11 Family statistics

*This section sets out our recommendation for the assumptions around dependants' pensions, the rationale for those assumptions and their financial impact.*

**Recommended assumptions for 2012 valuation**

11.1 In the absence of robust data we recommend adopting assumptions based on statistics produced by the Office for National Statistics (ONS).

- Future pensioners:
  - 75% of 1992 Scheme members are assumed to be married or in a civil partnership at retirement; and
  - 80% of 2006 Scheme and 2015 Scheme members are assumed to be married, in a civil partnership, or have a nominated partner at retirement.
- Current pensioners:
  - 1992 Scheme members: The proportion married or in a civil partnership to be in line with male ONS data for proportions married at each age;
  - 2006 Scheme and 2015 Scheme members: The proportions married, in a civil partnership, or who have a nominated partner at retirement to be in line with male ONS data for proportions married or cohabiting at each age.
- Members are assumed to be three years older than their partners.
- No allowance is made for remarriage on the grounds of materiality.
- We have recommended the same assumptions for the English 2012 valuation.

**Previous valuation assumptions**

11.2 Assumptions for proportions married/partnered and age differences were framed around the members' circumstances at death for the 2009 assessment, with separate assumptions for each age. No allowance was made for remarriage.

11.3 The assumed proportions married/partnered are generally lower than adopted for the 2009 assessment, particularly for older members and partners.

### Use of the assumption

11.4 Dependants' pensions[18] are provided to legal spouses, civil partners, and (in the 2006 Scheme and 2015 Scheme) nominated partners (financially dependent and residing together) on the death of a member. Assumptions are required for the proportion of members who are married or partnered to determine how many dependants' pensions will be paid. Assumptions are required about age differences between members and partners as this affects how long dependants' pensions are expected to be paid for.

### Results of analysis

11.5 We do not have credible data from the Scottish Schemes on which to analyse experience.

### Rationale for recommended assumptions

11.6 In the absence of Scottish Scheme specific information, we have recommended assumptions in line with ONS statistic for the UK population for proportions married and partnered; and recommended being consistent with the 2009 assessment for age difference and remarriage. The same approach was used for the English 2012 valuation.

### Financial impact

11.7 Table 11.1 shows the approximate impact of adopting our recommended assumption as opposed to that adopted for the 2009 assessment.

**Table 11.1: Approximate impact of recommended change in family statistics assumptions**

| Family Statistics | Past service effect[1] | Cost of accrual[2] | | |
|---|---|---|---|---|
| | | 1992 Scheme | 2006 Scheme | 2015 Scheme[3] |
| Proportion married/partnered | -2.9% | -0.7% | -0.3% | -0.3% |
| Age difference | No change in assumption | | | |
| Remarriage | No change in assumption | | | |

1 - Adjustment to contribution rate for 15 years from 2015 – this will affect the contribution rate in all three Schemes.
2 – This is the impact on the cost of benefits currently being accrued before any addition or subtraction for the past service effect.
3 - The employer cost cap will be based on the cost of accrual in the 2015 Scheme (without any allowance for any past effects).

[18] Pensions are also payable to dependent children on a member's death but the costs are not material overall.

# Appendix A: Summary of recommended assumptions

| Assumption[19] | Summary of recommended assumptions | Rationale for recommendation | Approximate impact on total contribution rate of change from 2009 assumptions | |
|---|---|---|---|---|
| | | | **Past service** | **Employer cost cap** |
| **Pensioner baseline mortality[20]** | Aligned to standard SAPS table as at 2012[21,22] | | | |
| Current pensioners | 132% × S1PMA as at 2012 | In line with 2007-12 experience. *See graph C1 p61* | | |
| Future pensioners (normal health) | 132% × S1NMA as at 2012 | In line with 2007-12 experience, adjusted to remove allowance for future ill health pensioners, who are assumed to live less long | -4.6% | -0.7% |
| Future pensioners (ill health) | 100% × S1IMA as at 2012 | In line with experience of UK self-administered pension schemes | | |
| Dependants | 131% × S1DFA as at 2012 | In line with 2007-12 experience. *See graph C2 p62* | | |

[19] Our recommendations are for the same assumptions to be used for males and females in all areas. Because the majority of members are male, there is insufficient data to analyse female members separately.
[20] As directed by HMT, improvement in mortality from 2012 are assumed to be in line with those underlying the most recent ONS population projections
[21] SAPS tables are published by the Actuarial Profession and are based on the experience of self-administered pension schemes over the period 2000 to 2006. The 'S1' series has separate standard tables based on experience of male pensioners who have retired in normal or ill health (S1PMA), male members retiring in normal health (S1NMA) and in ill health (S1IMA) and for female dependants (S1DFA).
[22] Adjusted to take account of improvements in mortality applying to the UK population between 2002 (the base year for the SAPS tables) and 2012

| | | | | |
|---|---|---|---|---|
| **Age retirement** | | | | |
| 1992 scheme protected and taper protected | Retirement depends on age and service, with many retiring at the earlier of 30 years service and age 55. | In line with 2007-2012 experience in Scotland *see graph D2 p65.* | | |
| 1992 scheme unprotected members | No retirements before age 55. Age and service based rates, with many retiring at age 55, for example for members joining before age 25, over 99% retire at age 55, for members joining at age 30, about 93% retire at age 55. | 1992 scheme benefits are available before age 55. However, there is a significant disincentive of leaving the 2015 scheme before age 55 (retirement age effectively increases from 60 to SPA).<br>The minimum past service in 2015 for these members is 9 years. 1992 scheme benefits are still a very sizeable amount even if only in respect of service up to 2015, from which point accruals will be under the 2015 scheme. So it is reasonable to expect high take-up of age retirement at 55 for these members.<br>There is, however, no relevant evidence yet for Scotland. | +0.4% | N/A |

| | | | | |
|---|---|---|---|---|
| **Age retirement continued** | | | | |
| 2006 scheme (ie generally post-06 entrants) (protected, taper protected and unprotected) | Retire at age 60 | Retirement before age 60 would significantly reduce the value of benefits accrued in the 2006 scheme (retirement age effectively increases from 60 to SPA).<br>There is, however, no relevant evidence yet for Scotland or England. This assumption is aligned to England. | No change in assumption | N/A |
| New entrants from 2015 | About 25% retire at age 55, remainder retire at 60 | No relevant evidence. Proposal makes a reasonable allowance for the take up of benefits at the earliest time at which they become available and is consistent with Police Scotland and Fire England. To be kept under review. | No past service | New assumption |

| | | | | |
|---|---|---|---|---|
| **Ill-health retirement** | | | | |
| Incidence | Increasing by age: around 0.02% at age 25, 0.26% at age 45 | Broadly in line with 2007-2012 experience, with assumption aligned to England because of reasonable fit to experience. Not adjusted for further improvements in health. *see table E1 p69 and graph E2 p69* | +0.1%[23] | -0.3% |
| Higher/lower tier split | 40% on higher tier[24] | In line with 2010-2012 experience in England due to lack of data in Scotland *see paragraph E7 p70* | | |

[23] Does not take account of the reduced ill-health charge adjustment which will arise as a consequence, which will offset the overall impact on employer contributions to the scheme to some extent. It also does not take account of any deficit or surplus which will have emerged as a result of ill-health rates being different to those assumed over the period 2009 to 2012.

[24] Higher tier ill-health benefits are granted to those in more serious ill-health than those granted only lower tier benefits.

| | | | | |
|---|---|---|---|---|
| **Withdrawal** | | | | |
| 1992 scheme (ie generally pre-06 entrants) | Withdrawals decreasing with age: 1.1% at age 25, 0.3% at age 45 | No grounds to change assumption based on 2007-2012 withdrawal experience *see table F1 p71 and paragraph F.4 p71* | No change in assumption | |
| 2006 scheme (ie post-06 entrants), and new entrants from 2015 | Regular firefighters: rates decreasing with age: 1.8% at age 25, 1.4% at age 45; Retained firefighters: withdraw at four times these rates | Rates for Regular firefighters are as adopted for 2009 assessment and scheme reform. Little evidence to support or dispute previous assumption. | Immaterial | -0.4% |
| | or[25] | | | |
| | Regular firefighters: rates consistent with 1992 scheme; Retained firefighters: withdraw at nine times these rates | Rates for Regular firefighters in the 1992 scheme and 2006 scheme are the same. | +0.1% | +1.2% |
| **Death before retirement** | Increasing by age: 0.02% at age 25, about 0.05% at age 45, 0.3% at age 65 | Broadly in line with 2007-2012 aggregate experience in Scotland and England, with assumption aligned to England because of reasonable fit to aggregate experience, not adjusted for future improvements in mortality *see table G1 p73* | Immaterial | Immaterial |

[25] There is little evidence on the rates of withdrawal of Regular firefighters in the 2006 scheme. In the light of this uncertainty, we have provided two possible alternative assumptions, with rationales. SPPA have confirmed that they propose to adopt the second alternative above.

| | | | | |
|---|---|---|---|---|
| **Promotional salary scale** | | | | |
| Regular firefighters | Service based scale: about 1.2% a year between 4 and 30 years, after 30 years a lower scale is used | In line with scheme data as at 31 March 2012 with 2009 assessment assumption retained because of reasonable fit to experience *see graph H2 p75* | -0.3% | Not a feature of the scheme |
| Retained firefighters | Age related scale: about 1% a year up to age 50, 0.4% a year thereafter | In line with scheme data as at 31 March 2012 , with assumption aligned to England because of reasonable fit to experience *see graph H3 p77* | | |
| **Commutation** | | | | |
| 1992 scheme protected | 25% of pension commuted | Maximum permitted under reguations | New assumption | N/A |
| Former 1992 scheme members in 2015 scheme | Nil commutation from 2015 scheme | Reasonable approach given that 1992 scheme offers a greater lump sum for pension given up, compared with 2015 scheme | New assumption | N/A |
| 2006 scheme | 15% of pension commuted | Required by draft HMT directions | Directed | |
| New entrants from 2015 | 15% of pension commuted | Required by draft HMT directions | Directed | |

| | | | | |
|---|---|---|---|---|
| **Family statistics** | | | | |
| Proportion married/partnered | 75% married, 80% partnered at retirement (consistent assumptions for existing pensioners) | In line with ONS statistics for UK population | -2.9% | -0.3% |
| Age difference | Member 3 years older than partner | In line with ONS statistics for UK population | No change in assumption | |
| Remarriage | No allowance | In line with 2009 assumptions | No change in assumption | Not a feature of the scheme |

# Appendix B: Details of recommended assumptions for the 2012 valuation

B.1 This appendix contains details of the recommended assumptions including sample rates and values.

**Table B1: Baseline Mortality Assumptions**

| Baseline mortality | Standard table[26] | Adjustment |
|---|---|---|
| Current pensioners (normal and ill-health) | S1PMA | 132% |
| Future pensioners (normal health) | S1NMA | 132% |
| Future pensioners (ill-health) | S1IMA | 100% |
| Dependants | S1DFA | 131% |

[26] SAPS tables are published by the Continuous Mortality Investigation and based on the experience of self-administered pension schemes over the period 2000 to 2006. The 'S1' series has separate standard tables based on experience of male pensioners who have retired in normal or ill-health (S1PMA), male members retiring in normal health (S1NMA) and in ill-health (S1IMA) and for female dependants (S1DFA). The standard table has been adjusted to broadly allow for overall mortality improvements applying to the UK population from the mid-point of the period covered by the S1 tables to 31 March 2012.

**Age retirement from service**

**Table B2: Age retirement rates for 1992 Scheme protected members and tapered members**

| *Age at joining* | *18* | *19* | *20* | *21* | *22* | *23* | *24* | *25* | *26* | *27* | *28* | *29* | *30 and over* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Age** | | | | | | | | | | | | | |
| **50** | 0.970 | 0.970 | 0.970 | 0.060 | 0.060 | 0.060 | 0.060 | 0.060 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **51** | 0.600 | 0.600 | 0.600 | 0.970 | 0.025 | 0.025 | 0.025 | 0.025 | 0.060 | 0.000 | 0.000 | 0.000 | 0.000 |
| **52** | 0.600 | 0.600 | 0.600 | 0.600 | 0.975 | 0.025 | 0.025 | 0.025 | 0.025 | 0.060 | 0.000 | 0.000 | 0.000 |
| **53** | 0.600 | 0.600 | 0.600 | 0.600 | 0.600 | 0.975 | 0.025 | 0.025 | 0.025 | 0.025 | 0.060 | 0.000 | 0.000 |
| **54** | 0.600 | 0.600 | 0.600 | 0.600 | 0.600 | 0.600 | 0.975 | 0.025 | 0.025 | 0.025 | 0.025 | 0.060 | 0.000 |
| **55** | 0.780 | 0.780 | 0.780 | 0.800 | 0.830 | 0.855 | 0.885 | 0.975 | 0.930 | 0.930 | 0.930 | 0.930 | 0.930 |
| **56** | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.895 | 0.375 | 0.375 | 0.375 | 0.375 |
| **57** | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.895 | 0.375 | 0.375 | 0.375 |
| **58** | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.895 | 0.375 | 0.375 |
| **59** | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.895 | 0.375 |
| **60 and over** | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |

**Age retirement from service**

**Table B3: Age retirement rates for 1992 Scheme unprotected members**

| *Age at joining* | *18* | *19* | *20* | *21* | *22* | *23* | *24* | *25* | *26* | *27* | *28* | *29* | *30 and over* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Age** | | | | | | | | | | | | | |
| **50** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **51** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **52** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **53** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **54** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| **55** | 1.000 | 1.000 | 1.000 | 1.000 | 0.999 | 0.999 | 0.997 | 0.979 | 0.939 | 0.937 | 0.936 | 0.934 | 0.930 |
| **56** | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.895 | 0.375 | 0.375 | 0.375 | 0.375 |
| **57** | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.895 | 0.375 | 0.375 | 0.375 |
| **58** | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.895 | 0.375 | 0.375 |
| **59** | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.605 | 0.895 | 0.375 |
| **60 and over** | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |

**Table B4: Age retirement rates for 2006 Scheme protected members and new entrants to the 2015 Scheme**

| Retirement Age | 2006 Scheme only | Unprotected 2006 Scheme members in the 2015 Scheme | 2015 Scheme only |
|---|---|---|---|
| 55 | - | - | 0.250 |
| 56 | - | - | - |
| 57 | - | - | - |
| 58 | - | - | - |
| 59 | - | - | - |
| 60 | 1.000 | 1.000 | 1.000 |

The recommended English 2012 valuation assumptions for age retirement rates are the same as those above.

### Ill-health retirement from service

**Table B5: Ill-health retirement rates for all members**

| Age | Ill-health retirement rate |
|---|---|
| 20 | 0.00008 |
| 25 | 0.00016 |
| 30 | 0.00031 |
| 35 | 0.00063 |
| 40 | 0.00128 |
| 45 | 0.00260 |
| 50 | 0.00526[27] |
| 55 | 0.01023 |
| 59 | 0.01139 |

The recommended English 2012 valuation assumptions for ill-health retirement rates are the same as those above.

[27] Rates are zero at age 50 if the member is eligible to retire on an unreduced pension.

**Voluntary withdrawal from service**

**Table B6: Withdrawal rates**

| Age | Withdrawal rate | | |
|---|---|---|---|
| | 1992 Scheme | 2006 Scheme and New entrants from 2015- Regular Firefighters | 2006 Scheme and New entrants from 2015- Retained Firefighters |
| 20 | 0.0106 | 0.0106 | 0.0954 |
| 25 | 0.0106 | 0.0106 | 0.0954 |
| 30 | 0.0106 | 0.0106 | 0.0954 |
| 35 | 0.0098 | 0.0098 | 0.0882 |
| 40 | 0.0061 | 0.0061 | 0.0549 |
| 45 | 0.0034 | 0.0034 | 0.0306 |
| 50 | 0.0019[28] | 0.0019 | 0.0171 |
| 55 | 0.0000 | 0.0000 | 0.0000 |
| 59 | 0.0000 | 0.0000 | 0.0000 |

The recommended English 2012 valuation assumptions for withdrawal rates are the same as those above.

[28] Rates are zero at age 50 if the member is eligible to retire on an unreduced pension.

### Death before retirement

**Table B7: Death before retirement rates for all members**

| Age | Death before retirement |
|---|---|
| 20 | 0.00014 |
| 25 | 0.00015 |
| 30 | 0.00021 |
| 35 | 0.00028 |
| 40 | 0.00038 |
| 45 | 0.00054 |
| 50 | 0.00079 |
| 55 | 0.00128 |
| 60 | 0.00196 |
| 65 | 0.00308 |

The recommended English 2012 valuation assumptions for death before retirement are the same as those above.

**Table B8: Promotional salary scales for Regular firefighter members**

The salary scale shows assumed pay progression in excess of general wage inflation in comparison to an index base of 100 at entry.

| Service (years) | Promotional Pay for Regular Members | |
|---|---|---|
| | Scotland | England |
| 0 | 100.0 | 100.0 |
| 5 | 141.4 | 140.4 |
| 10 | 151.4 | 145.4 |
| 15 | 161.4 | 152.2 |
| 20 | 171.4 | 161.6 |
| 25 | 181.4 | 171.1 |
| 30 | 194.7 | 183.6 |
| 35 | 201.6 | 190.1 |
| 40 | 201.6 | 190.1 |

### Table B9: Promotional salary scales for Retained firefighter members

The recommended salary scale (with an index base of 100 at age 18) is summarised in the table below.

| Age | Promotional Pay for Retained Firefighters |
|---|---|
| 20 | 102.2 |
| 25 | 107.7 |
| 30 | 113.2 |
| 35 | 118.7 |
| 40 | 124.2 |
| 45 | 129.7 |
| 50 | 135.2 |
| 55 | 137.7 |
| 60 | 140.2 |
| 65 | 142.7 |

The recommended English 2012 valuation assumptions for the promotional pay of Retained firefighters are the same as those above.

### Commutation of pension for cash at retirement

### Table B10: Recommended commutation assumptions

| Member with service in the following Schemes | 1992 Scheme only | 2006 Scheme only | Mixed 1992 and 2015 Scheme | | Mixed 2006 and 2015 Scheme | | 2015 Scheme only |
|---|---|---|---|---|---|---|---|
| **Scheme pension commuted from** | **1992** | **2006** | **1992** | **2015** | **2006** | **2015** | **2015** |
| **All members** | 25% | 15%* | 25% | 0% | 15%* | 15%* | 15%* |

*The assumption of 15% as determined by HMT Directions.

**Family statistics**

**Table B11: Recommended proportion married or partnered at retirement for future pensioners**

| Proportion married | Proportion married or partnered |
|---|---|
| 75% | 80% |

**Table B12: Recommended proportion married or partnered for current pensioners (at the valuation date)**

| Age | Proportion married | Proportion married or partnered |
|---|---|---|
| 50 | 75% | 80% |
| 60 | 75% | 80% |
| 70 | 75% | 78% |
| 80 | 63% | 64% |
| 90 | 36% | 36% |

Male members are assumed to be three years older than their partners.

The recommended English 2012 valuation assumptions for family statistics are the same as those above.

# Appendix C: Analysis of pensioner mortality

### Type of analysis

C.1 We have analysed the pensioner mortality experience over the five-year period 1 April 2007 to 31 March 2012. The analysis compares the actual number of deaths (grouped by age) with the expected number of deaths using the 2009 assessment assumptions and standard mortality tables prepared by the Continuous Mortality Investigation (the 'S1' set of tables).

C.2 There were a total of 321 member pensioner deaths in 2007-2012. This is a relatively small number of deaths, and we have therefore carried out a combined analysis for all male pensioners (covering both normal health and ill-health pensioners).

C.3 There is insufficient data to carry out an analysis for current female pensioners, or male dependents. This approach was taken in 2009.

C.4 The valuation data supplied included data on the number of deaths that occurred during the five-year observation period, but did not include the pension amounts at death (which would be needed for an 'amounts' analysis, which takes account of the amount of pension ceasing due to the death). Hence, we have carried out our analysis on a 'lives' basis, which considers the number of deaths without weighting by pension amount. We consider this to be a reasonable method for the Scottish Schemes, as the underlying population is largely homogeneous, and so pension amounts are less widely spread than would be the case in a more diverse scheme. However, if the amounts data were available it is possible that analysis could lead to different mortality assumptions.

C.5 Therefore we have analysed male pensioners (former firefighters, including both those retiring in normal health and ill-health) and female dependants.

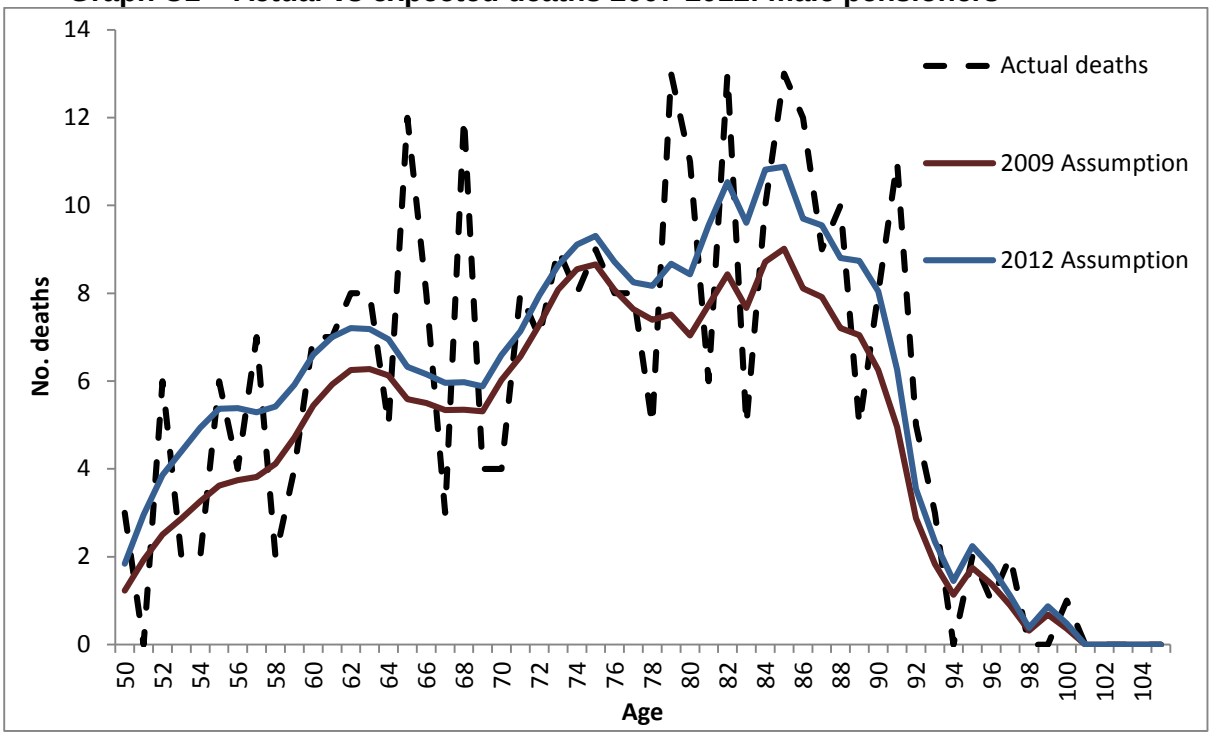
### Mortality analysis - members: comparison of experience and 'best fit' against S1 tables

C.6 The total number of actual deaths of male pensioners analysed over the five-year period is 321.

C.7 Graph C1 shows a comparison of the actual mortality experience over the five-year period with that expected based on the recommended adjustment to the most appropriate S1 standard table[29]. The expected mortality experience based on the assumption used in the 2009 assessment is shown for comparison.

[29] Adjusted to those applicable to the period the deaths occurred by applying adjustments broadly in line with the improvements applying to the UK population over the relevant period.

**Graph C1 – Actual vs expected deaths 2007-2012: male pensioners**




C.8 We also attempted a similar analysis for normal health and ill-health pensioners separately, but the analysis did not prove to be a good match to standard mortality tables, possibly due to the small number of deaths (185 normal health and 136 ill-health).

## Comparison of life expectancies on 2007 assumptions and recommended 2012 assumptions

C.9 Table C1 gives a comparison of the resulting life expectancies[30] assumed and recommended for the 2009 assessment and 2012 valuation.

**Table C1: Comparison of life expectancies (years)**

| | 2009 assessment[31] | 2012 valuation | Scotland Population[32] |
|---|---|---|---|
| **Current pensioners (normal and ill-health)** | | | |
| Member aged 50 | 36.6 | 35.3 | 34.0 |
| Member aged 55 | 31.6 | 30.2 | 28.9 |
| Member aged 60 | 26.7 | 25.5 | 24.2 |
| Member aged 65 | 21.9 | 20.8 | 19.8 |
| **Future pensioners (normal health) – current age 45** | | | |
| Member aged 50 | 38.5 | 36.3 | 34.8 |
| Member aged 55 | 33.9 | 31.7 | 30.5 |
| Member aged 60 | 29.4 | 27.3 | 26.3 |
| Member aged 65 | 25.1 | 22.9 | 22.3 |
| **Future pensioners (ill-health) – current age 45** | | | |
| Member aged 50 | 34.8 | 34.0 | |
| Member aged 55 | 30.3 | 30.2 | |
| Member aged 60 | 25.9 | 26.4 | |
| Member aged 65 | 21.7 | 22.6 | |

C.10 The comparison of life expectancies given in table C1 is complex. It reflects changes to both the assumed baseline mortality and mortality improvements, as well as a change to using different mortality assumptions for people born in different years (rather than an average mortality assumption for the relevant population).

[30] Cohort life expectancies based on the ages shown as at the valuation date, i.e. allowing for future mortality improvements .

[31] The 2009 valuation adopted different assumptions for current normal health and ill-health pensioners. The life expectancies shown below are based on the average under those two assumptions, weighted by the number of normal and ill-health pensioners as at 2012.

[32] Cohort life expectancies are from the ONS website and the 2012 based projected data table for Scotland.

C.11 A comparison can also be shown of life expectancies which do not allow for future improvements in mortality after the period 2007-2012. This comparison reflects only the change to the assumed baseline mortality.

C.12 Table C2 compares life expectancies for current pensioners assumed and recommended for the 2009 assessment and 2012 valuation respectively[33]. The equivalent figures for the Scotland population are also shown.

**Table C2: Comparison of life expectancies without allowance for future improvements in mortality (years)**

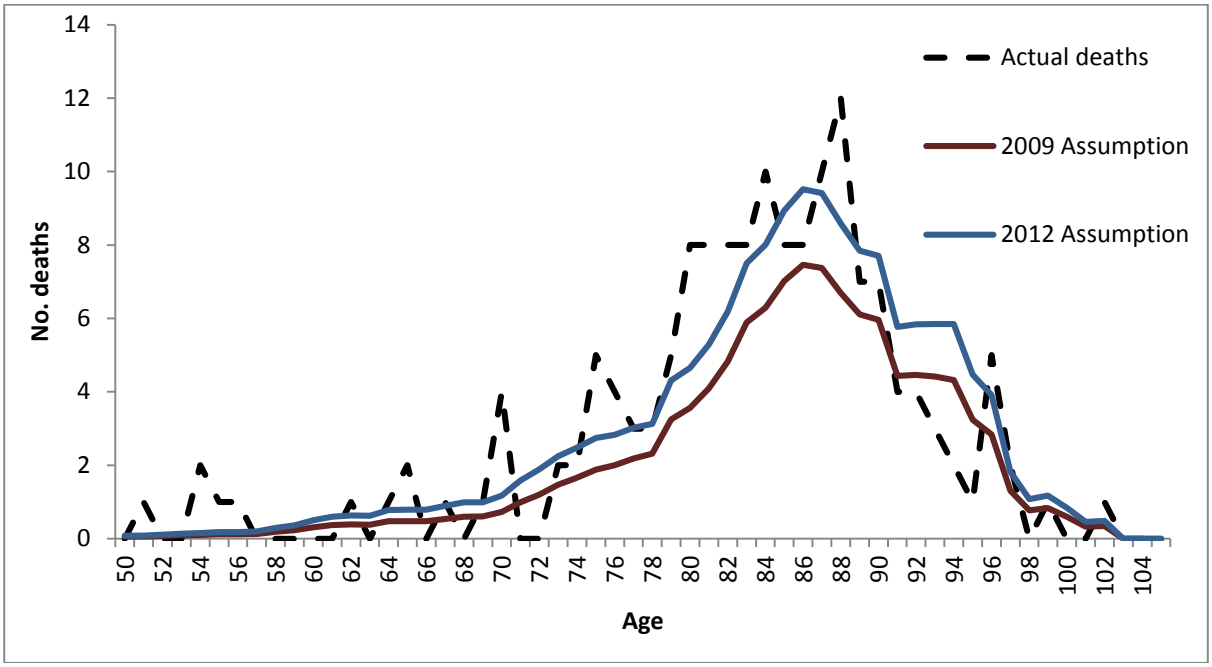
| | 2009 assessment[34] | 2012 valuation | Scotland population[35] |
|---|---|---|---|
| **Current pensioners (normal and ill-health)** | | | |
| Member aged 50 | 31.9 | 30.5 | 28.9 |
| Member aged 55 | 27.3 | 26.1 | 24.6 |
| Member aged 60 | 22.9 | 21.8 | 20.5 |
| Member aged 65 | 18.6 | 17.7 | 16.7 |

[33] Period future life expectancies based on the ages shown as at calendar year 2009.
[34] The 2009 valuation adopted different assumptions for current normal health and ill-health pensioners. The life expectancies shown below are based on the average under those two assumptions, weighted by the number of normal and ill-health pensioners as at 2012.
[35] Period life expectancies from the 2012-based projections for males in Scotland at calendar year 2009, produced by the Office for National Statistics.

**Mortality analysis - dependants: Comparison of experience and 'best fit' against S1 tables**

C.13 Graph C2 shows a comparison of the actual mortality experience over the five-year period with that expected based on the recommended adjustment to the most appropriate S1 standard table[36]. The expected mortality experience based on the assumption used in the 2009 assessment is shown for comparison.

**Graph C2 – Actual vs expected deaths 2007-2012: female dependants**




[36] Adjusted to those applicable to the period the deaths occurred by applying adjustments broadly in line with the improvements applying to the UK population over the relevant period.

# Appendix D: Analysis of age retirement from service

### Process for setting assumptions

D.1 A reasonable process is:

- Set assumptions for the group with full protection by reference to the recent retirement experience in the Scottish Schemes.
- Set assumptions for new entrants to the 2015 Scheme by considering any relevant evidence. This is not a simple task because the available experience is overwhelmingly from the 1992 Scheme which has very different retirement rules to the 2015 Scheme.
- Set assumptions for members with service in both Schemes relative to the assumptions for members with service in only one of the Schemes. Again, this is not a simple task because there are many factors that could affect the retirement behaviour of this group of members.

### Members with full protection

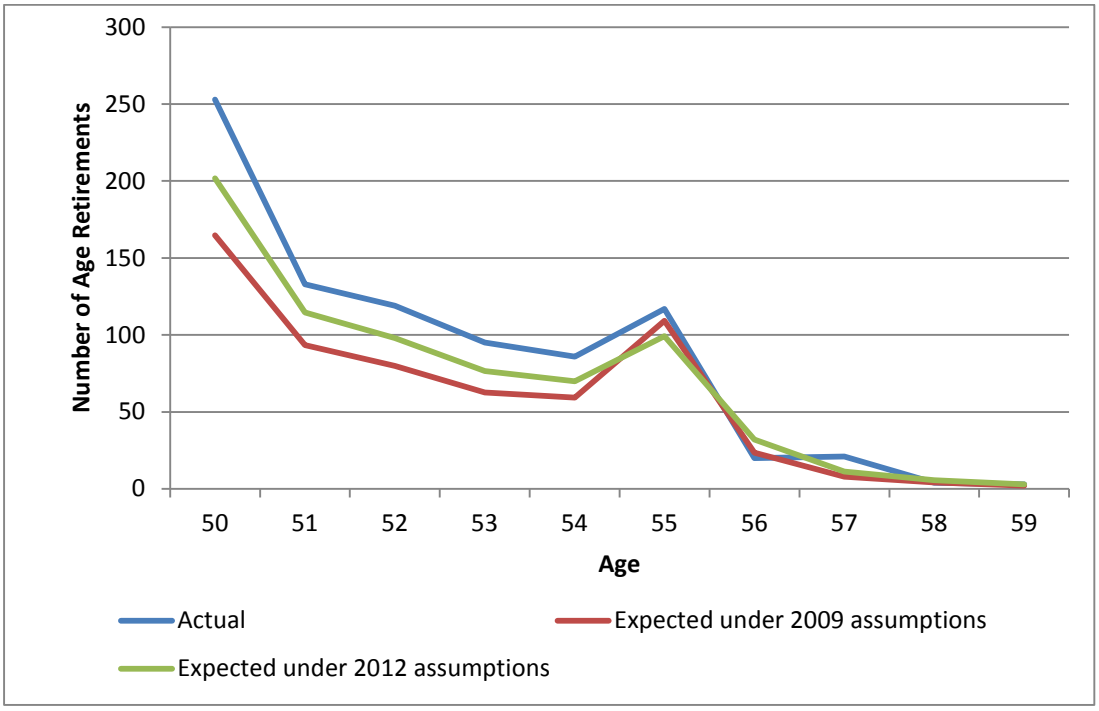
*Data analysed*

D.2 We have analysed the pattern of age retirements from active membership over the five-year period to 31 March 2012. The analysis compares the actual rate of age retirements (grouped by age of retirement) to the expected rate.

D.3 Insufficient data exists to perform a credible analysis of the 2006 Scheme Regular or Retained members.

D.4 Graph D1 below shows a comparison of actual age retirements, expected retirements under the 2009 assumptions and expected retirements under the recommended English 2012 assumptions:

**Graph D1: Actual age retirements against expected**




D.5 Table D1 below shows the actual and expected (based on recommended English 2012 assumptions) age retirements split into three age bands.

**Table D1: Age retirement experience 2007-2012 by age**

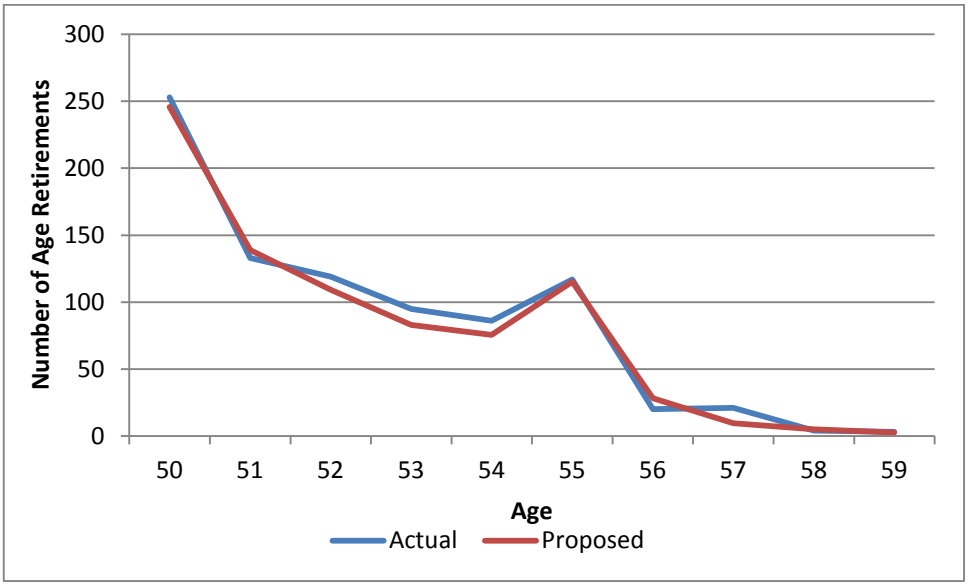
| | | English 2012 assumptions | |
|---|---|---|---|
| **Age** | **Actual retirements** | **Expected retirements** | **Actual/ Expected** |
| 50-54 | 686 | 460 | 149% |
| 55 | 117 | 109 | 107% |
| 56-59 | 48 | 38 | 126% |
| Totals | 851 | 607 | 140% |

*Recommended rates - 1992 Scheme*

D.6 For the 2012 valuation we recommend members are assumed to retire in line with the actual experience. The recommended assumptions are in line with the recommended English 2012 assumptions with adjustments made to each age band shown in Table D1 to bring the expected number of retirements in line with the actual experience. The recommended assumptions are shown in Appendix B.

D.7 Graph D2 below shows the actual rates of age retirement compared to the recommended assumptions described above.

**Graph D2: Actual age retirement rates against recommended rates**




*Recommended rates – 2006 Scheme*

D.8 All members to retire at age 60. This assumption is consistent with the recommended assumption for the English Schemes. Members choosing to retire before age 60 will suffer a significant reduction in the value of their 2006 Scheme benefits as they will be converted to a deferred pension from age 65. This is expected to act as a disincentive to retiring before age 60 for members with service in the 2006 Scheme.

*New entrants to the 2015 Scheme*

D.9 In the absence of directly relevant experience, a pragmatic approach to setting this assumption is required. There are a number of ways that this assumption could be set and no approach is clearly better than all others. Our recommended approach is to assume 25% of members retire at age 55 with the remainder retiring at age 60. This is consistent with the assumption adopted for scheme reform work.

**Members with service in the existing Scottish Schemes and the 2015 Scheme**

D.10 Lack of evidence or relevant experience makes it difficult to predict members' future retirement patterns. A pragmatic approach allowing for the evidence that is available and reasoning about members' future behaviour is therefore required. The approach outlined below is intended to be unbiased.

D.11 As is currently the case, both age and service are likely to influence members' retirement decisions. The relative level of service in the two Schemes is also likely to influence the age of retirement.

D.12 In general one might expect that retirement patterns will generally change smoothly and gradually over time. However, less smooth changes may be expected when active and deferred pension ages differ, as is the case for the Scottish Schemes. This particularly affects the consideration of retirements before age 55.

D.13 It is appropriate to consider separately the 1992 Scheme and 2006 Scheme members who will join the 2015 Scheme because of the different structures of the existing Scottish Schemes and the different characteristics of their existing memberships, e.g. 2006 Scheme members have relatively little service compared to 1992 Scheme members.

D.14 For members with 1992 Scheme service, the attainment of 30 years' service (and the associated attainment of the maximum accrual rate) is currently a significant trigger for members to retire between ages 50 and 54. Reaching age 55 is also a significant trigger. A small proportion of members also retire before age 55 with between 25 and 30 years' service. In the future, there are two main disincentives for members to retire before age 55:

- Immediately available income will be lower. Retirement before age 55 will only give members access to their 1992 Scheme pension; benefits accrued in the 2015 Scheme will not be payable until age 55 at the earliest.
- Retirement before age 55 will significantly reduce the value of benefits accrued in the 2015 Scheme. Retirement from the 1992 Scheme can only occur with simultaneous withdrawal from the 2015 Scheme. Withdrawal from the 2015 Scheme results in a pension age for 2015 Scheme pension of SPA, rather than age 60.

D.15 Members who retire from active service at age 55 or above will be eligible for early retirement from the 2015 Scheme with reduction for early payment with reference to age 60. This will act as an incentive for members to remain in the Scottish Scheme until age 55. For those who retire before age 55, their 2015 Scheme benefit will become a deferred pension payable from SPA.

D.16 The 2006 Scheme retirement assumption for the 2009 assessment assumed that all members retired at age 60. Retirement before age 60 would lead to 2006 Scheme benefits being deferred and payable from 65.

D.17 We recommend the following assumptions for members who transfer to the 2015 Scheme.

*Ex-1992 Scheme members:*

D.18 **Members with tapered protection** retire in line with 1992 Scheme assumptions.

D.19 **Members with no tapered protection** do not retire earlier than age 55 but with a bulk of retirements happening at age 55.

D.20 Allowance for members delaying retirement past age 55 would increase the value of 2015 Scheme accrual and would place a slightly lower value on accrued 1992 Scheme benefits.

D.21 Tapered members will generally accrue a greater proportion of their benefits in the 1992 Scheme than the unprotected members, so it is reasonable to assume that retirement decisions will be more focused on the availability of 1992 Scheme benefits for tapered members than for unprotected members.

D.22 The impact of not allowing for some members with tapered protection retiring later is the opposite of not allowing for some of the unprotected members retiring before age 55. Therefore, there will be an offsetting effect between these two simplifications.

*Ex-2006 Scheme members:*

D.23 **All members** are assumed to retire at age 60.

D.24 Members choosing to retire before age 60 will suffer a significant reduction in the value of their 2006 Scheme benefits as these will be converted to a deferred pension payable from age 65. This will act as a disincentive to retiring before age 60 for members with service in the 2006 Scheme.

# Appendix E: Analysis of ill-health retirement from service

### Rates of ill-health retirement

E.1 We have analysed the pattern of ill-health retirements over the five-year period to 31 March 2012. The analysis compares the actual rate of ill-health retirements to the expected rate of ill-health retirements based on the 2009 assumptions.

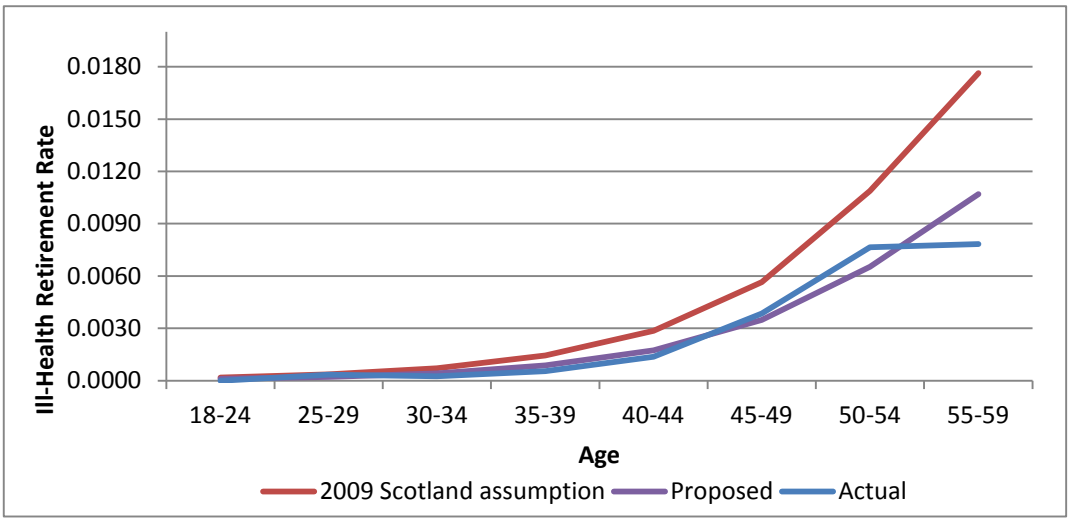
E.2 The table below shows the actual number of ill-health retirements compared with the expected number of ill-health retirements based on the 2009 assumptions.

**Table E1: Ill-health retirement experience 2007-2012**

| | | 2009 assumptions | | English 2012 assumptions | |
|---|---|---|---|---|---|
| | Actual retirements | Expected retirements | Actual/ Expected | Expected retirements | Actual/ Expected |
| Scotland | 54 | 90 | 60% | 55 | 98% |

E.3 Graph E1 shows the actual rates of ill-health retirements for firefighters grouped by age against the rates based on the 2009 assumptions and the recommended Scottish 2012 Fire Scotland assumptions (which are the same as the recommended English 2012 assumptions).

**Graph E1: Scotland Ill-health retirement experience 2007-2012**




E.4 The number of ill-health retirements for the Scottish Schemes has been fairly limited over 2007-2012, and the recommended assumption for the 2012 valuation of the English Schemes provided a reasonable fit to the experience. Therefore our recommended assumption is that rates of ill-health retirement are in line with the recommended English 2012 assumptions.

**Proportion of higher-tier ill-health benefit awards**

E.5 The data we have does not differentiate ill-health retirements between higher and lower tier grants. Therefore we have determined a value for the proportion of higher tier benefit awards made to 1992 Scheme members based on English Scheme statistics, in particular DCLG statistics for the years 2010-2011 and 2011-2012.

E.6 We have not considered 2006 Scheme data as very few 2006 Scheme members will have the five years' service required to be eligible for a higher tier award.

E.7 During this two-year period 43 higher-tier ill-health retirements were recorded out of a total of 104 ill-health retirements in the 1992 English Scheme. Therefore we recommend assuming that 40% of (eligible) members retiring on ill-health grounds will receive the higher-tier benefit and the remainder will receive the lower-tier benefit.

**Trends in the number of ill-health retirements**

E.8 We have also compared the number of ill-health retirements in each year. As Table E2 shows, the number of ill-health retirements observed in each year of the analysis has remained fairly stable.

**Table E2: Numbers of ill-health retirements**

| 2007/08 | 2008/09 | 2009/10 | 2010/11 | 2011/12 | Total |
|---|---|---|---|---|---|
| 13 | 11 | 15 | 5 | 10 | 54 |

E.9 The number of ill-health retirements from the English Schemes has been increasing each year since 2008/09. The recommended English 2012 assumption is about 25% higher than the English experience over the period 2007-2012 to allow for this trend.

E.10 The data available in Scotland is limited, but does not show any evidence of an increasing number of ill-health retirements each year. Although the recommended 2012 English assumption provides a good fit to the experience of the Scottish Schemes, the reasoning behind the 2012 English assumptions is different, because it allows for a trend of an increasing number of retirements and the Scottish assumption does not.

# Appendix F: Analysis of voluntary withdrawal from service

**Data used in setting the assumptions**

*Excluding short servers*

F.1 All of our analysis was carried out only on members with more than two years' service.

F.2 Although there is quite clear evidence that members with shorter service are more likely to withdraw, the impact of allowing for this on the valuation results is small. We expect that the simplification would not affect the assessment of the employer cost cap or employer contribution rate by as much as 0.1% of salaries. On the other hand including short serving members in the analysis may give them undue weight when setting the assumption given their relatively low financial impact.

**Rates of withdrawal - 1992 Scheme**

F.3 The table below shows the actual number of withdrawals compared with the expected number of withdrawals based on the 2009 assumptions.

**Table F1: Actual number of withdrawals vs expected based on 2009 Fire England assumptions**

| | | 2009 assumptions | |
|---|---|---|---|
| | Actual withdrawals | Expected withdrawals | Actual/ Expected |
| Regular firefighters in the 1992 Scheme | 128 | 111 | 115% |

F.4 As we can see from the table above, actual withdrawal rates are 115% of the 2009 assumptions. Our analysis of the movement data indicates that roughly 40% of the members who have been coded as withdrawals were recorded as active members of the 1992 Scheme as at 31 March 2012 either at the same FRA or another Scottish FRA. (It is possible that some members who took inter-authority transfers were coded as withdrawals.) Allowing for these data issues, the number of actual withdrawals may be significantly below the number expected of 111 on the 2009 assumptions.

F.5 The data does not therefore provide convincing grounds to either increase or decrease the assumption, so we propose to retain the 2009 assumption.

**Rates of withdrawal – 2006 Scheme**

F.6 Data from the English Schemes indicates that the withdrawal rates for Retained firefighters are far higher than for Regular firefighters.

F.7 However, the Scottish data does not appear credible as it shows more Regular withdrawals than Retained withdrawals from the 2006 Scheme even though Retained firefighters make up over 80% of the membership.

F.8 In the absence of robust data in respect of the 2006 Scheme, we have recommended the same assumption as the English 2012 Valuation.

# Appendix G: Analysis of death in service

G.1 In this analysis we have analysed all members jointly, covering all male and female members in both the 1992 and 2006 Schemes. We have compared experience to the 2009 assumptions and the recommended English 2012 assumptions.

G.2 There have been few deaths in Scotland, so we have also considered the aggregate experience for Scotland and England together.

G.3 The table below shows the number of actual and expected deaths.

**Table G1: Death in service experience 2007-2012**

| | | 2009 assumptions | | Recommended 2012 English assumptions | |
|---|---|---|---|---|---|
| | Actual deaths | Expected deaths | Actual/ Expected | Expected deaths | Actual/ Expected |
| Scotland | 19 | 15 | 126% | 12 | 158% |
| England | 72 | 91 | 79% | 72 | 100% |
| Scotland and England | 91 | 106 | 86% | 84 | 108% |

G.4 The table shows that the recommended English 2012 assumptions are a reasonable fit to the aggregate experience in Scotland and England. We recommend that this assumption is also adopted for the Scottish Schemes.

G.5 There is insufficient data from the Scottish Schemes to produce a robust analysis of deaths by age. The English 2012 assumptions was a reasonable fit to the experience in England.

# Appendix H: Analysis of promotional pay increases

### Approach to the analysis

### Regular firefighter members

H.1 We analysed the promotional increases implied by the current pay structure of the membership as at 31 March 2012 (for members with up to 30 years' service). These increases were then compared to the assumed increases adopted for 2009 assessment and the recommended English 2012 assumptions.

### Retained firefighter members

H.2 Retained firefighters were only eligible to join the 2006 Scheme from April 2006, and as such the date of joining the 2006 Scheme does not correspond to the date they joined the Fire and Rescue Service. Therefore, the experience for Retained firefighters was analysed by looking at the profile of the Retained firefighter membership as at 31 March 2012 in terms of the average pensionable pay at each age.

H.3 We have compared these increases with the recommended English 2012 valuation assumptions. The analysis is shown in Graph H3.

### Results of 2007-12 experience analysis

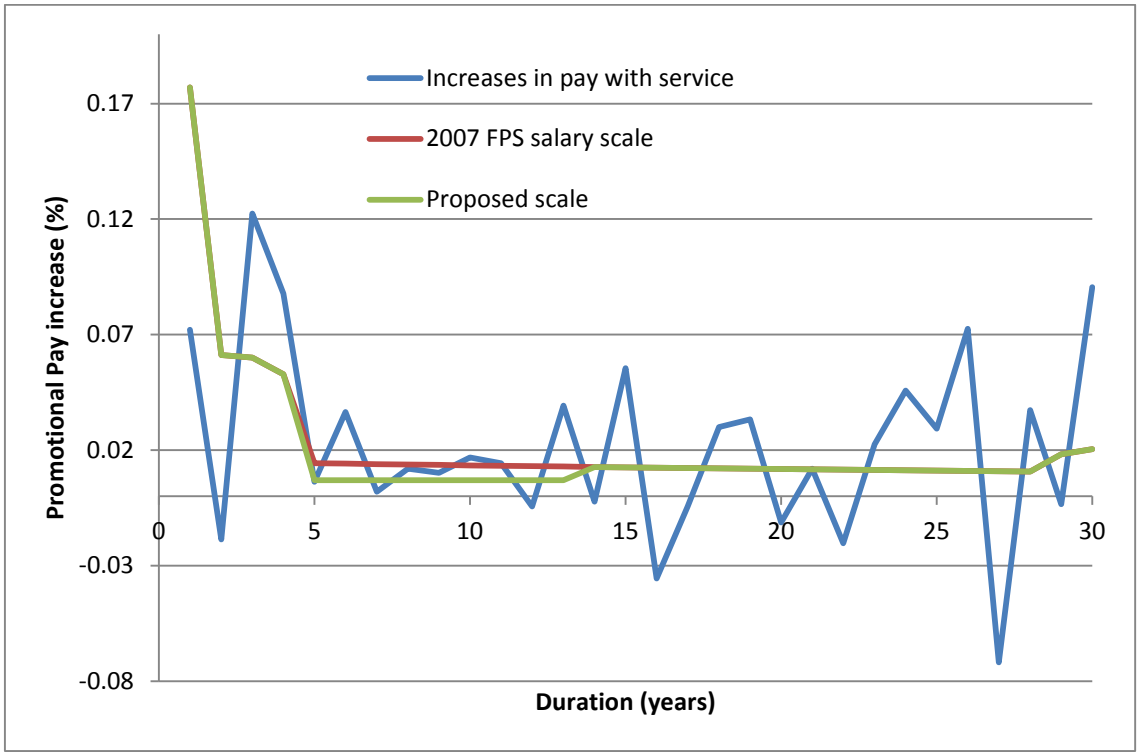
### Regular firefighter members

H.4 Graph H1 shows the implied and expected annual increases in promotional pay for Regular firefighter members for durations up to 30 years' service. The implied promotional pay increases are derived using the analysis set out above. The expected annual increases are based on the assumption used for 1992 Scheme in the 2009 assessment and the recommended English 2012 assumption.

H.5 The graph shows that the implied salary increases derived from the membership profile as at 31 March 2012 are broadly consistent with those assumed for the 2009 assessment at most durations of service.

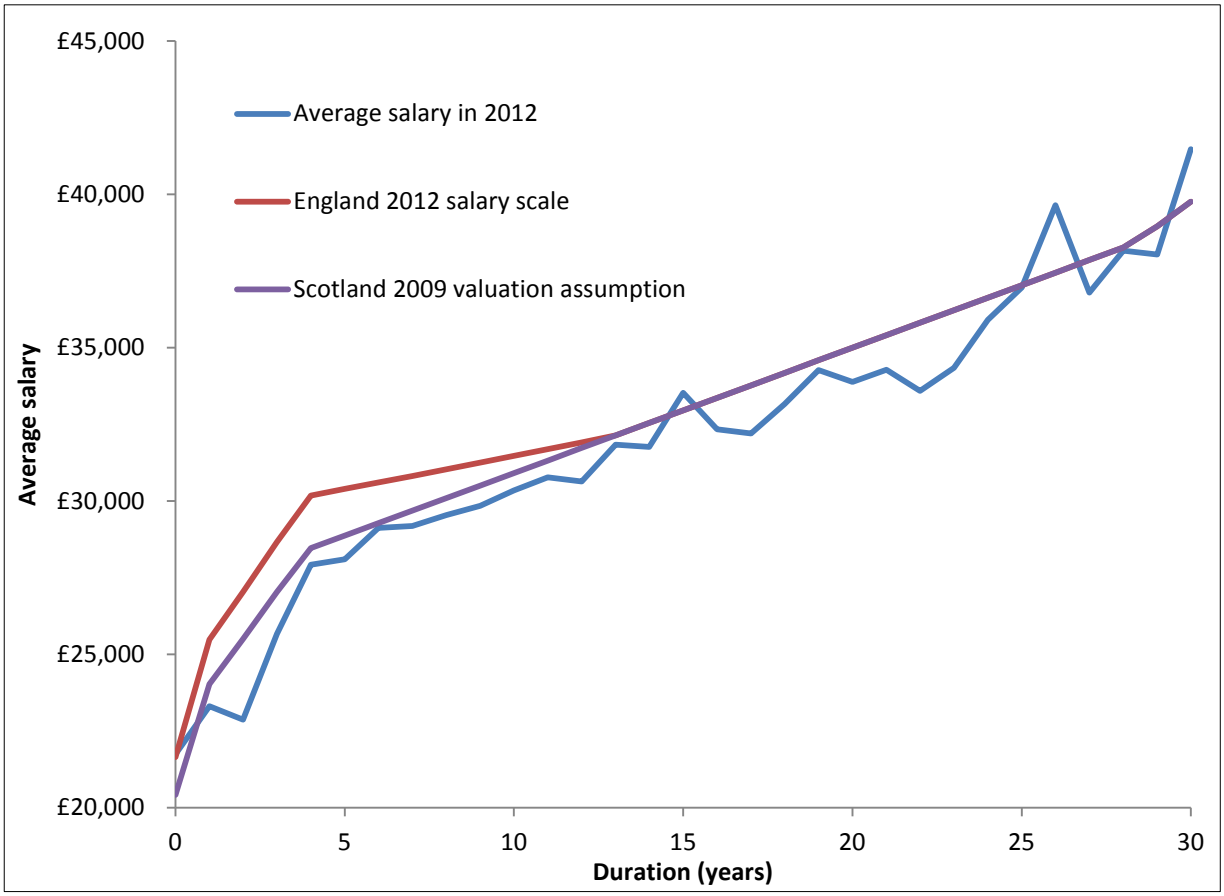
H.6 The recommended English 2012 assumptions shown allows for the lower annual increases in pensionable pay for members with between 5 and 13 years of service.

**Graph H1: Regular firefighters' promotional pay increases**




H.7 We have also shown the same information comparing the cumulative effects of the salary increases and the respective salary scales in Graph H2. From this it can be seen that the 2009 assumption remains a good fit for the actual salary increases. The recommended English 2012 assumption is not as good a fit to the Scottish experience.

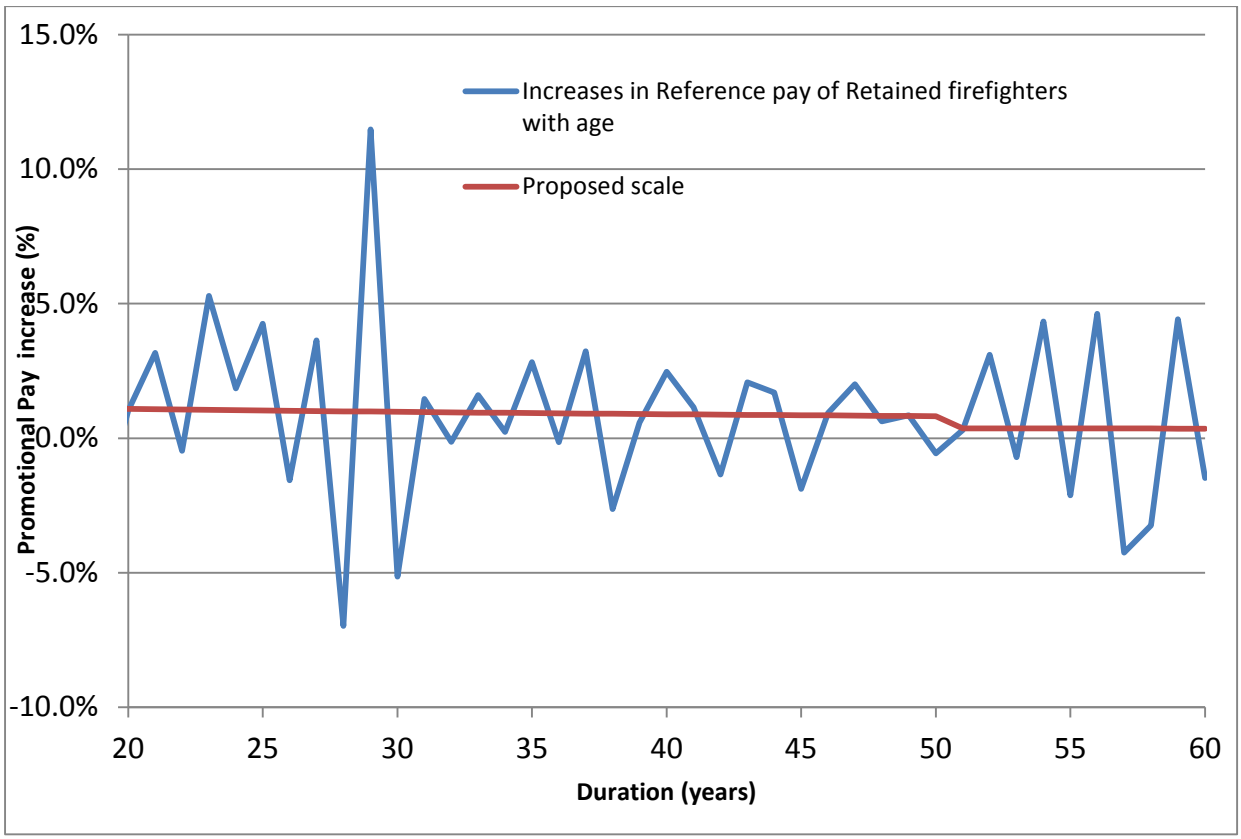
**Graph H2: Regular firefighters' cumulative promotional pay increases**



### Retained firefighter members

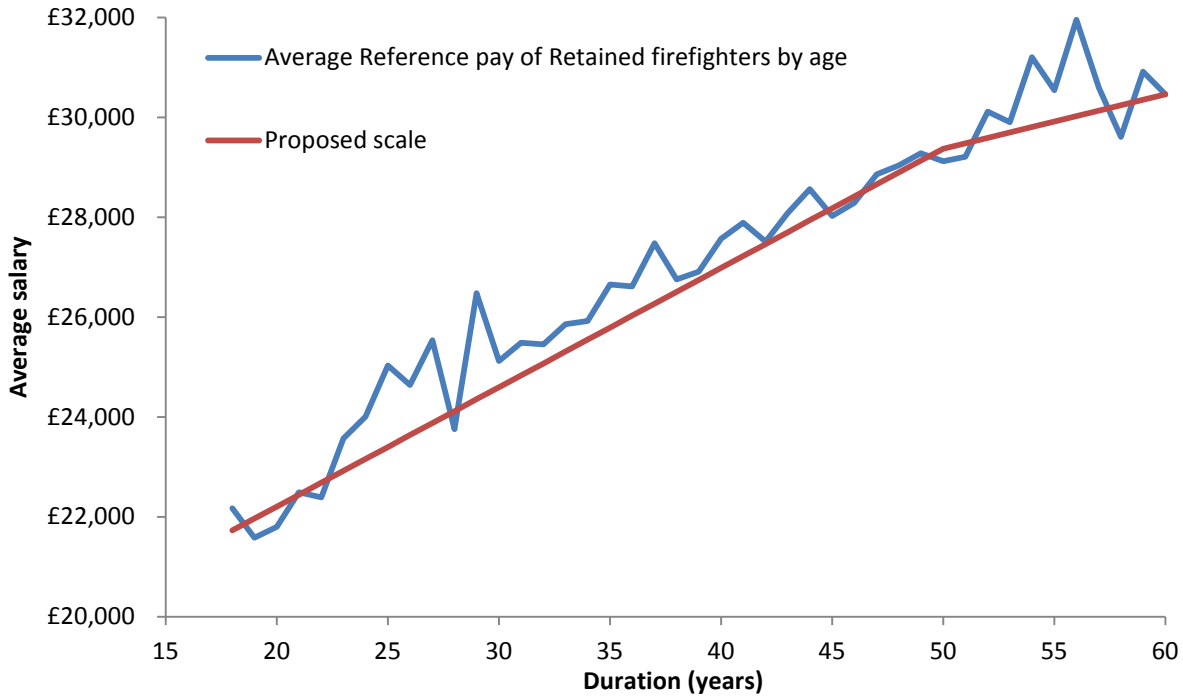
H.8 Graph H3 shows the implied annual increases in Retained firefighter member's Reference pay due to promotion and the recommended scale for promotional increases. This graph illustrates that Reference pay for Retained firefighter members tends to increase with age; by around 0.8% pa on average up to age 50, and by around 0.5% above age 50.

**Graph H3: Retained firefighters' promotional pay increases**




H.9 Graph H4 show the average reference pay of Retained firefighters by age and the cumulative effects of the proposed salary scale shown in graph H3.

**Graph H4: Retained firefighters' cumulative promotional pay increases**



# Appendix I: Analysis of commutation

I.1 The following table summarises the proportion of pension commuted by members of the 2006 Scheme.

**Table I1: Commuted pensions on retirement (2006 Scheme)**

| | Number of retirements (normal health) | Pension at retirement (before commutation) | Pension commuted | Commutation proportion |
|---|---|---|---|---|
| Fire Scotland | 12 | £6,200 | £1,300 | 21% |
| Fire England | 78 | £98,000 | £16,000 | 16% |
| Fire England + Scotland | 90 | £104,200 | £17,300 | 17% |

I.2 These figures compare with the assumption of 15% directed by HM Treasury, which we understand is based on experience in other major public sector schemes where commutation is offered on similar terms. As noted in the table above, there have been very few retirements from the 2006 Scheme and the members who have retired may be somewhat atypical, having joined the 2006 Scheme at a later age than most members.

# Appendix J: Record of changes since the 24 February 2014 draft

J.1 This advice was issued in draft on 24 February 2014. The table below records the changes made since that draft.

| Reference | Change |
|---|---|
| Section 5 | Amendments made in respect of the reformed scheme design which makes use of active service early retirement factors |
| Section 7 | Notes SPPA's proposal to use the second option for withdrawal assumptions |
| Section 10 | Amendments made in respect of the underpin for 1992 scheme commutation factors |
| Various | No change to the proposed assumption. The "approximate impact of proposed change in assumption" tables in sections 4 to 11 have been updated and expanded to show separately the impact on past service and the impact on the cost of accrual in the 1992, 2006 and 2015 schemes. |
| Various | No change to the proposed assumption. Minor drafting changes to correct spelling, grammatical and other minor issues, or to clarify previous wording. |