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The Cost and Benefit of UK Defined Benefit Provision

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The Cost and Benefit of UK Defined Benefit Provision

Paul Sweeting¹

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Abstract

In this paper, I look at the effect of the change in the cost to an employer of providing a defined benefit (“DB”) pension on the overall cost of remunerating an employee and compare that with the cost of remunerating an employee with no such pension benefits. I allow for the additional cost to the employer of National Insurance Contributions. I also look at the change in value of an employee’s remuneration taking into account the value of DB pension accrual and compare this with the change in remuneration for an employee with no such benefits. Here, I allow for employee National Insurance Contributions and income tax. I find that costs of employment have risen significantly more for members of defined benefit pension schemes compared with other employees, and that this has largely been as a result of falling long-term interest rates and their effect on the cost of DB pension accrual. The increase in the value of remuneration to employees has shown a similar pattern.

1. Introduction

Pension scheme deficits in the UK have been a cause of concern since the turn of the twenty first century, and the negative effect of such deficits on corporate earnings is well understood. Less well understood, however, is the effect of the ongoing accrual of DB pension benefits on company profits. In this paper I look at the increase in the various costs of employing an individual taking into account wages, income taxes and pension accrual. Implicitly, therefore, I ignore the effect on company profits of the cost of removing pension scheme deficits (the excess of pension scheme liabilities over pension scheme assets) since these have been created largely as a result of the investment policies and funding valuation bases adopted by pension schemes rather than by the liabilities themselves.

It might not be clear why the distinction should be between those receiving DB pension benefits and all other employees. Why are members of defined contribution (“DC”) pension schemes not included? Consider two companies, one with a defined contribution scheme with employer contributions of 10% of salary, and one with no pension benefits. If the average wage for each company rises from £10,000 to £10,500, this is clearly an increase of 5%. The firm with a DC pension scheme will also see its average pension bill per member rise from £1,000 (10% of the average salary) to £1,050, so the average total remuneration for this company will have risen from £11,000 to £11,550 – still an increase of 5%. In other words, a firm with a DC pension scheme can be treated as being the same as a firm with no pension scheme for the purpose of this analysis.

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2. The cost of accrual

The basic approach that I use to calculate the cost of accrual is the projected unit credit (“PUC”) method. This gives the cost now of providing for an additional year’s accrual of pension payable from retirement. This is equivalent to calculating the present value of a deferred annuity payable from the date of retirement. In order to calculate the value of this deferred annuity, which I assume to be paid continuously with increases being awarded continuously until death, I use actuarial commutation functions. If the value of a continuous deferred annuity payable in n years to an individual currently aged x is ${}_n\bar{a}_x$, then

$${}_n\bar{a}_x = \frac{\bar{N}_{x+n}}{D_x}$$

where $\bar{N}_x \approx N_x - (\frac{1}{2} \times D_x)$, $N_x = \sum_{t=0}^{\infty} D_{x+t}$, $D_x = \frac{l_x}{(1+i)^x}$, l_x is the number of lives

aged x , and i is the valuation rate of interest used to discount the liabilities. I also allow for the cost of widows’ and widowers’ pensions payable if the pension scheme member dies after retirement. Such a benefit is known as a deferred reversionary annuity. If the value of such an annuity is ${}_n\bar{a}_{x|y}$, then

$${}_n\bar{a}_{x|y} = {}_n\bar{a}_y - {}_n\bar{a}_{xy}$$

where ${}_n\bar{a}_{xy} = \frac{\bar{N}_{x+n,y+n}}{D_{xy}}$, $\bar{N}_{xy} \approx N_{xy} - (\frac{1}{2} \times D_{xy})$, $N_{xy} = \sum_{t=0}^{\infty} D_{x+t,y+t}$, $D_{xy} = \frac{l_{xy}}{(1+i)^{(x+y)/2}}$

and l_{xy} is the number of lives aged x multiplied by the number of lives aged y

One adjustment that needs to be made to the cost of accrual is the deduction of members’ own contributions. According to Occupational Pension Schemes 2004, the level of member contributions to private sector DB pension schemes follows a bimodal distribution with 20% of members making no contribution, 44% contributing between 5% and 7% and the remainder contributing between 0% and 5% or more than 7%. I therefore consider the non-contributory scenario and also a scenario where 6% member contributions are paid.

3. Approach

I use two very similar approaches, one for calculating the increase in cost from the employer’s point of view and the other for calculating the increase in benefit from the employee’s point of view.

From the employer’s point of view, I compare:

- gross earnings excluding pension;
- earnings *plus* employer National Insurance Contributions (“NICs”), excluding pension accrual; and
- earnings *plus* employer NICs and pension accrual.

From the employee's point of view, I compare:

- gross earnings excluding pension;
- earnings *less* employee NICs and income tax, excluding pension accrual; and
- earnings *less* employee NICs and income tax *plus* pension accrual.

For this high-level part of the analysis, the approach I use to consider the impact of the different factors is to layer the effects one on top of the other. As mentioned above, the base scenario is the increase in gross earnings ignoring NICs and, if appropriate, income tax. The earnings that I consider are National Average Earnings ("NAE"). I then consider the effect of allowing for NICs and income tax and calculate the difference between the increase in this figure and the increase in gross earnings. This is the increase (or decrease) in benefits attributable to changes in NICs and income tax. Because the effects of NICs and income tax vary depending on the level of earnings, I consider the effects in respect of individuals not only earning NAE, but also half, twice and four times NAE.

Next, I look at the effect of allowing for defined benefit pension accrual, assuming that the benefits paid are in line with the statutory minima. For contracted-in pension schemes, this meant that no increases were required for pension accrued before 6 April 1997; increases in line with Retail Price Index ("RPI") inflation subject to a maximum of 5% per annum ("5% Limited Price Indexation", or "5% LPI") for pension accrued on or after 6 April 1997 and before 6 April 2005; and 2.5% LPI for pension accrued on or after 6 April 2005. I take the increase in earnings allowing for NICs, income tax (if appropriate) and pension accrual, and deduct the increase in earnings allowing only for NICs and income tax. This gives the increase in earnings attributable to changes in the cost of pension accrual.

In this part of the analysis I also allow for all changes in nominal and real interest rates, and in mortality assumptions. For periods starting on 6 April for years up to and including 1999, I assume that the mortality is in line with the tables AM80 and AF80 for men and women before retirement, and PMA80(c=2010) and PFA80(c=2010) for men and women after retirement. All of these tables were published in 1990 and are based on mortality investigations using data from the years 1979 to 1982 with mortality projected to the calendar year 2010 in the second two tables. For the years commencing on or after 6 April 2000, I assume that the mortality is in line with the tables AM92 and AF92 for men and women before retirement, and PMA92(c=2020) and PFA92(c=2020) for men and women after retirement. All of these tables were published in 1999 and are based on mortality investigations using data from 1991 to 1994, with mortality projected to 2020 in the second two tables. For years commencing 6 April 2003 and later, three amendments to PFA92 and PMA92 are available, reflecting the greater than expected improvement in longevity, particularly in the 1980s and particularly for those individuals born in and around 1926. These new bases are the short cohort ("sc"), medium cohort ("mc") and long cohort ("lc") projections. The sc projection assumes that the improvement continues to 2010; the mc projection assumes that it continues to 2020; and the lc projection assumes that it continues to 2040. In this high level analysis, I ignore these projections.

The change in gross earnings from year x to year $x+1$ is ΔG_x , defined as

$$\Delta G_x = \frac{G_x}{G_{x-1}} - 1$$

where G_x represents the gross earnings in year x . The change in net earnings *excluding* pensions accrual from the employer's point of view is ΔN_x^{er} , defined as:

$$\Delta N_x^{er} = \frac{G_x + NIC_x^{er}}{G_{x-1} + NIC_{x-1}^{er}} - 1$$

where NIC_x^{er} represents the employer NICs payable for year x . The change in the cost of employment due to changes in NICs is therefore $\Delta N_x^{er} - \Delta G_x$. The change in net earnings *including* pensions accrual from the employer's point of view is ΔT_x^{er} , defined as:

$$\Delta T_x^{er} = \frac{G_x + NIC_x^{er} + (G_x \times PF_x)}{G_{x-1} + NIC_{x-1}^{er} + (G_{x-1} \times PF_{x-1})} - 1$$

where PF_x is the cost of accruing an extra year's pension per £1 of gross earnings in year x . Therefore, the change in the cost of employment due to changes in the cost of pension accrual is $\Delta T_x^{er} - \Delta N_x^{er}$.

The calculations are similar from the employee's point of view. Here, the change in net earnings *excluding* pension accrual is ΔN_x^{ee} , defined as:

$$\Delta N_x^{ee} = \frac{G_x - NIC_x^{ee} - IT_x^{ee}}{G_{x-1} - NIC_{x-1}^{ee} - IT_{x-1}^{ee}} - 1$$

where NIC_x^{ee} represents the employee NICs and IT_x^{ee} the income tax both payable in year x . The change in the benefit to the employee due to changes in NICs and income tax is therefore $\Delta N_x^{ee} - \Delta G_x$. The change in net earnings *including* pensions accrual from the employee's point of view is ΔT_x^{ee} , defined as:

$$\Delta T_x^{ee} = \frac{G_x - NIC_x^{ee} - IT_x^{ee} + (G_x \times PF_x)}{G_{x-1} - NIC_{x-1}^{ee} - IT_{x-1}^{ee} + (G_{x-1} \times PF_{x-1})} - 1$$

so the change in the benefit of employment to the employee due to changes in the value of pension accrual is $\Delta T_x^{ee} - \Delta N_x^{ee}$.

Additionally, I analyse the components of the change in the value of pension accrual separately. The approach I use for this is slightly different to the approach above, in

that I analyse the effect of each of the assumptions individually rather than cumulatively, resulting in an additional balancing item to allow for the cross-products.

I define ${}_yPF_x$ as the cost of accruing an extra year's pension per £1 of gross earnings in year x using all of the assumptions for year x , except the assumption for y , where y is equal to m (mortality), d (discount rate) or p (change to pension accrued). The assumption for y is that which would have been used if year $x-1$ data still applied. This is not necessarily the same as the assumption actually used in year $x-1$. For example, if the increase to pensions in payment for benefits accrued in year $x-1$ is nil, but for benefits accrued in year x is in line with RPI, then the discount rate used in the calculation of ${}_yPF_x$ is the real interest rate from year $x-1$ rather than the nominal interest rate actually used in year $x-1$.

The change in total cost to the employer using the data applicable to year $x-1$ for assumption y can be defined as $\Delta_y T_x^{er}$, where:

$$\Delta_y T_x^{er} = \frac{G_x + NIC_x^{er} + (G_x \times {}_yPF_x)}{G_{x-1} + NIC_{x-1}^{er} + (G_{x-1} \times PF_{x-1})} - 1$$

The cost to the employer attributable to a change in assumption y is therefore calculated as $\Delta T_x^{er} - \Delta_y T_x^{er}$ for each y . The difference between the sum of these three costs and the total cost attributable to pension accrual gives the residual.

Similarly, $\Delta_y T_x^{ee}$ is calculated as:

$$\Delta_y T_x^{ee} = \frac{G_x - NIC_x^{ee} - IT_x^{ee} + (G_x \times {}_yPF_x)}{G_{x-1} - NIC_{x-1}^{ee} - IT_{x-1}^{ee} + (G_{x-1} \times PF_{x-1})} - 1$$

and $\Delta T_x^{ee} - \Delta_y T_x^{ee}$ gives the benefit to the employee attributable to a change in assumption y , with the residual being calculated as above.

I also use this approach to calculate the additional effect of changing to the sc, mc and lc projection bases in 2003.

As well as carrying out the analysis on a year-to-year basis, I also calculate the average change for each component over the whole period.

The interest rates I use in this analysis are the nominal gross redemption yield on the 30 year UK Government Bond and the real gross redemption yield on the 30 year UK Index Linked Government Bond assuming 3% per annum inflation.

I carry out these calculations over a range of ages (20, 40 and 60 years of age) and for both men and women.

4. Additional assumptions

A number of additional assumptions are required when calculating the cost of pension accrual. I assume that the contribution rate for the following 12 month period is set on 6 April each year using the yield information applicable on that date. I assume that the benefit provided is a pension of one-sixtieth of final salary for each year of pensionable service. According to Occupational Pension Schemes 2004, 60% of private sector DB pension schemes used this accrual rate in 2004, making this accrual rate more than five times as popular as the nearest alternative.

I assume a normal pension age (“NPA”) of 65, the NPA used by 53% of private sector schemes, according to the same survey.

I assume that each pension scheme member also accrues a spouse’s pension of 50% of the member’s pension payable should the member die after retirement. The above survey shows that 96% of private sector defined benefit schemes provide a spouse’s pension and of these 74% provide a pension of up to 50%.

I assume that pension scheme members remain in active service until retirement, and so their benefits increase in line with salary inflation in the period up to retirement. I assume future salary inflation to be 1.5% above the increase in the Retail Price Index. This is in line with the difference between average earnings and retail prices for the period 1990 to 2006.

Prior to retirement, pension schemes might be expected to offset the cost of pension accrual by investing in assets with a higher expected return than bonds, typically equities. One way of allowing for this higher expected return is to allow for an equity risk premium over bonds in the discount rate used to value the liabilities. Dimson et al (2006) imply that a forward looking world equity risk premium of 4% over bonds would be appropriate. I therefore use this figure as the maximum risk premium, and also consider risk premia of 2% and 0% to allow for 50% and zero allocations to equities in respect of members’ benefits before retirement.

The discount rate I use for pre-retirement benefits is therefore the real yield on the 30 year UK Index Linked Government Bond less 1.5% plus either 0%, 2% or 4% depending on the degree to which equity investment is assumed.

The increases to pensions in payment accrued in different periods are outlined earlier; however, some assumptions are needed in the choice of interest rate used. I assume that equities will not be held in respect of pensioners’ benefits, so no adjustment is needed here. The appropriate discount rate for benefits with no pension increase is therefore straightforward, being the nominal yield on the conventional gilt. For benefits where either 5% LPI or 2.5% LPI increases are due, I use the greater of the real yield on the index linked bond and the difference between the nominal yield on the conventional bond and the fixed upper limit to pension increases (either 5% or 2.5% per annum). This is, however, only an approximation if any volatility in price inflation is expected. To illustrate this, consider what happens if RPI inflation is expected to be 4.5% on average and the benefits receive 5% LPI pension increases. If price inflation actually oscillates between 5.5% and 3.5%, then the average pension increase will be 4.25% (the average of 3.5% and 5%) rather than 4.5% since the 5%

cap on pension increases will apply for half of the time. I am therefore making an assumption that future inflation is expected to be in line with the implied inflation from the index linked and conventional bonds with no volatility from year to year.

I ignore indirect taxes and benefits related to factors such as age, marital status, disability and dependent children. I also ignore any other benefits in kind. Finally, I assume that all earnings are pensionable, that is, included in the calculation of the accrued pension benefits.

5. Results

5.1 Cost to the Employer

I initially consider a sample case, giving summary information for other assumptions later on. In this sample case I assume:

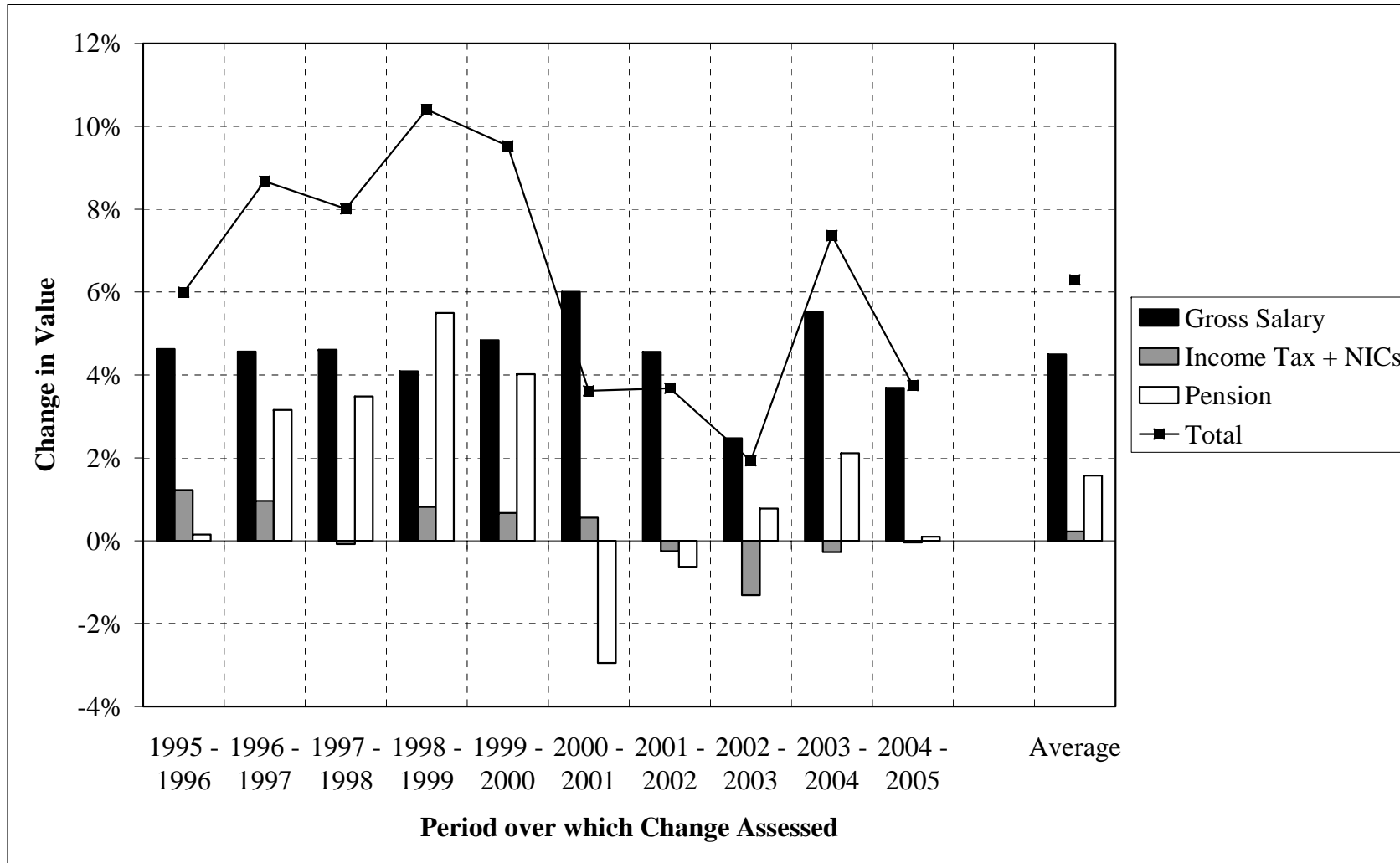
- the member is a 40 year old male;
- the member's earnings are in line with NAE;
- the pre-retirement assets are invested 50% in equities, so the pre-retirement equity risk premium is 2% per annum; and
- the employee contribution rate is 6% of earnings.

Looking first at high-level numbers, the average year-to-year increase in gross earnings over the period is 4.50% per annum. However, after allowing for NICs, the cost to employers has actually risen by an additional 0.42% per annum, bringing the total before-pension average cost increase to 4.92% per annum. This is also the average cost increase to an employer once pensions have been allowed for assuming that those pensions are defined contribution in nature and that the contribution rate has not changed.

However, if defined benefit pension accrual is allowed for, there is an additional cost increase of 1.07% per annum, bringing the total average cost increase to 5.99% per annum.

The year-by-year development of this cost increase is shown in Figure 1. As is clear, the largest increase in cost each year is simply down to the increasing level of NAE. However, between 6 April 1998 and 6 April 1999 a change in the rate of NICs payable results in a larger-than-average cost increase over this period. There are also a number of years where the cost of pension accrual adds significantly to the rate of increase, most notably in the late 1990s.

Figure 1



5.2 *Components of Cost to the Employer*

The components of the change in cost attributable to pension accrual are also of interest: the benefit payable (in particular the rate of interest applicable to the pension being accrued); the mortality assumptions used in the calculation; and the discount rate used to calculate the cost of accrual. Carrying out calculations as described earlier, I find that on average the 1.07% per annum increase in cost attributable to pension accrual is made up as follows:

- 0.75% per annum in respect of changes in the discount rate;
- 0.22% per annum in respect of changes in the mortality assumptions;
- 0.12% per annum in respect of changes in the benefits offered; and
- -0.02% as a balancing item.

If the recent projection bases are also allowed for, I find that the average increase in cost rises by an additional 0.06% (sc), 0.09% (mc) or 0.15% (lc). In other words, the biggest effect on the change in cost attributable to pension accrual is the fall in the discount rate. Even after allowing for the greatest projected improvement in longevity, the change in mortality tables only accounts for one-third of the increase in cost. Perhaps most surprising is that the change in benefits – from no guaranteed increases at all to (ultimately) 2.5% LPI – has made very little difference to the overall increase in cost.

Figure 2 shows how these three components contribute to the overall increase in cost attributable to defined benefit pension accrual on a year-by-year basis, with the changes attributable to mortality stacked to show the cumulative effect.

As might be expected, the change in respect of benefit changes results in a large increase in the cost on 6 April 1997 (when 5% LPI increases to pensions in payment were introduced) and a smaller reduction in cost on 5 April 2005 (when the 5% LPI was reduced to 2.5 %LPI).

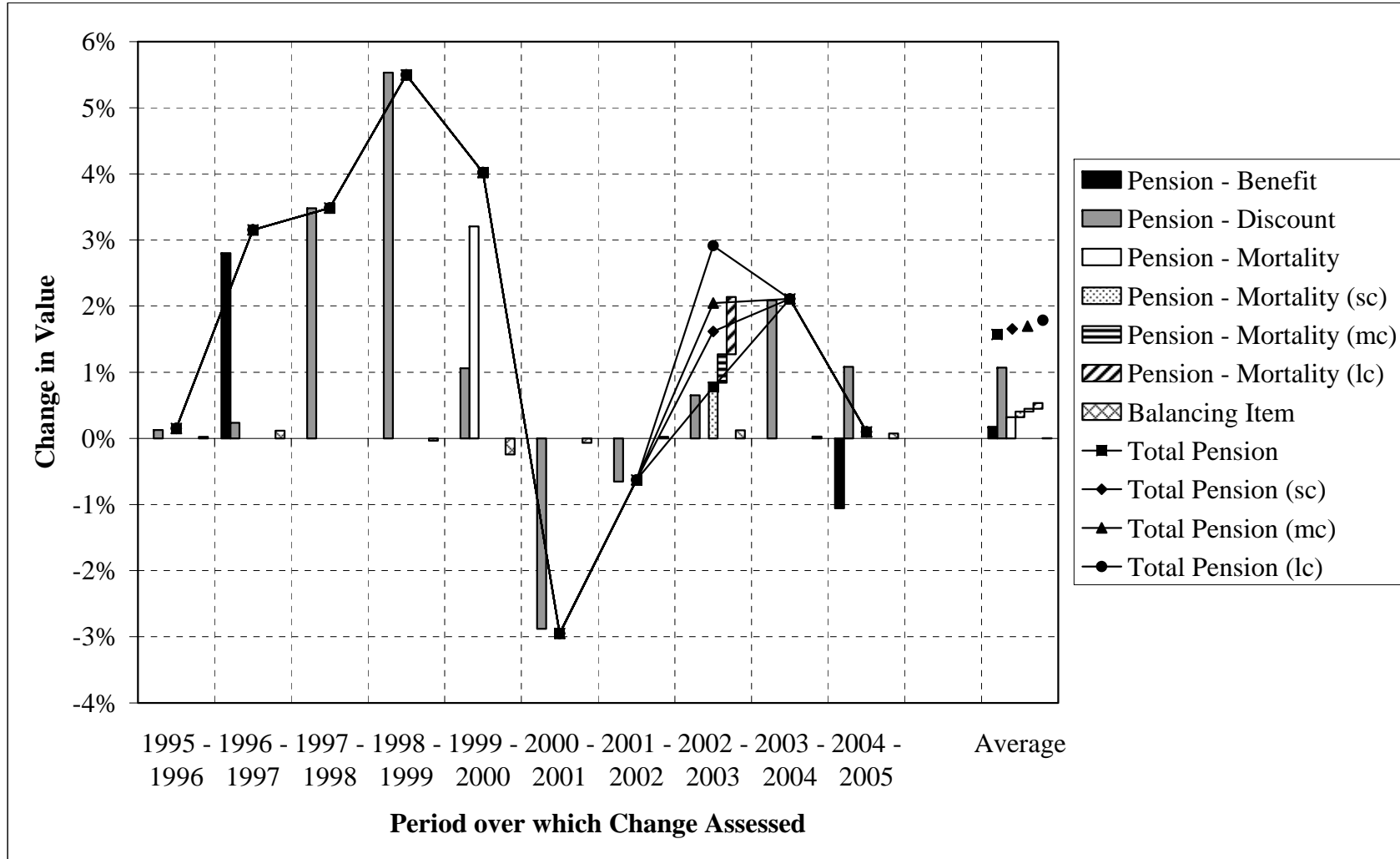
The change due to mortality assumption revisions also occurs at two distinct times – when the tables were changed in 2000 and (optionally) in 2003. Both have a significant effect in the years of introduction, but the average effect over the period of observation is significantly smaller.

However, long-term interest rates have fallen in seven out of the ten periods considered, and these falls have significantly increased the cost of pension accrual – by nearly 4% in one year.

5.3 *Variations in Cost to the Employer*

In Appendix 1, I give details of the average cost increase, split by type, for a large range of combinations of earnings, age, sex, contribution rate and ERP assumption. Several trends emerge from this analysis.

Figure 2



First, the increase in cost attributable to NICs is lowest for employees on NAE, being higher for individuals earning more or less than this. For employees on NAE, the average increase in cost is 0.42%; it is 0.53% for individuals earning 50% of NAE, 0.68% for individuals on 200% of NAE and 1.00% for those on 400% of NAE. The main reasons for this increase occurred in April 1999. At this time, employer NICs became payable on earnings above the Upper Earnings Limit (UEL) as well as below. This was coincident with an increase in the rate of employer NICs. The increase in rate also adversely affected the costs in respect of those on only 50% of NAE. Although employer NICs were no longer payable in respect of those on very low earnings, the increase in rate still meant that more was payable in respect of anyone earning over a few thousand pounds a year.

The increase in cost attributable to the cost of pension accrual ranges from 1.15% to 2.13%. This is a wide range, and clearly a number of factors influence the figure relating to costs in respect of a particular individual.

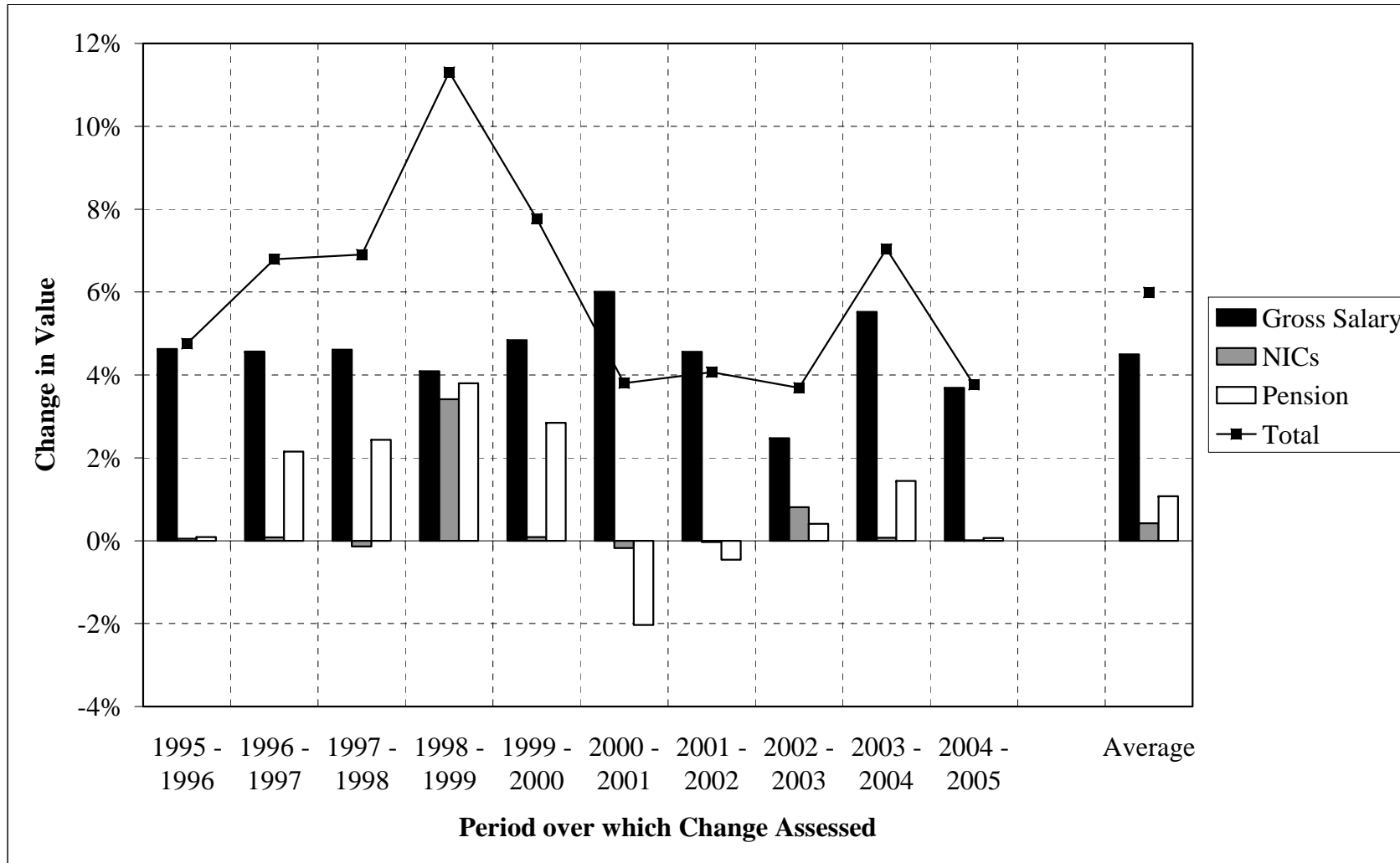
Looking first at contributory versus non-contributory pension schemes, it is clear that the proportional increase in pension cost is greater for contributory schemes. This is what one would expect, given that in the increase-in-cost calculation the change, which is the numerator, is the same in both cases, but the denominator is smaller for contributory schemes than it is for non-contributory ones. The difference between the contributory and non-contributory calculations is small, ranging from a 0.08% to a 0.33% difference. The difference is larger if the employee is younger, earns more, is female, and if a higher equity risk premium is assumed in the calculations.

There is a difference between the pensions accrual cost increase for men and that for women. For sixty year olds, the increase is only 0.06% to 0.08% greater for women than for men; however, this difference is between 0.15% and 0.20% for twenty year olds.

Age is in fact the cause of the greatest difference in the increases in the costs of pension accrual. The difference between the cost for twenty year old and a sixty year old ranges from 0.59% to 1.00%, the cost increase being higher for younger than for older employees. The figures are higher for women than for men, and higher the greater the ERP assumed. Unsurprisingly, the key here is the effect of the change in discount rate. In fact, the difference in cost for twenty year old and a sixty year old attributable to only the discount rate is between 0.83% and 1.27% – this figure is offset by the fact that the effect of the change in benefits is lower for younger employees.

The effect of mortality is similar in all cases. This is because most of the improvements to longevity occur at higher ages (post-retirement).

Figure 3



5.4 *Benefit to the Employee*

Looking at the same sample individual as before, I next look at the increase in the value of benefits to that individual rather than the cost to the employer. Again considering the high level numbers first, the average year-to-year increase in gross earnings over the period is 4.50% per annum. The individual's earnings net of income tax and NICs have on average increased by an additional 0.22% per annum, bringing the total before-pension average benefit increase to 4.72%. However, this increase is small compared to the average additional 1.57% per annum increase in respect of defined benefit pension accrual, giving a total average increase of 6.29%. This increase is significantly larger than the increase in cost to the employer. However, this is to be expected – the increase for the employer is in addition to gross earnings *plus* NICs whereas for the employee it is in addition to gross earnings *less* NICs and income tax.

The year-by-year development of this benefit increase is shown in Figure 3. Again, it is clear that the largest increase in cost each year is simply down to the increasing level of NAE. However, in this case, changes to NICs and income tax generally benefit individuals in the first half of the period under investigation, although changes to NICs in April 2003, resulting in an additional 1% of earnings being payable by nearly all employees, did reduce the average increase in net income. As expected, there are also a number of years where the cost of pension accrual adds significantly to the rate of increase, most notably in the late 1990s.

5.5 *Components of Benefit to the Employee*

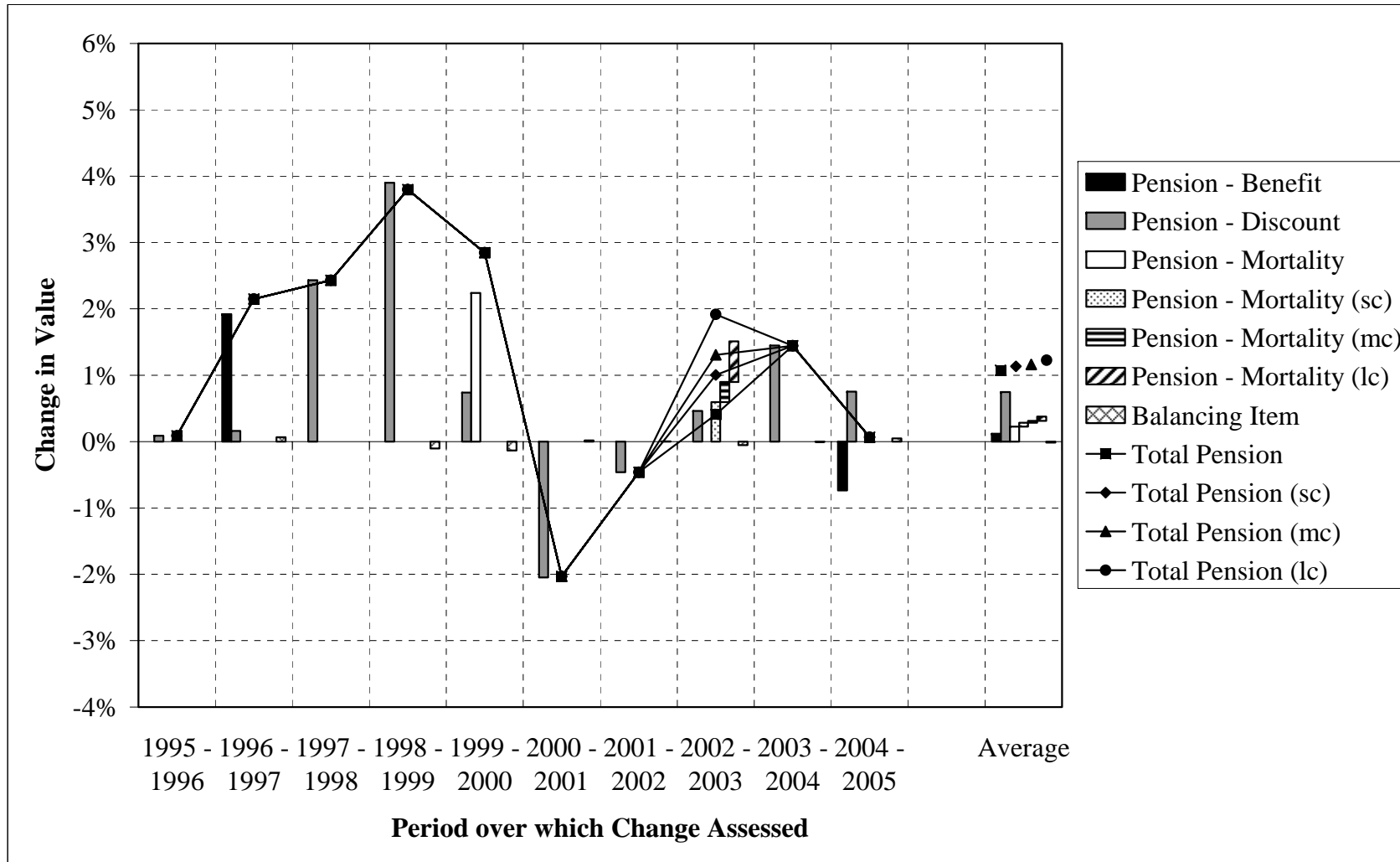
To recap, the components of the change in benefit attributable to pension accrual are of interest: the benefit payable; the mortality assumptions used in the calculation; and the discount rate used to calculate the value of pension accrual. Carrying out calculations as described earlier, I find that on average the 1.57% per annum increase in benefit attributable to pension accrual is made up as follows:

- 1.07% per annum in respect of changes in the discount rate;
- 0.32% per annum in respect of changes in the mortality assumptions;
- 0.17% per annum in respect of changes in the benefits offered; and
- 0.00% as a balancing item.

If the recent projection bases are also allowed for, I find that the average increase in benefit rises by an additional 0.08% (sc), 0.04% (mc) or 0.09% (lc). In other words, the biggest effect on the change in benefit attributable to pension accrual is still the fall in the discount rate. This reflects the fact that the pension accrual calculation is the same for the value to the member as it is for the cost to the employer.

Figure 4 shows how these three components contribute to the overall increase in cost attributable to DB pension accrual on a year-by-year basis, with the changes attributable to mortality stacked to show the cumulative effect. The pattern is, unsurprisingly, similar to that shown in Figure 2.

Figure 4



5.6 *Variations in Benefit to the Employee*

In Appendix 2, I give details of the average benefit increase, split by type, for a large range of combinations of earnings, age, sex, contribution rate and ERP assumption. Unsurprisingly, the trends emerging from this analysis are similar to those arising from the analysis relating to employer costs.

However, the impact of income tax and NICs is less severe for employees than it is for employers. In fact, these items contribute on average 0.14% and 0.22% per annum to the increase in earnings for individuals on 50% and 100% NAE respectively. For those on 200% and 400% NAE, however, contributions of -0.04% and -0.10% respectively are seen. Reductions in income tax are primarily responsible for positive contributions to the increase in earnings for those on lower wages, whilst the increase in employee NICs – in particular the additional 1% payable from April 2003 – is the main cause of the negative contribution to the increase in earnings for those on higher wages.

The increase in earnings attributable to DB pension accrual ranges from 1.61% to 4.16%. These figures are higher than those given for the cost to the employer, for reasons explained earlier. Again, the range is wide and influenced by a number of factors.

As before, the proportional increase in pension benefit is greater for contributory schemes, and the range of the difference is similar to that for the pension cost calculations, being 0.11% to 0.33%.

There is also a difference between the pension accrual benefit increase for men and that for women. For sixty year olds, the increase is only 0.08% to 0.11% greater for women than for men; however, this difference is between 0.19% and 0.30% for twenty year olds. This is slightly higher than the increase in the cost to the employer, but this is down to the same reason that the increase in pension cost overall is greater than the increase in pension benefit, as described earlier.

Once again, age is the cause of the greatest difference in the increases in the benefits attributable to pension accrual. The difference between the increase for twenty year old and a sixty year old ranges from 0.76% to 1.57%, the cost increase being higher for younger than for older employees. The figures are again higher for women than for men, and higher the greater the ERP assumed. Unsurprisingly, the effect of the change in discount rate is the most important factor, and the difference in cost for twenty year old and a sixty year old attributable to only the discount rate is between 1.09% and 2.07%. This figure is again offset by the fact that the effect of the change in benefits is lower for younger employees.

As before, and for the same reasons, the effect of mortality is similar in all cases.

6. **Conclusion**

If similar firms have given similar headline pay increases but one group has provided DB pensions and the other DC pensions, then the return on capital will have been lower for the firm offering DB. Unless action is taken, there will continue to be a

drag on the return to capital at the expense of the return to labour. Given that many firms within an industry are likely to offer similar benefits packages, the issue is perhaps more that certain industries will find themselves uncompetitive relative to the same industries in countries where DB provision is not the norm.

The biggest impact on the increase in the cost of DB is the fall in real and nominal long-term interest rates. This has meant that the greatest increase in cost has been in respect of individuals furthest away from retirement due to the effect of compounding. Whilst the impact of increasing longevity has been significant, the effect has been much less than that of interest rates.

If the macroeconomic factors that caused this increase in cost persist, then one approach to relieve the burden on firms is to require employees to pay higher contributions. However, this inevitably leads to a reduction in the standard of living before retirement. Another approach is to reduce the DB pension provided or to move to DC with lower contribution rates. However, this leads to a reduction in the standard of living after retirement. Furthermore, both of these approaches effectively transfer the burden to the Government which will then transfer it back to the tax-paying population, reducing standards of living by a different route. The only reasonable solution is to delay retirement either by increasing retirement ages or by increasing the opportunities for part-time work and a more gradual move towards full retirement. This approach is also consistent with alleviating the symptoms of the increase in longevity.

On the benefits side, it is important to recognise that although employees with DB pensions have effectively had higher pay rises than their DC counterparts, the increases attributable to DB pension accrual do not actually result in a higher pension; they merely reflect the fact that the pensions to which individuals are entitled have got more expensive. Another way of looking at this is that deferred pay that pensions constitute has been cut for individuals with DC pensions if DC contribution rates have remained static.

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Appendix 1 – Employer Costs

50% NAE, Non-Contributory – Males

ERP	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs	0.53%	0.53%	0.53%	0.53%	0.53%	0.53%	0.53%	0.53%	0.53%
Increase – Pension	1.84%	1.60%	1.23%	2.10%	1.87%	1.34%	2.22%	2.05%	1.44%
Pension Components									
<i>Discount Rate</i>	1.50%	1.15%	0.64%	1.76%	1.43%	0.75%	1.88%	1.60%	0.85%
<i>Mortality</i>	0.33%	0.33%	0.29%	0.33%	0.33%	0.29%	0.33%	0.33%	0.29%
<i>Benefits</i>	0.09%	0.19%	0.37%	0.09%	0.19%	0.37%	0.09%	0.19%	0.37%
<i>Balancing Item</i>	-0.07%	-0.07%	-0.08%	-0.07%	-0.07%	-0.08%	-0.07%	-0.07%	-0.08%
Total	6.86%	6.62%	6.25%	7.13%	6.90%	6.36%	7.24%	7.07%	6.46%

50% NAE, Non-Contributory - Females

ERP	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs	0.53%	0.53%	0.53%	0.53%	0.53%	0.53%	0.53%	0.53%	0.53%
Increase – Pension	1.99%	1.71%	1.29%	2.29%	2.02%	1.41%	2.42%	2.21%	1.52%
Pension Components									
<i>Discount Rate</i>	1.72%	1.32%	0.73%	2.02%	1.63%	0.84%	2.15%	1.83%	0.95%
<i>Mortality</i>	0.23%	0.23%	0.22%	0.23%	0.23%	0.22%	0.23%	0.23%	0.22%
<i>Benefits</i>	0.11%	0.23%	0.43%	0.11%	0.23%	0.43%	0.11%	0.23%	0.43%
<i>Balancing Item</i>	-0.07%	-0.07%	-0.08%	-0.07%	-0.07%	-0.08%	-0.07%	-0.07%	-0.08%
Total	7.02%	6.73%	6.32%	7.32%	7.04%	6.43%	7.44%	7.24%	6.54%

50% NAE, 6% Employee Contributions - Males

ERP	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs	0.53%	0.53%	0.53%	0.53%	0.53%	0.53%	0.53%	0.53%	0.53%
Increase – Pension	1.97%	1.71%	1.32%	2.25%	2.01%	1.43%	2.37%	2.19%	1.54%
Pension Components									
<i>Discount Rate</i>	1.58%	1.21%	0.68%	1.86%	1.51%	0.79%	1.98%	1.69%	0.90%
<i>Mortality</i>	0.34%	0.35%	0.30%	0.34%	0.35%	0.30%	0.34%	0.35%	0.30%
<i>Benefits</i>	0.09%	0.20%	0.39%	0.09%	0.20%	0.39%	0.09%	0.20%	0.39%
<i>Balancing Item</i>	-0.05%	-0.05%	-0.05%	-0.05%	-0.05%	-0.05%	-0.05%	-0.05%	-0.05%
Total	6.99%	6.74%	6.34%	7.28%	7.03%	6.46%	7.40%	7.22%	6.56%

50% NAE, 6% Employee Contributions - Females

ERP	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs	0.53%	0.53%	0.53%	0.53%	0.53%	0.53%	0.53%	0.53%	0.53%
Increase – Pension	2.13%	1.83%	1.38%	2.45%	2.15%	1.51%	2.58%	2.36%	1.62%
Pension Components									
<i>Discount Rate</i>	1.82%	1.39%	0.76%	2.14%	1.72%	0.89%	2.27%	1.93%	1.00%
<i>Mortality</i>	0.24%	0.24%	0.23%	0.24%	0.24%	0.23%	0.24%	0.24%	0.23%
<i>Benefits</i>	0.12%	0.24%	0.45%	0.12%	0.24%	0.45%	0.12%	0.24%	0.45%
<i>Balancing Item</i>	-0.05%	-0.05%	-0.06%	-0.05%	-0.05%	-0.06%	-0.05%	-0.05%	-0.06%
Total	7.15%	6.85%	6.41%	7.47%	7.18%	6.53%	7.61%	7.39%	6.64%

100% NAE, Non-Contributory - Males

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs	0.42%	0.42%	0.42%	0.42%	0.42%	0.42%	0.42%	0.42%	0.42%
Increase – Pension	1.80%	1.57%	1.22%	2.06%	1.84%	1.32%	2.17%	2.01%	1.42%
Pension Components									
Discount Rate	1.46%	1.12%	0.63%	1.71%	1.39%	0.73%	1.82%	1.56%	0.83%
Mortality	0.32%	0.33%	0.29%	0.32%	0.33%	0.29%	0.32%	0.33%	0.29%
Benefits	0.08%	0.18%	0.36%	0.08%	0.18%	0.36%	0.08%	0.18%	0.36%
Balancing Item	-0.06%	-0.06%	-0.05%	-0.06%	-0.06%	-0.05%	-0.06%	-0.06%	-0.05%
Total	6.72%	6.49%	6.13%	6.97%	6.75%	6.24%	7.08%	6.92%	6.33%

100% NAE, Non-Contributory - Females

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs	0.42%	0.42%	0.42%	0.42%	0.42%	0.42%	0.42%	0.42%	0.42%
Increase – Pension	1.95%	1.68%	1.28%	2.24%	1.98%	1.39%	2.37%	2.17%	1.50%
Pension Components									
Discount Rate	1.68%	1.29%	0.71%	1.97%	1.59%	0.82%	2.09%	1.78%	0.93%
Mortality	0.22%	0.23%	0.21%	0.22%	0.23%	0.21%	0.22%	0.23%	0.21%
Benefits	0.10%	0.22%	0.41%	0.10%	0.22%	0.41%	0.10%	0.22%	0.41%
Balancing Item	-0.05%	-0.06%	-0.06%	-0.05%	-0.06%	-0.06%	-0.05%	-0.06%	-0.06%
Total	6.87%	6.59%	6.19%	7.16%	6.89%	6.31%	7.28%	7.09%	6.41%

100% NAE, 6% Employee Contributions - Males

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs	0.42%	0.42%	0.42%	0.42%	0.42%	0.42%	0.42%	0.42%	0.42%
Increase – Pension	1.92%	1.68%	1.30%	2.19%	1.96%	1.41%	2.31%	2.14%	1.51%
Pension Components									
Discount Rate	1.54%	1.18%	0.66%	1.81%	1.46%	0.77%	1.93%	1.64%	0.87%
Mortality	0.34%	0.34%	0.30%	0.34%	0.34%	0.30%	0.34%	0.34%	0.30%
Benefits	0.09%	0.19%	0.38%	0.09%	0.19%	0.38%	0.09%	0.19%	0.38%
Balancing Item	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%
Total	6.84%	6.59%	6.21%	7.11%	6.87%	6.33%	7.23%	7.05%	6.43%

100% NAE, 6% Employee Contributions – Females

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs	0.42%	0.42%	0.42%	0.42%	0.42%	0.42%	0.42%	0.42%	0.42%
Increase – Pension	2.08%	1.79%	1.36%	2.39%	2.10%	1.48%	2.52%	2.31%	1.59%
Pension Components									
Discount Rate	1.77%	1.35%	0.74%	2.07%	1.67%	0.86%	2.21%	1.87%	0.97%
Mortality	0.24%	0.24%	0.22%	0.24%	0.24%	0.22%	0.24%	0.24%	0.22%
Benefits	0.11%	0.24%	0.44%	0.11%	0.24%	0.44%	0.11%	0.24%	0.44%
Balancing Item	-0.04%	-0.04%	-0.04%	-0.03%	-0.04%	-0.04%	-0.03%	-0.04%	-0.04%
Total	6.99%	6.70%	6.28%	7.30%	7.02%	6.40%	7.43%	7.22%	6.51%

200% NAE, Non-Contributory - Males

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%
Increase – Pension	1.79%	1.55%	1.18%	2.05%	1.82%	1.29%	2.16%	1.99%	1.39%
Pension Components									
Discount Rate	1.47%	1.13%	0.64%	1.74%	1.41%	0.74%	1.85%	1.58%	0.84%
Mortality	0.32%	0.32%	0.28%	0.32%	0.32%	0.28%	0.32%	0.32%	0.28%
Benefits	0.09%	0.19%	0.37%	0.09%	0.19%	0.37%	0.09%	0.19%	0.37%
Balancing Item	-0.08%	-0.09%	-0.10%	-0.08%	-0.09%	-0.10%	-0.08%	-0.09%	-0.10%
Total	6.97%	6.73%	6.36%	7.23%	7.00%	6.47%	7.35%	7.18%	6.57%

200% NAE, Non-Contributory - Females

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%
Increase – Pension	1.94%	1.66%	1.24%	2.24%	1.96%	1.36%	2.36%	2.15%	1.46%
Pension Components									
Discount Rate	1.70%	1.30%	0.72%	1.99%	1.61%	0.83%	2.12%	1.80%	0.94%
Mortality	0.22%	0.22%	0.21%	0.22%	0.22%	0.21%	0.22%	0.22%	0.21%
Benefits	0.11%	0.23%	0.42%	0.11%	0.23%	0.42%	0.11%	0.23%	0.42%
Balancing Item	-0.09%	-0.10%	-0.11%	-0.09%	-0.10%	-0.11%	-0.09%	-0.10%	-0.11%
Total	7.12%	6.84%	6.42%	7.42%	7.14%	6.54%	7.54%	7.34%	6.64%

200% NAE, 6% Employee Contributions - Males

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%
Increase – Pension	1.93%	1.67%	1.28%	2.20%	1.96%	1.39%	2.32%	2.14%	1.49%
Pension Components									
Discount Rate	1.56%	1.19%	0.67%	1.83%	1.48%	0.78%	1.95%	1.66%	0.88%
Mortality	0.33%	0.34%	0.30%	0.33%	0.34%	0.30%	0.33%	0.34%	0.30%
Benefits	0.09%	0.20%	0.39%	0.09%	0.20%	0.39%	0.09%	0.20%	0.39%
Balancing Item	-0.05%	-0.06%	-0.07%	-0.05%	-0.06%	-0.07%	-0.05%	-0.06%	-0.07%
Total	7.11%	6.85%	6.46%	7.38%	7.14%	6.57%	7.50%	7.32%	6.67%

200% NAE, 6% Employee Contributions - Females

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%	0.68%
Increase – Pension	2.08%	1.78%	1.34%	2.40%	2.10%	1.46%	2.53%	2.31%	1.57%
Pension Components									
Discount Rate	1.79%	1.37%	0.75%	2.10%	1.69%	0.87%	2.23%	1.90%	0.98%
Mortality	0.23%	0.24%	0.22%	0.23%	0.24%	0.22%	0.23%	0.24%	0.22%
Benefits	0.12%	0.24%	0.44%	0.12%	0.24%	0.44%	0.12%	0.24%	0.44%
Balancing Item	-0.05%	-0.07%	-0.08%	-0.05%	-0.07%	-0.08%	-0.05%	-0.07%	-0.08%
Total	7.26%	6.96%	6.52%	7.58%	7.28%	6.64%	7.71%	7.49%	6.75%

400% NAE, Non-Contributory - Males

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Increase – Pension	1.79%	1.53%	1.15%	2.06%	1.81%	1.25%	2.17%	1.99%	1.35%
Pension Components									
Discount Rate	1.50%	1.15%	0.65%	1.77%	1.43%	0.75%	1.88%	1.61%	0.85%
Mortality	0.32%	0.32%	0.28%	0.32%	0.32%	0.28%	0.32%	0.32%	0.28%
Benefits	0.09%	0.19%	0.38%	0.09%	0.19%	0.38%	0.09%	0.19%	0.38%
Balancing Item	-0.12%	-0.13%	-0.16%	-0.12%	-0.13%	-0.16%	-0.12%	-0.13%	-0.16%
Total	7.28%	7.03%	6.64%	7.55%	7.31%	6.75%	7.66%	7.48%	6.85%

400% NAE, Non-Contributory - Females

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Increase – Pension	1.94%	1.64%	1.20%	2.24%	1.95%	1.32%	2.37%	2.15%	1.43%
Pension Components									
Discount Rate	1.72%	1.32%	0.73%	2.03%	1.63%	0.85%	2.16%	1.83%	0.95%
Mortality	0.22%	0.22%	0.21%	0.22%	0.22%	0.21%	0.22%	0.22%	0.21%
Benefits	0.11%	0.24%	0.43%	0.11%	0.24%	0.43%	0.11%	0.24%	0.43%
Balancing Item	-0.12%	-0.14%	-0.17%	-0.12%	-0.14%	-0.17%	-0.12%	-0.14%	-0.17%
Total	7.43%	7.13%	6.70%	7.73%	7.44%	6.81%	7.86%	7.64%	6.92%

400% NAE, 6% Employee Contributions - Males

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Increase – Pension	1.94%	1.67%	1.26%	2.23%	1.97%	1.37%	2.35%	2.15%	1.48%
Pension Components									
Discount Rate	1.58%	1.22%	0.68%	1.87%	1.51%	0.79%	1.99%	1.70%	0.90%
Mortality	0.33%	0.34%	0.29%	0.33%	0.34%	0.29%	0.33%	0.34%	0.29%
Benefits	0.10%	0.20%	0.40%	0.10%	0.20%	0.40%	0.10%	0.20%	0.40%
Balancing Item	-0.07%	-0.09%	-0.11%	-0.07%	-0.09%	-0.11%	-0.07%	-0.09%	-0.11%
Total	7.44%	7.17%	6.75%	7.72%	7.46%	6.87%	7.84%	7.65%	6.97%

400% NAE, 6% Employee Contributions - Females

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Increase – Pension	2.10%	1.78%	1.31%	2.42%	2.11%	1.44%	2.56%	2.32%	1.55%
Pension Components									
Discount Rate	1.82%	1.39%	0.76%	2.14%	1.72%	0.89%	2.28%	1.93%	1.00%
Mortality	0.23%	0.23%	0.22%	0.23%	0.23%	0.22%	0.23%	0.23%	0.22%
Benefits	0.12%	0.25%	0.46%	0.12%	0.25%	0.46%	0.12%	0.25%	0.46%
Balancing Item	-0.07%	-0.10%	-0.13%	-0.07%	-0.10%	-0.13%	-0.07%	-0.10%	-0.13%
Total	7.59%	7.27%	6.81%	7.91%	7.60%	6.93%	8.05%	7.81%	7.05%

Appendix 2 – Employee Benefits

50% NAE, Non-Contributory – Males

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs, IT	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%
Increase – Pension	2.37%	2.07%	1.61%	2.71%	2.42%	1.75%	2.86%	2.65%	1.87%
Pension Components									
<i>Discount Rate</i>	1.88%	1.43%	0.79%	2.22%	1.78%	0.93%	2.37%	2.01%	1.05%
<i>Mortality</i>	0.41%	0.41%	0.36%	0.41%	0.41%	0.36%	0.41%	0.41%	0.36%
<i>Benefits</i>	0.11%	0.24%	0.46%	0.11%	0.24%	0.46%	0.11%	0.24%	0.46%
<i>Balancing Item</i>	-0.02%	-0.01%	0.00%	-0.02%	-0.01%	0.01%	-0.02%	-0.01%	0.01%
Total	7.01%	6.71%	6.25%	7.36%	7.07%	6.39%	7.51%	7.29%	6.52%

50% NAE, Non-Contributory - Females

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs, IT	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%
Increase – Pension	2.56%	2.20%	1.69%	2.95%	2.60%	1.84%	3.12%	2.86%	1.97%
Pension Components									
<i>Discount Rate</i>	2.15%	1.63%	0.89%	2.53%	2.03%	1.03%	2.70%	2.28%	1.17%
<i>Mortality</i>	0.28%	0.29%	0.27%	0.28%	0.29%	0.27%	0.28%	0.29%	0.27%
<i>Benefits</i>	0.14%	0.29%	0.53%	0.14%	0.29%	0.53%	0.14%	0.29%	0.53%
<i>Balancing Item</i>	-0.01%	0.00%	0.01%	-0.01%	0.00%	0.01%	-0.01%	0.00%	0.01%
Total	7.20%	6.85%	6.33%	7.59%	7.24%	6.48%	7.76%	7.50%	6.61%

50% NAE, 6% Employee Contributions - Males

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs, IT	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%
Increase – Pension	2.55%	2.22%	1.73%	2.92%	2.60%	1.87%	3.08%	2.85%	2.01%
Pension Components									
<i>Discount Rate</i>	2.01%	1.53%	0.84%	2.38%	1.91%	0.99%	2.54%	2.15%	1.12%
<i>Mortality</i>	0.43%	0.44%	0.38%	0.43%	0.44%	0.38%	0.43%	0.44%	0.38%
<i>Benefits</i>	0.12%	0.25%	0.49%	0.12%	0.25%	0.49%	0.12%	0.25%	0.49%
<i>Balancing Item</i>	-0.01%	0.00%	0.02%	-0.01%	0.00%	0.02%	-0.01%	0.00%	0.02%
Total	7.19%	6.86%	6.37%	7.56%	7.25%	6.52%	7.72%	7.49%	6.65%

50% NAE, 6% Employee Contributions - Females

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs, IT	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%	0.14%
Increase – Pension	2.75%	2.36%	1.81%	3.17%	2.79%	1.96%	3.35%	3.07%	2.11%
Pension Components									
<i>Discount Rate</i>	2.30%	1.74%	0.94%	2.71%	2.17%	1.10%	2.90%	2.44%	1.24%
<i>Mortality</i>	0.30%	0.30%	0.28%	0.30%	0.30%	0.28%	0.30%	0.30%	0.28%
<i>Benefits</i>	0.15%	0.31%	0.56%	0.15%	0.31%	0.56%	0.15%	0.31%	0.56%
<i>Balancing Item</i>	0.00%	0.01%	0.02%	0.00%	0.01%	0.02%	0.00%	0.01%	0.02%
Total	7.39%	7.00%	6.45%	7.81%	7.43%	6.61%	7.99%	7.71%	6.75%

100% NAE, Non-Contributory - Males

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs, IT	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%
Increase – Pension	2.56%	2.23%	1.72%	2.94%	2.62%	1.87%	3.11%	2.87%	2.01%
Pension Components									
<i>Discount Rate</i>	2.03%	1.55%	0.85%	2.41%	1.93%	1.00%	2.57%	2.18%	1.13%
<i>Mortality</i>	0.44%	0.45%	0.39%	0.44%	0.45%	0.39%	0.44%	0.45%	0.39%
<i>Benefits</i>	0.12%	0.26%	0.50%	0.12%	0.26%	0.50%	0.12%	0.26%	0.50%
<i>Balancing Item</i>	-0.03%	-0.02%	-0.01%	-0.03%	-0.02%	-0.01%	-0.02%	-0.01%	0.00%
Total	7.29%	6.95%	6.45%	7.67%	7.34%	6.60%	7.83%	7.59%	6.74%

100% NAE, Non-Contributory - Females

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs, IT	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%
Increase – Pension	2.77%	2.37%	1.80%	3.19%	2.81%	1.97%	3.38%	3.09%	2.11%
Pension Components									
<i>Discount Rate</i>	2.33%	1.76%	0.95%	2.75%	2.19%	1.11%	2.93%	2.47%	1.26%
<i>Mortality</i>	0.30%	0.31%	0.28%	0.30%	0.31%	0.28%	0.30%	0.31%	0.28%
<i>Benefits</i>	0.16%	0.32%	0.57%	0.16%	0.32%	0.57%	0.16%	0.32%	0.57%
<i>Balancing Item</i>	-0.02%	-0.02%	0.00%	-0.02%	-0.01%	0.00%	-0.01%	-0.01%	0.00%
Total	7.49%	7.09%	6.53%	7.92%	7.53%	6.69%	8.10%	7.81%	6.84%

100% NAE, 6% Employee Contributions - Males

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs, IT	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%
Increase – Pension	2.78%	2.41%	1.86%	3.19%	2.84%	2.02%	3.37%	3.11%	2.17%
Pension Components									
<i>Discount Rate</i>	2.19%	1.66%	0.91%	2.60%	2.08%	1.07%	2.78%	2.35%	1.21%
<i>Mortality</i>	0.47%	0.48%	0.41%	0.47%	0.48%	0.41%	0.47%	0.48%	0.41%
<i>Benefits</i>	0.13%	0.28%	0.54%	0.13%	0.28%	0.54%	0.13%	0.28%	0.54%
<i>Balancing Item</i>	-0.01%	0.00%	0.01%	-0.01%	0.00%	0.01%	-0.01%	0.00%	0.01%
Total	7.50%	7.14%	6.59%	7.92%	7.56%	6.75%	8.09%	7.83%	6.90%

100% NAE, 6% Employee Contributions - Females

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs, IT	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%
Increase – Pension	2.99%	2.56%	1.95%	3.46%	3.03%	2.12%	3.66%	3.34%	2.28%
Pension Components									
<i>Discount Rate</i>	2.50%	1.89%	1.02%	2.96%	2.36%	1.19%	3.16%	2.66%	1.34%
<i>Mortality</i>	0.32%	0.33%	0.30%	0.32%	0.33%	0.30%	0.32%	0.33%	0.30%
<i>Benefits</i>	0.17%	0.34%	0.62%	0.17%	0.34%	0.62%	0.17%	0.34%	0.62%
<i>Balancing Item</i>	0.00%	0.00%	0.01%	0.00%	0.01%	0.01%	0.00%	0.01%	0.02%
Total	7.72%	7.28%	6.67%	8.18%	7.76%	6.84%	8.39%	8.07%	7.00%

200% NAE, Non-Contributory - Males

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs, IT	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%
Increase – Pension	2.74%	2.39%	1.86%	3.13%	2.79%	2.02%	3.30%	3.06%	2.16%
Pension Components									
<i>Discount Rate</i>	2.13%	1.61%	0.88%	2.52%	2.01%	1.04%	2.69%	2.27%	1.18%
<i>Mortality</i>	0.46%	0.46%	0.40%	0.46%	0.46%	0.40%	0.46%	0.46%	0.40%
<i>Benefits</i>	0.13%	0.27%	0.52%	0.13%	0.27%	0.52%	0.13%	0.27%	0.52%
<i>Balancing Item</i>	0.03%	0.04%	0.06%	0.03%	0.05%	0.07%	0.03%	0.05%	0.07%
Total	7.20%	6.85%	6.32%	7.59%	7.25%	6.48%	7.76%	7.52%	6.62%

200% NAE, Non-Contributory - Females

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs, IT	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%
Increase – Pension	2.95%	2.54%	1.95%	3.40%	2.99%	2.12%	3.59%	3.29%	2.27%
Pension Components									
<i>Discount Rate</i>	2.43%	1.84%	0.99%	2.87%	2.29%	1.15%	3.07%	2.58%	1.31%
<i>Mortality</i>	0.32%	0.32%	0.30%	0.32%	0.32%	0.30%	0.32%	0.32%	0.30%
<i>Benefits</i>	0.16%	0.33%	0.59%	0.16%	0.33%	0.59%	0.16%	0.33%	0.59%
<i>Balancing Item</i>	0.04%	0.05%	0.07%	0.05%	0.06%	0.07%	0.05%	0.06%	0.08%
Total	7.41%	7.00%	6.41%	7.86%	7.45%	6.58%	8.05%	7.75%	6.73%

200% NAE, 6% Employee Contributions - Males

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs, IT	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%
Increase – Pension	2.96%	2.57%	2.00%	3.39%	3.01%	2.17%	3.58%	3.30%	2.32%
Pension Components									
<i>Discount Rate</i>	2.30%	1.74%	0.94%	2.73%	2.17%	1.11%	2.91%	2.46%	1.26%
<i>Mortality</i>	0.49%	0.50%	0.43%	0.49%	0.50%	0.43%	0.49%	0.50%	0.43%
<i>Benefits</i>	0.14%	0.29%	0.56%	0.14%	0.29%	0.56%	0.14%	0.29%	0.56%
<i>Balancing Item</i>	0.03%	0.04%	0.07%	0.04%	0.05%	0.07%	0.04%	0.05%	0.07%
Total	7.42%	7.03%	6.46%	7.85%	7.47%	6.63%	8.04%	7.76%	6.78%

200% NAE, 6% Employee Contributions - Females

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs, IT	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%	-0.04%
Increase – Pension	3.18%	2.73%	2.09%	3.67%	3.23%	2.27%	3.89%	3.55%	2.44%
Pension Components									
<i>Discount Rate</i>	2.62%	1.97%	1.06%	3.10%	2.46%	1.24%	3.32%	2.78%	1.40%
<i>Mortality</i>	0.34%	0.34%	0.31%	0.34%	0.34%	0.31%	0.34%	0.34%	0.31%
<i>Benefits</i>	0.18%	0.36%	0.64%	0.18%	0.36%	0.64%	0.18%	0.36%	0.64%
<i>Balancing Item</i>	0.05%	0.06%	0.08%	0.05%	0.06%	0.08%	0.06%	0.07%	0.08%
Total	7.64%	7.19%	6.55%	8.13%	7.69%	6.73%	8.35%	8.01%	6.90%

400% NAE, Non-Contributory - Males

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs, IT	-0.10%	-0.10%	-0.10%	-0.10%	-0.10%	-0.10%	-0.10%	-0.10%	-0.10%
Increase – Pension	2.92%	2.54%	1.98%	3.34%	2.97%	2.15%	3.52%	3.25%	2.30%
Pension Components									
<i>Discount Rate</i>	2.27%	1.72%	0.94%	2.69%	2.15%	1.10%	2.87%	2.43%	1.25%
<i>Mortality</i>	0.49%	0.49%	0.42%	0.49%	0.49%	0.42%	0.49%	0.49%	0.42%
<i>Benefits</i>	0.14%	0.29%	0.55%	0.14%	0.29%	0.55%	0.14%	0.29%	0.55%
<i>Balancing Item</i>	0.02%	0.04%	0.07%	0.03%	0.05%	0.07%	0.03%	0.05%	0.07%
Total	7.32%	6.94%	6.38%	7.74%	7.37%	6.55%	7.92%	7.65%	6.70%

400% NAE, Non-Contributory - Females

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs, IT	-0.10%	-0.10%	-0.10%	-0.10%	-0.10%	-0.10%	-0.10%	-0.10%	-0.10%
Increase – Pension	3.15%	2.70%	2.07%	3.62%	3.18%	2.25%	3.83%	3.50%	2.41%
Pension Components									
<i>Discount Rate</i>	2.59%	1.95%	1.05%	3.07%	2.43%	1.22%	3.27%	2.75%	1.38%
<i>Mortality</i>	0.34%	0.34%	0.31%	0.34%	0.34%	0.31%	0.34%	0.34%	0.31%
<i>Benefits</i>	0.17%	0.35%	0.63%	0.17%	0.35%	0.63%	0.17%	0.35%	0.63%
<i>Balancing Item</i>	0.04%	0.06%	0.08%	0.04%	0.06%	0.08%	0.05%	0.06%	0.08%
Total	7.54%	7.10%	6.47%	8.02%	7.58%	6.65%	8.23%	7.90%	6.81%

400% NAE, 6% Employee Contributions - Males

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs, IT	-0.10%	-0.10%	-0.10%	-0.10%	-0.10%	-0.10%	-0.10%	-0.10%	-0.10%
Increase – Pension	3.17%	2.75%	2.13%	3.63%	3.22%	2.31%	3.83%	3.53%	2.48%
Pension Components									
<i>Discount Rate</i>	2.47%	1.86%	1.01%	2.93%	2.33%	1.18%	3.13%	2.64%	1.35%
<i>Mortality</i>	0.52%	0.53%	0.45%	0.52%	0.53%	0.45%	0.52%	0.53%	0.45%
<i>Benefits</i>	0.15%	0.32%	0.60%	0.15%	0.32%	0.60%	0.15%	0.32%	0.60%
<i>Balancing Item</i>	0.02%	0.04%	0.07%	0.02%	0.04%	0.07%	0.03%	0.05%	0.07%
Total	7.56%	7.15%	6.53%	8.03%	7.62%	6.71%	8.23%	7.93%	6.87%

400% NAE, 6% Employee Contributions - Females

Equity Risk Premium	0%			2%			4%		
Age	20	40	60	20	40	60	20	40	60
Increase – NAE	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%	4.50%
Increase – NICs, IT	-0.10%	-0.10%	-0.10%	-0.10%	-0.10%	-0.10%	-0.10%	-0.10%	-0.10%
Increase – Pension	3.41%	2.91%	2.23%	3.93%	3.44%	2.42%	4.16%	3.79%	2.60%
Pension Components									
<i>Discount Rate</i>	2.81%	2.11%	1.12%	3.33%	2.64%	1.31%	3.56%	2.98%	1.49%
<i>Mortality</i>	0.36%	0.36%	0.33%	0.36%	0.36%	0.33%	0.36%	0.36%	0.33%
<i>Benefits</i>	0.20%	0.39%	0.69%	0.20%	0.39%	0.69%	0.20%	0.39%	0.69%
<i>Balancing Item</i>	0.04%	0.06%	0.08%	0.04%	0.06%	0.08%	0.04%	0.06%	0.08%
Total	7.81%	7.31%	6.63%	8.33%	7.84%	6.82%	8.56%	8.19%	6.99%