PENSIONS AND LOW INFLATION

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ABSTRACT

This working party has considered the pensions implications of a prolonged period of low inflation. Experience in the United States suggests weaker correlation between equity and bond returns and greater overall volatility of returns. Without a further significant increase in the valuation of equities relative to their underlying economic activity, the cost of pensions will rise, possibly as much as doubling within the next 15 years. It follows that for defined contribution schemes and personal pensions, current contribution levels are likely to produce disappointing and generally inadequate results. Similarly, the costs of defined benefit promises will increase. Future defined benefit provision is also vulnerable to the mismatch of mainly equity assets with mainly fixed liabilities and is therefore difficult to control. Many practical issues of scheme design still reflect past inflation and need to be addressed.

1 INTRODUCTION

1.1 Background

1.1.1 This paper is the result of a Working Party, which was set up by the Technical Support and Research Committee of the Pensions Board to:

- consider the implications for pension arrangements of a prolonged period of low inflation and low interest rates, and
- recommend any steps that the profession should take.

1.1.2 The full terms of reference are included in appendix 1. We have kept tightly to this mandate as we have become convinced that some powerful conclusions can be drawn, on the simple assumption that future UK inflation will average 2.5%.

1.2 Historical perspective

1.2.1 Sustained peacetime inflation without economic collapse is a phenomenon of the last half-century, but so is widespread provision of good, mainly final salary-linked, occupational pensions.

1.2.2 In the 1970s, inflation was fuelled by the oil price quadrupling. The annual rate of increase in the UK Retail Prices Index peaked at 27% and prices nearly tripled in nine years. This ‘great inflation’ produced real injustice, with those reliant on pensions or other income not linked to wages or prices suffering a huge, permanent and totally unexpected reduction in standard of living. However, commitment to occupational pensions was strong. Other savings were taxed punitively. For example, the top rate on investment income was 98%. For most people, the only practical way to provide for retirement was through a pension arrangement.

1.2.3 Scott (1981) reported that private sector schemes, used as a comparison for the public sector, had typically provided 50 to 55% protection against inflation in the preceding five years or so, that is a fall in the purchasing power of pensions of about 20%. An appendix to Scott's report submitted by Professor RA Brealey and Dr SD Hodges concluded that the best estimate of the real discount rate for a fully index-linked investment was -0.9%. This was based on a mixture of long-term borrowing and a large investment in short-dated fixed interest. The inaugural index-linked bond was eventually issued in 1982 yielding 2%. Even after dividend controls were ended in 1979, many of the original promoters of equity investment in the 1950s doubted whether dividends could once again rise in line with prices, let alone overall economic growth. Such was the effect of high inflation.

1.2.4 After the second oil shock in 1979, prices rose by a further 50% in three years and thereafter at around 5% a year on average. Companies were comfortable with their final salary pension commitment to employees as the liability was still cushioned by a substantial discretionary element in benefits.

1.2.5 Following the housing boom in the late 1980s, inflation rose again, briefly to 11%. With benefit flexibility much reduced, the subsequent sustained fall in inflation and interest rates could have been very painful for pension funds and their sponsors. However high returns on investment in equities cushioned the effects of the mismatch of mainly equity investments with mainly fixed liabilities. Company profitability prospered to an extent that was not generally foreseen and therefore only gradually discounted in share prices.

1.2.6 This benign environment has lulled many commentators, including the press and trustees, members and even sponsors, into expecting high investment returns. These returns are expected to provide windfall surplus relative to actuarial assumptions, which have generally proved conservative in the past. But, if these effects are effectively transitional, reflecting the once and for all conquest of inflation, then there is a coming cost crunch. This has been the focus of our investigations.

1.3 Structure of this paper

1.3.1 Section 2 reviews financial markets and the impact of inflation. In particular, the US experience suggests, uncomfortably, that low inflation may lead to lower correlation between equity and bond returns but also, surprisingly, that it may lead to more volatility in investment returns. We also explain the rationale for the key economic assumptions used in later projections. This section also looks at gilt market distortions and the extent to which the Minimum Funding Requirement (MFR) and other regulatory requirements may be increasing the costs and risks to those companies which provide salary related pensions.

1.3.2 Section 3 considers defined contribution schemes, in particular the historic costs and potential future costs of meeting the aspirations of sponsors and members. These implications are relevant to all long-term savings arrangements, including defined benefit schemes.

1.3.3 Section 4 covers some design features of defined benefit schemes, which leave them vulnerable to low inflation. We also consider current expectations about the cost of pension provision and examine the impact of low inflation accompanied by low returns on four typical UK defined benefit schemes.

1.3.4 Section 5 concludes that the cost of pensions will rise and that it will require extreme care to ensure that defined benefit provision is not overwhelmed by less benign conditions.

2 FINANCIAL MARKETS

2.1 The impact of inflation on financial markets

2.1.1 An obvious place to start an investigation into the effects of low inflation on financial and actuarial fields is to analyse the past experience of financial markets, and how they have reacted to inflation in the past. However, there is a hindrance: quality data is relatively short term in nature, and exists for relatively few countries. The only two sets of data that appear to be continuous, reliable and long-term are the US and the UK.

2.1.2 The data we have analysed are from the UK (from 1919) and from the US (from 1926). Both periods contain the 'Great Depression' and so may be viewed as either interesting but misleading, or a true reflection of the risks and experiences of an economy. We have attempted to obtain credible long-term data for other economies (for example, Germany and Japan) but were not satisfied that reliable continuous data is available. German and Japanese data is limited to post 1945 and the early years are heavily influenced by their extraordinary recoveries after the war.

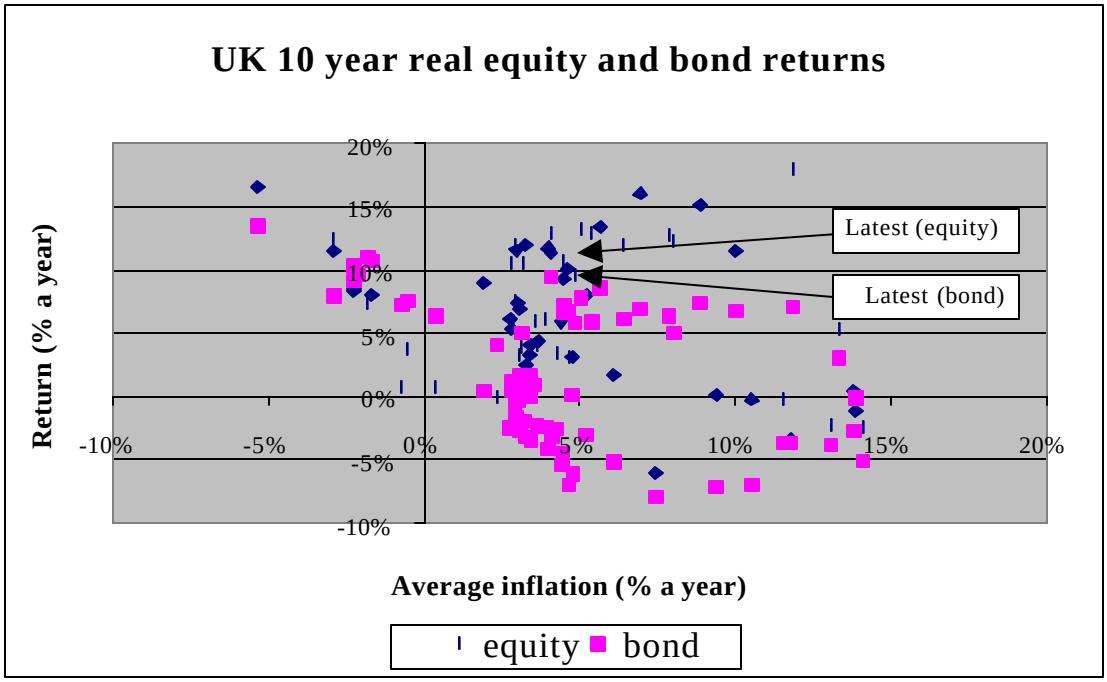
2.1.3 The US has undoubtedly been the more stable economy, albeit largely self sufficient until it started importing oil. It has therefore been substantially immune to external shocks and much less distorted by nationalisation and central planning than other economies. By contrast, the UK economy recovered only slowly and belatedly from the ravages of two world wars and loss of Empire: exchange controls persisted until 1979. Arguably, the inflation of the 1970s was worse in the UK because it was so helpful in controlling the real burden of the national debt. If we are now in a benign, low inflation environment, then we think that the US experience is the most relevant.

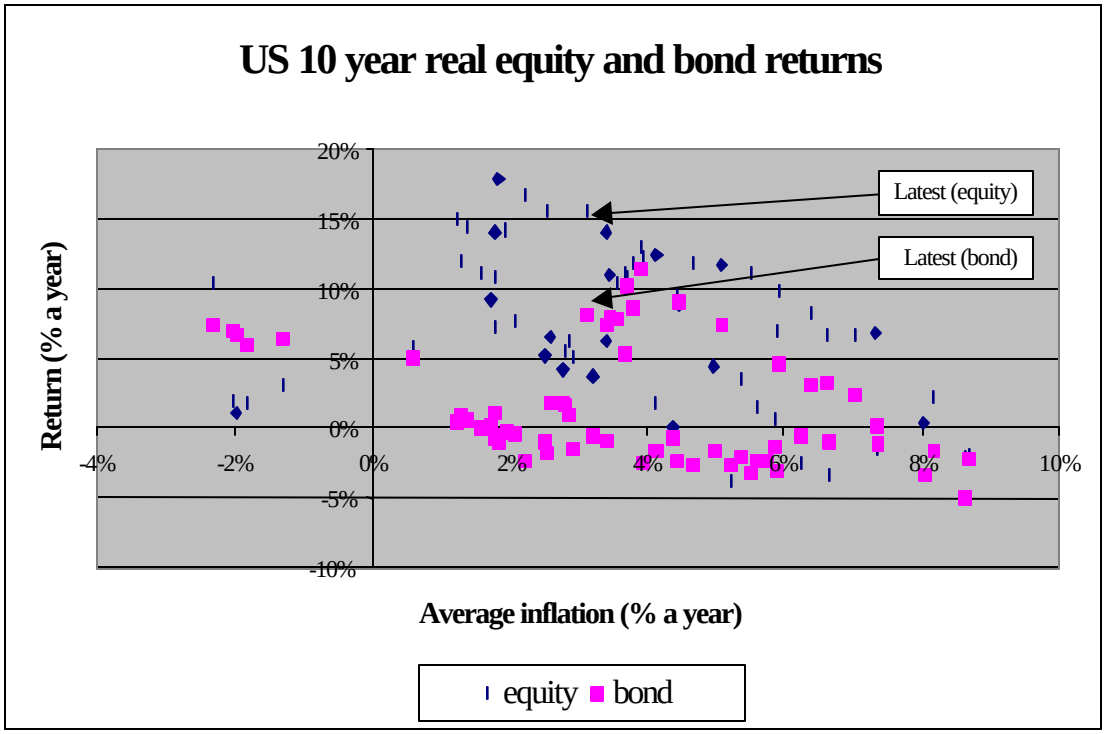
2.1.4 The data analysed consisted of retail prices, broad equity indices and long bond data. The investigation centred on:

- mean levels of real return
- volatility of real return
- correlation of real equity and bond returns.

2.2 Return

2.2.1 The following graphs show the average real returns for UK and US securities over the periods from 1919 and 1926 respectively.

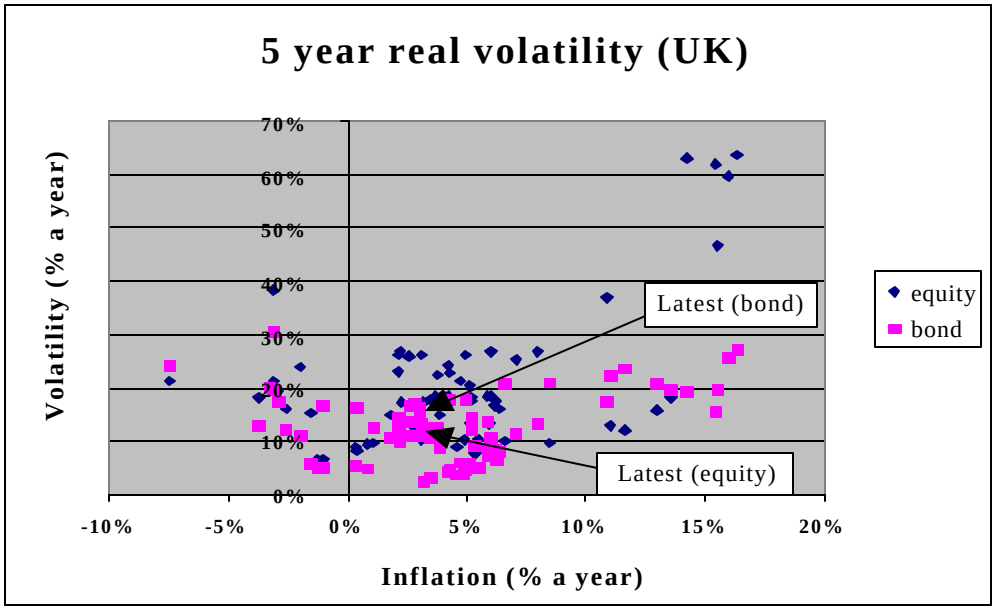


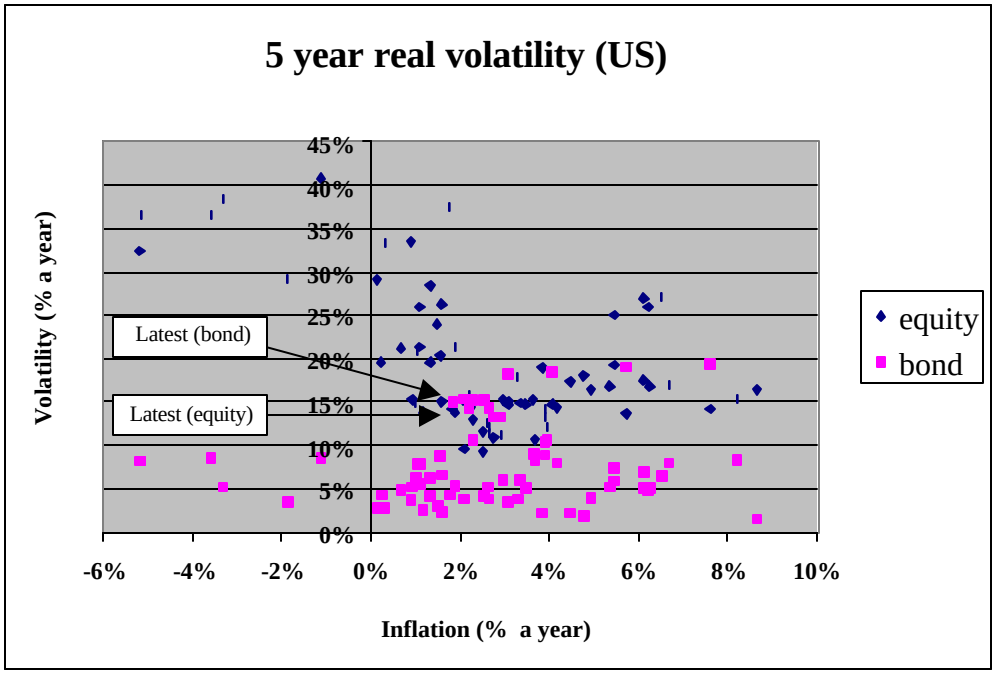


2.2.2 There appears to be relatively little that can be deduced from the UK data regarding lower or higher returns in any particular inflation environment. For the US data, the highest returns appear to have occurred over periods when inflation was 'modest' (defined as inflation in the range of 0% to 4% a year). It should be noted that much of this higher return could be attributed to increases in market valuations brought about by the move to lower inflation.

2.3 Volatility

2.3.1 The following graphs show the average real volatility for UK and US securities over the periods from 1919 and 1926 respectively.

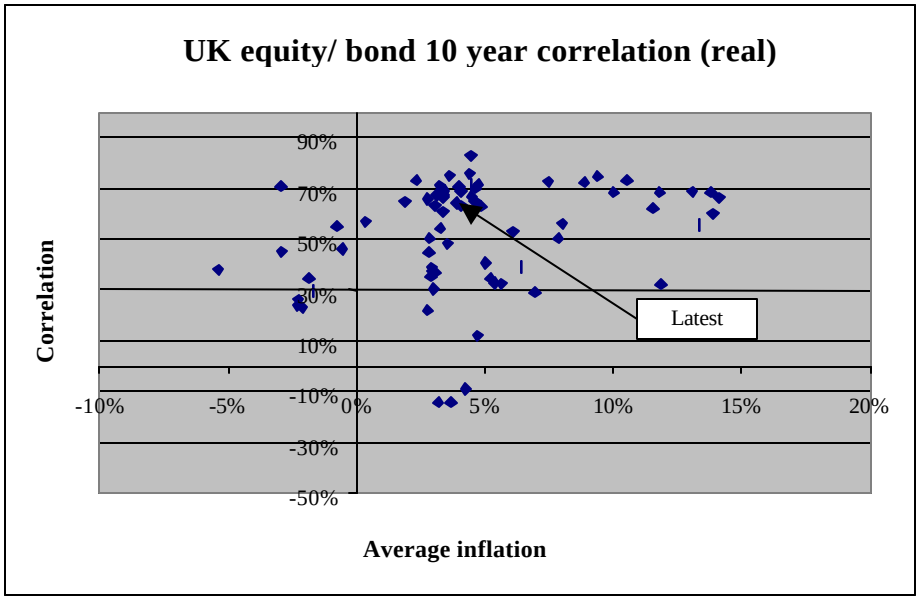


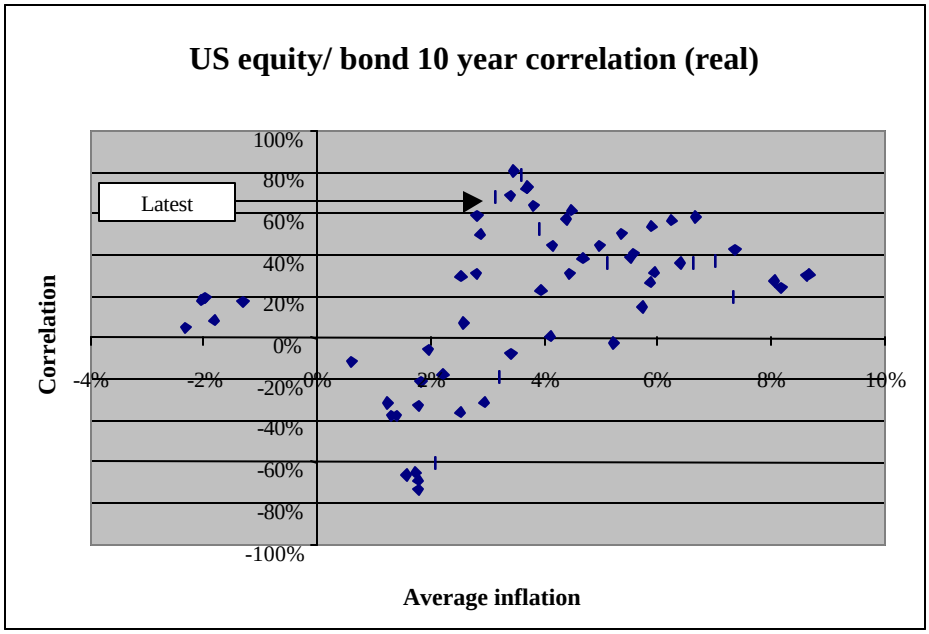


2.3.2 Again it will be noted that there appears to be relatively little that can be deduced from the UK data regarding lower or higher volatility of returns in any particular inflation environment, although one can observe that the periods of highest volatility in the UK appear to have been during very high inflation periods (but note that this is for a very few observations). The converse appears true for the US, with high equity volatility during low inflation periods, and in all periods of deflation.

2.4 Correlation

2.4.1 The following graphs show the average correlations between equities and bonds for the UK and the US, over the periods from 1919 and 1926 respectively.





2.4.2 The UK data does not suggest any relationship. For the US, it appears that low inflation is associated with a lower correlation between equity and bond returns. Perhaps this is what might be expected. If inflation is high then confidence in all markets depends heavily on its conquest; that is, the lowering of inflation expectations leads to lower bond yields and also to higher valuation multiples for equities (and thus higher market valuations). In these conditions the business cycle is of lesser importance in driving market valuations. When inflation is low and stable, and expected to remain low and stable, then the effect of any business cycle becomes more important to market valuations. A strong phase in the business cycle would increase company profits (good for equities) and increase interest rates (due to monetary policy, and also the demand for capital to invest) which would be poor for bond valuations.

2.5 Summary of historical data

2.5.1 Considering the two sets of data:

- US data indicates that low inflation may lead to higher volatility and lower correlation between equity and bond returns. There is evidence of assets providing high returns in the period running up to stable prices.
- UK data would support little in the way of useful conclusions regarding returns and relationships with inflation.

2.6 Risk premium

2.6.1 In this paper the term 'risk premium' refers to the additional return that investors require (as a forward looking expectation) in return for accepting the risk of poor performance against the 'risk free return' that could be attained from investing in (for example) government bonds. This risk could be in respect of equity risk versus risk-free bonds, or it could be the risk of nominal (fixed interest) bonds versus inflation linked (index linked) bonds. Note that this is not the historically experienced extra return. It is the future level of extra return which investors expect when making the initial investment.

2.6.2 Wilkie (1994) noted that the experienced risk premium for equities over fixed interest bonds in the UK had been around 7% a year over extended periods. However, he also noted that a risk premium of this level should not be expected going forward, and estimated a more realistic risk premium of around 2% a year and possibly up to 4% a year in the long term. These estimates were based on equities initially yielding around 1% a year above index-linked gilts, and dividend growth being around 1% a year in real terms.

2.6.3 The assumptions for the analysis in this paper allow for a risk premium on equities of between 2% a year and 2.5% a year (over fixed interest or index linked respectively). This is lower than the level historically observed, but the methodology used to set the risk premium (and the expected return from UK equities) is consistent with the historically observed return on equities. Examples are shown in part 2.11 below.

2.7 **The risks arising from a period of low inflation.**

2.7.1 Financial markets have taken a very long time to convince themselves that inflation is under control, and is unlikely to be a problem in the near future. A measure of this is the 'risk premium' which investors can access in the fixed income markets rather than accepting an index-linked return.

2.7.2 The risk premium for fixed interest securities has taken a decade in the UK to fall from a figure that was generally accepted as being around 1.5% a year to its current level of around 0.5% a year, despite a background of inflation that has gradually fallen year on year. Such a long period to reflect changing economic environments should not surprise us, since it took nearly a decade for the 'great inflation' of 1974-1980 to be fully reflected in gilt yields.

2.7.3 What is more worrying is that the current (historically low) levels of index linked and fixed interest yields in the UK appear to assume a very high probability of low and stable inflation going forward.

2.7.4 These low yields lead to a higher cost of financing pension and other long-term benefits in the future than would otherwise be the case. There appear to be three practicable choices:

- pay more,
- invest in higher returning assets,
- cut benefits.

2.7.5 Cutting benefits would help to ensure affordability, but may only be practicable for future accrual, and may prove unpopular with Trustees and scheme members. Increasing contributions may prove unpalatable to scheme sponsors.

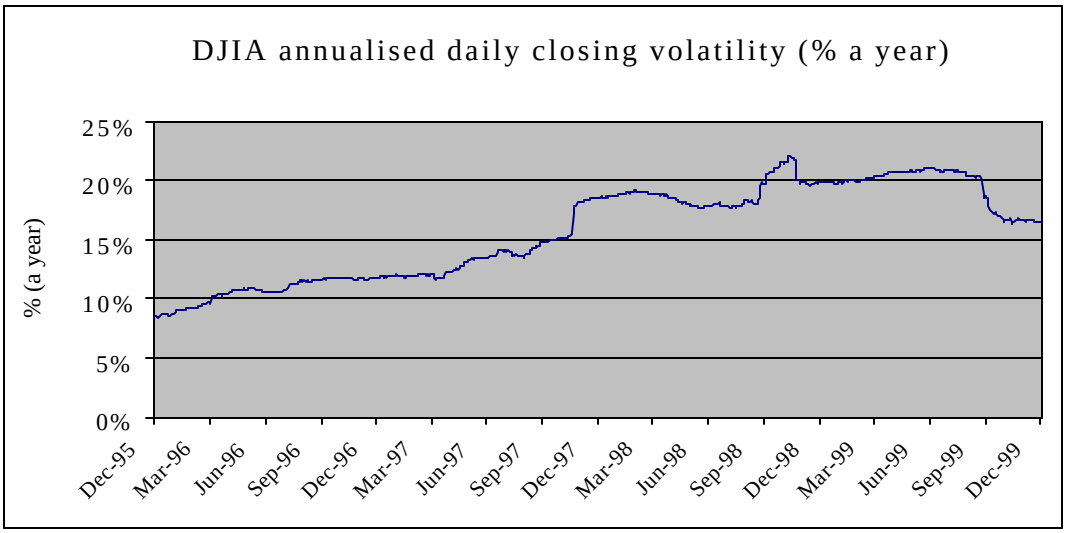
2.7.6 It is difficult to identify asset classes which will actually produce higher returns in advance, although certain asset classes are expected to provide higher returns, but this could mitigate some of the lower levels of return implicit in gilt market pricing. This would usually include a higher weighting in equities rather than bonds (the equity risk premium), or a higher weighting in fixed interest rather than index linked (the fixed interest risk premium). The issue of investing in higher return asset classes has risks, which we discuss further below.

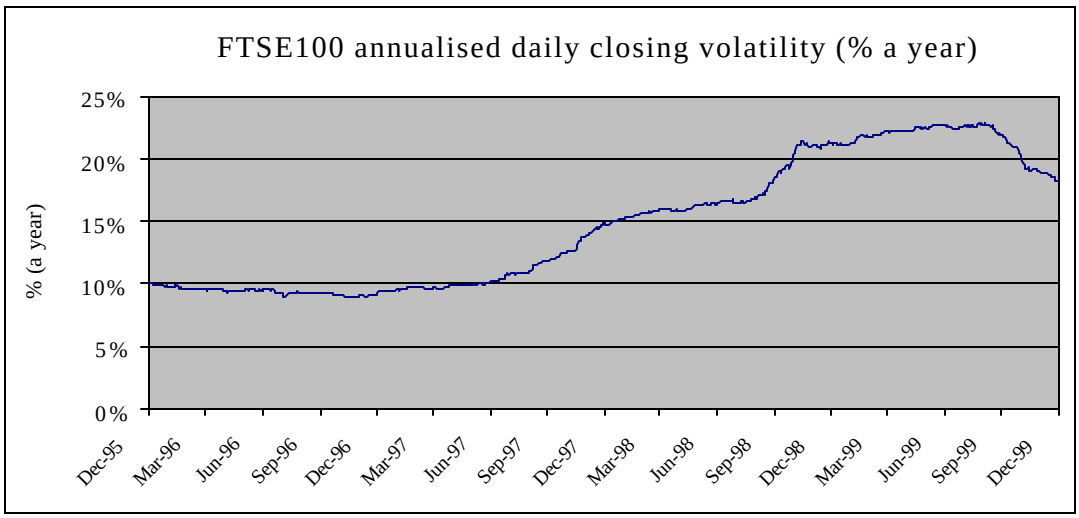
2.8 **Equity investment**

2.8.1 Many defined benefit pension funds in the UK are currently overweight equities (relative to bonds) as defined by the MFR legislation. Also, a growing proportion of actuarial opinion believes that bonds are a more appropriate matching asset than equities, even for active member liabilities. The proposed UK accounting standard (FRED 20) is also likely to increase the pressure for a higher bond weighting for many pension funds, though the freedom to select the assumed future equity return may mitigate some of the pressure. Any further move into equities would increase the investment risks of UK pension funds, by making the market value of their assets more volatile relative to their liabilities (as valued for MFR and accounting purposes).

2.8.2 The perception of equity risk has fallen over the last decade, as witnessed by the increased acceptance by equity investors of lower risk premia. This recently culminated with the views expressed in Glassman and Hassett (1999), who predict that the Dow Jones index will imminently reach 36,000. The view is effectively that equities are no more risky than bonds in the long term, and therefore a risk premium of zero over bonds is appropriate. However, we note that Glassman and Hassett's analysis is based on earnings rather than dividends. Risk premia are generally calculated relative to dividends.

2.8.3 This reduction in the risk premium acceptable to some investors does seem to characterise periods of stable prices, as highlighted by Martin (1999). However, the fact is that experienced volatility actually seems to *rise* for equity markets during such periods. The following graphs show experienced one-year volatility for the Dow Jones Industrial Average and the FTSE 100 for the last 5 years. It is strange to realise that these data are from a period, which is being used to justify lower risk premia in equity markets.





2.9 **Deflation**

2.9.1 A further risk during a prolonged period of (relatively stable) low inflation is the likelihood of periods of negative inflation. The risk here is that the mechanics of pension schemes (which often only allow for pensions to be *increased* in line with the changes to RPI) will lead to pensions being held static, whilst prices (and the coupons and principal of index linked gilts) are falling.

2.9.2 If prices were to fall more rapidly (say over 2% a year, for a period of 5 years or more), then there are likely to be serious effects on pension funds' assets (apart from the direct impact on the real value of the liabilities). One example would be the level of real interest rates on company debt (whilst low in nominal terms) could lead to falling profits, and a less favourable environment for equity investment. Extra pension costs could also affect the profitability of companies with significant pension liabilities.

2.10 **Assumptions**

2.10.1 In this paper we have undertaken deterministic projections allowing for central estimates of return that we believe are realistic (or at least 'best guess'). The assumptions allow for market yields as at 30 June 1999, and are shown below.

	Current Yield % a year	**Adjustment % a year**	**Total real assumption (rounded) % a year**
UK equities	2.26	2.25 (1)	4.5
Bonds			
- UK long dated (15+ years)	5.04	-2.5 (2)	2.5
- Index linked gilts	2.01	-	2.0
RPI	2.50		

(1) Trend economic growth taken as 2.25% a year.

(2) Inflation taken as 2.5% a year.

2.10.2 The rationale for these assumptions is as follows:

- we start with the premise that the current market valuations (and thus yields) are sustainable, and will (subject to fluctuations around this level) remain as the expected market valuation level for the period of projection. Thus the key starting points are the current yields on UK equities, index-linked bonds and fixed interest bonds.
- the dividend yields are compared with the earnings yield (the inverse of the P/E), after allowing for distortions due to depreciation and reinvestment, to ensure that the dividend yield is not misleading.

- dividends are expected to grow in line with trend economic growth (taken as 2¼% a year in the UK, the average since 1970), under the assumption that corporate profit growth will broadly mirror the growth in the economy. Inflation is based on the Bank of England's inflation target, together with consideration of the yield differential between fixed income and index linked bonds.
- no allowance is made for any change in the valuation ratios of equities.

2.10.3 The return assumptions are starkly lower than the returns that have been experienced over the recent past. Whilst some will argue that the level of growth assumed for profits (and dividends) is rather low, the assumption for growth to be higher than GDP growth would imply a net transfer of the wealth earned by individuals (from salary) to capital (shareholders.)

2.10.4 The assumptions for bond returns are less controversial. The returns are simply those which current prices determine. The only uncertainty is whether the inflation assumption is correct (at 2.5% a year), or if this will change (for example, due to Government action, or joining the Euro).

2.11 Equity return assumptions

2.11.1 The methodology for setting assumptions outlined in 2.10 can be compared with the historical returns over the last 30 years. The following table shows the returns that would have been predicted using this method over the periods from 31 December 1969 to 31 December 1998. The table also makes an allowance for the change to the P/E ratio of the equity market (the methodology for setting the assumptions makes no allowance for changes to the P/E ratio):

Date	Dividend Yield % a year	Plus GDP % a year	Plus p/e change % a year *	Total % a year	Actual % a year
31 December 1989	4.2	2.3	3.6	10.1	9.5
31 December 1979	6.9	2.3	5.3	14.5	12.7
31 December 1969	3.9	2.3	0.5	6.7	7.3

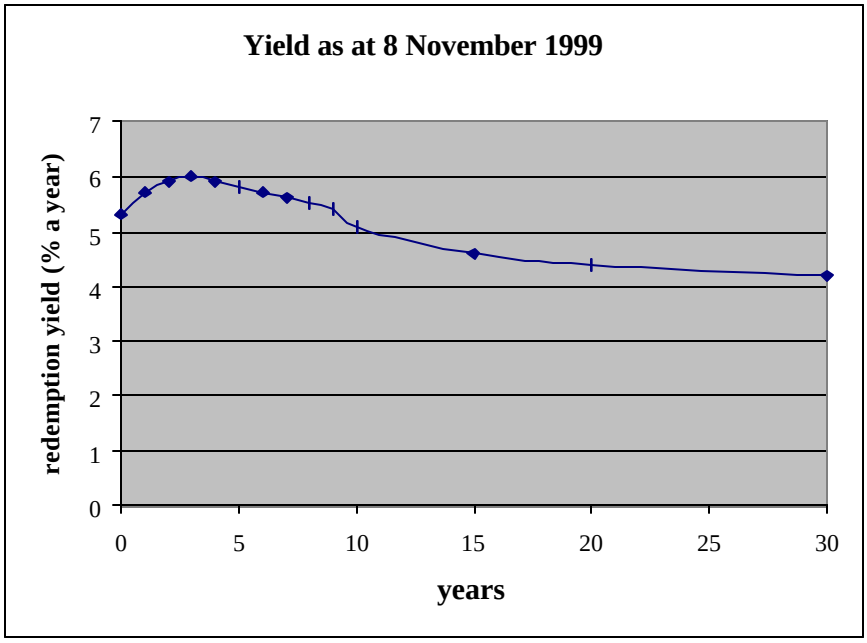
* (P/E for 31 December 1998, 1989, 1979, and 1969 were 22.44, 12.55, 6.56 and 15.15 respectively. There is also an allowance for a change to the allowance for ACT).

2.11.2 The table shows that the expected returns – after allowing for the change to the P/E multiple - were remarkably accurate. This would seem to suggest that a framework for setting assumptions, which is based on company profits escalating broadly in line with trend GDP growth, would have been appropriate in the past.

2.11.3 The estimate of future equity returns has been remarkably accurate once the effect of changing market valuations has been allowed for. This has been undertaken crudely in the above table by allowing for the changes to the P/E multiple over the period.

2.12 **Distortions in the UK gilts market**

2.12.1 What is clear is that current gilt yields are far lower than have been available in the recent past. The fixed income yield curve (shown in the graph below) is inverted, a condition that is usually a sign that short rates are expected to fall (or of the expectation of a recession). The UK curve is the only major government bond index, which has recently been inverted.



2.12.2 Further, if markets are broadly 'efficient', then the UK yield curve recently implied a number of interesting features. For example, investors apparently believed that in 2014:

- UK base rates would be between 3% and 3½% a year, and
- £1 would be worth in excess of DEM 4.50. (Compared to a recent rate of about DEM 3.00)

2.12.3 Alternatively the shape could imply that certain investors are willing to take much lower investment returns than might be expected. Such an attitude could be caused by legislative requirements, and might be described as a 'convenience premium'.

2.12.4 There are certainly plenty of investors who appear to require such matching. These would include pension funds, which wish to reduce the risk of failing the MFR, or life insurers, which wish to reduce the risk of their guaranteed annuity products causing insolvency.

2.12.5 In fact, the increase in the price of (or demand for) these gilts may have been influenced by

- solvency measures have been introduced which disadvantage pension schemes which are underweight in 'minimum risk assets' (defined as long dated bonds), and which are overweight in equities. The terms under- and overweight are relative to the MFR regulations.

- at the same time that these solvency measures were introduced, the discretionary benefit buffer (of pension increases) which helped to cushion pension schemes was being eroded by much lower inflation (and inflation expectations).
- the same factors were working in other areas of the market, for example, leading other investors (insurance companies) to cover the liabilities arising from guaranteed annuities.
- history suggests that in periods of low, stable inflation, the correlation between equities and bonds is likely to decrease, while their relative volatilities are likely to increase. The risk associated with mismatching out of bonds and into equities becomes higher.

2.12.6 It is worth considering the overall liability framework in the UK when trying to understand the scope for this demand. The following figures are for 31 December 1998 and are sourced from Watson Wyatt. Total pension fund assets are around £1,100 billion. Likewise the total market value of low risk assets (that is, gilts) is around £300 billion. The 'lowest risk' assets (as defined by the MFR legislation, which are typically long dated gilts and index linked gilts) have total market values of £66 billion and £60 billion respectively. Thus, there is a potential imbalance of liabilities to assets. The following table of holders of long dated UK gilts illustrates this.

Holders of over 15 year gilts	**£ billion holding**	**%**
Pension funds	13.3	24
Life insurers	36.6	65
General insurers	0.7	1
Unit, investment trusts	0.9	1
Other	4.6	9
Total	56.1	100

Source: Office of National Statistics, 1997

2.12.7 Net demand for long dated index linked has been estimated at greater than £2 billion per quarter. Without significant new issuance, it would appear unlikely that this demand will be satisfied by sales from existing holders.

2.12.8 In fact the supply side for long dated gilts (as defined by the 'over 15 years index') does not look healthy for new investors. The government is not expected to need to issue much government debt in the near term. In addition, one of the stocks in the index (the 2015, representing some £14 billion in market value) will drop out of the index in December 2000.

2.12.9 Bishop (1999) discusses this issue. Two quotes from his recent research paper are:

'An explosive brew of circumstances is unfolding in the UK financial system. An ageing population — with longer life expectancy — is swelling the cash available to pension and life funds. But a massive yield distortion is penalising pensioners and annuitants because a traditional asset — long gilts — is unlikely to be supplied in the desired quantities by a prudent government. The yield problem may even worsen — unless the UK joins EMU or the sterling bond market expands even further.'

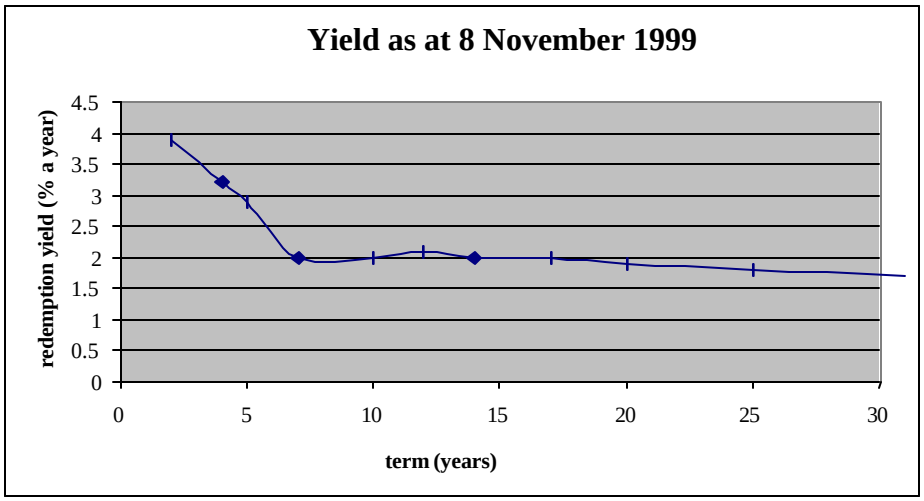
'Increased belief in EMU entry could trigger a major anticipatory sell-off in long gilts as yields converge. The corresponding surge of euro bond purchases could weaken sterling significantly. Overall, an unstable and explosive brew for the next few years.'

2.12.10 The executive summary of this paper is included in appendix 2.

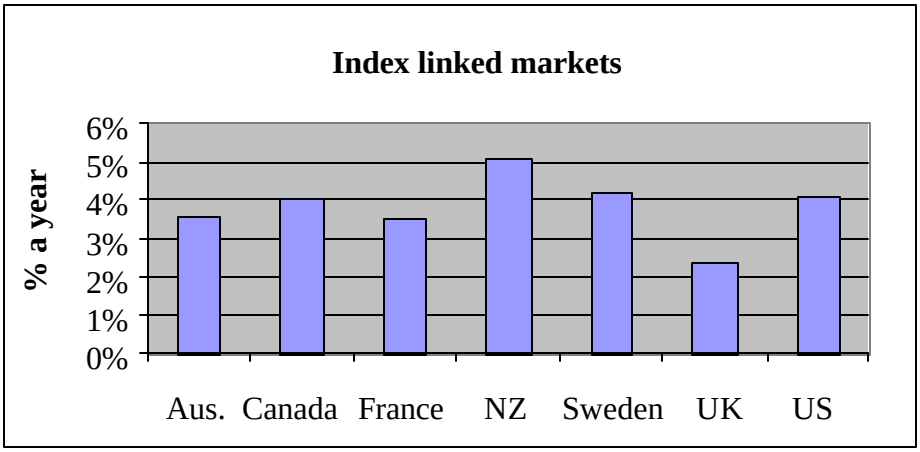
2.12.11 The Debt Management Office should consider the strong demand for issuance in the long dated section of the sterling yield curve when planning issuance. There is also a case for changing the profile of current outstanding debt through switch options for a wide range of shorter dated gilts. (These offer the opportunity to convert shorter dated gilts into longer dated gilts at the request of the holder.)

2.13 Index linked markets

2.13.1 The UK index linked market is inverted for terms up to around five years, but not after. However, it does have a somewhat lower yield than other index linked bond markets around the world. Yields as at 8 November 1999 are shown in the table below.



2.13.2 It is noticeable that the yields are considerably higher for the non-Sterling markets. It is especially strange allowing for the high credit quality of some of the alternative markets, coupled with the different guarantees against deflation for principal that certain of the non-sterling markets offer. Recent yields are summarised below: it should be noted that the overseas markets are generally of shorter duration than the UK market:



Source: Merrill Lynch, 31 October 1999

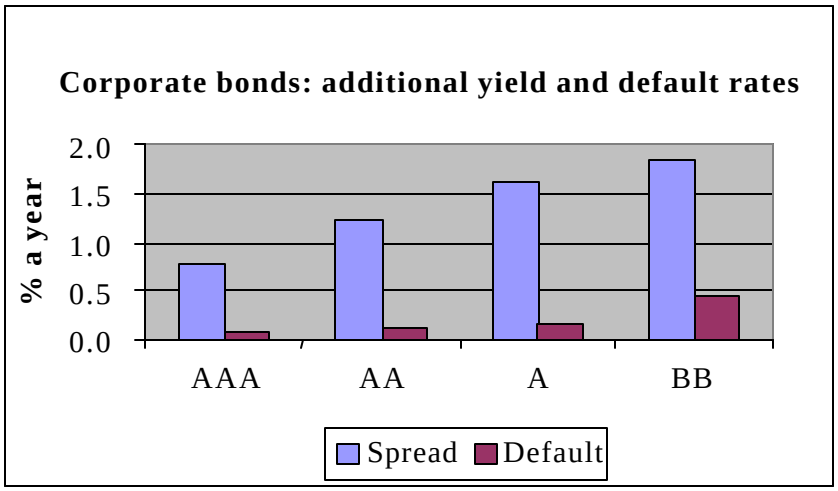
2.13.3 The immediate rationale might be that a 'convenience premium' is being applied again to UK markets due to high demand for UK index linked gilts by certain investors. However, there are certain other factors, which could be influential. For example the measure of inflation used for indexation could be a factor.

2.13.4 In Nowell (1999) it was identified that the measurement of European inflation was structurally around 0.7% to 1% a year lower than UK inflation. Likewise Boskin (1996) identified that US inflation might be around 1% a year too high primarily due to distortions in the quality of goods, but also due to substitution and discount shopping.

2.13.5 It might be that these alternative index linked markets are (at least in part) pricing in a structural difference in the expected level of inflation used for indexation.

2.14 Corporate bonds

2.14.1 Given the much lower yields expected on government bonds in a low inflation environment, it will become attractive for many investors to target the added yield from corporate bonds. The table below shows the current level of additional return (over government debt), and also the historical risk of default. The data analysed is from the US market, simply due to the much wider range of bonds that have been available in that market for a long period. The data covers the period 1970 to 1998. The additional yield appears favourable, and would appear to more than compensate for the risk of default – even before any allowance is made for some recoveries following default.



Sources: Warburg Dillon Read, and Moody, 5 November 1999

2.14.2 These levels of additional return are at historically high levels, and thus would imply that bond investors were very concerned about the possibility of default. This seems at odds with an equity market that appears to be putting a very high level of valuation on future earnings. One possible rationale is outlined below:

- markets have accepted the logic that inflation is low, and stable. However, there remains a possibility that inflation could fall lower (including deflation) or rise.
- this central expectation is expected to be 'good' for equity markets, and accordingly relatively high valuations (by historical standards) are placed in those markets.
- however, for a bond there is a limited total upside, regardless of the expectation of good news. The possibility of poor news (for example deflation, possibly greatly increasing the real debt burden on companies, and leading to more insolvencies), leads to a wide credit spread.

2.15 Key issues in respect of financial markets

2.15.1 Our analysis of the gilt market would indicate that there is a great deal of pressure being exerted on long dated sterling gilts through demand from investors attempting to reduce certain regulatory risks. We would recommend that:

- regulators recognise the high level of asset mismatching that solvency measures can imply for institutions. A particular point of concern is where there are insufficient matching assets available, which prevents the institutions from matching.
- where a change in regulation occurs, which causes institutions to revise their understanding of investment risk, then the requirements should be phased in over a period, to help reduce distortions in the markets (but mindful of the need to keep things simple).
- that the Debt Management Office reconsiders the current issuance profile. In addition, that the Debt Management Office considers how it might reduce some of the distortions in the market by changing the profile of outstanding debt.

3 DEFINED CONTRIBUTION PENSION SCHEMES

3.1 The theoretical impact of lower inflation

3.1.1 Individual active members in defined contribution pension schemes will be directly affected by a long-term change in inflation. However, an analysis of the true cost of a defined contribution pension will usually be based on contributions, benefits and expenses, which are fixed relative to inflation.

3.1.2 In this situation, the level of inflation is irrelevant, and the expected costs or resulting benefits will only depend on the real returns and real levels of expenses. This would allow us to finish this section here, with the conclusion that lower inflation has no meaningful effect on the value of defined contribution pension arrangements. However, in the real world:

- real returns may differ according to the level of inflation, whether or not there is a causal link,
- many investors prefer to buy level pensions, and we would not necessarily expect this preference to disappear in a period of low inflation,
- investors' propensity to save may differ in a future period of low inflation, whether or not there are logical links or reasons.

3.1.3 In the remainder of section 3 we explore the effect of these features. We have not distinguished between personal pensions and occupational pension schemes, or indeed alternative savings vehicles. The differences between defined contribution investment media are not fundamentally derived from actual or expected inflation, and so can be ignored for our purposes.

3.1.4 The primary purpose of this section is to explore the relationship between the amount and the cost of pension benefits. This can be achieved most easily by considering defined contribution schemes. However, the conclusions can be directly applied to defined benefit schemes too.

3.1.5 In this section we have not spent much time considering the effect on members already in receipt of pensions, since this is relatively straightforward. For pensioners, low inflation will generally be either favourable or irrelevant. The effect on scheme sponsors is discussed in section 4.

3.2 Members' reactions to low inflation

3.2.1 A typical level joint life annuity might cost around 30% more if expected long-term inflation (and hence nominal bond yields) fell 3%. Arguably, the investor is getting equivalent value, since his pension *may* not be eroded so quickly. Conventional wisdom sometimes seems to imply that generally investors are unwise to buy level annuities rather than index linked, however, it can easily be argued that some such investors:

- clearly understand that level annuities will be eroded by future inflation,
- are well able to understand the financial effect of this,
- nevertheless value the level pension more highly than the alternative index linked pension.

3.2.2 In a period of prolonged low inflation, such investors are forced to purchase annuities, which (hopefully) will not decrease in real terms as quickly as they would have in the past, when inflation was higher. This might imply that in periods of low inflation, members should have the option to purchase decreasing annuities, to preserve the same freedom of choice!

3.2.3 Interestingly, this strategy may be less attractive when expected inflation is low. Level annuities may be perceived to be more risky in this situation, since you might assume that there is more chance that inflation will subsequently rise in the future. (Conversely, investors who bought level annuities a decade ago must be very pleased to have obtained such good value). Nevertheless, it seems unlikely that any preferences for level pensions will be eliminated.

3.2.4 In 2.13.4 we noted that UK RPI may systematically generate a higher index than other countries' inflation indices. An investor might reasonably be concerned that RPI could be revised to increase more slowly in future, implying a significant disadvantage to the purchasers of index linked pensions. Additionally, there may possibly be further government action to lower UK RPI further, which may not be priced into annuity rates.

3.2.5 In passing, the general preference for level annuities may have some implications for the profession's discussions on long term care, where it is sometimes asserted that pensions should increase faster than the general level of inflation, to cover increasing health and care costs.

3.3 Real returns in a low inflationary environment

3.3.1 In section 2 we discussed real returns from the market's perspective. The perspective of a scheme member, or other prospective pensioner, may be somewhat different. It is difficult to disentangle assumptions of future real returns from the effects of expected lower inflation. It will not be clear to members what future real returns are really likely to be, nor if those expectations are influenced by any current expectations of lower future inflation. Clearly, if you make optimistic assumptions then pensions will appear cheap, conversely pessimistic assumptions make pensions appear expensive. The assumed inflation would not materially affect the cost of index linked pensions, nor the cost of level pensions of equivalent value (by definition).

3.3.2 It is possible that the level of expenses charged against pension funds might differ in a low inflationary environment. However, low inflation should not force a provider to charge more in real terms than it would otherwise, so we have not considered this possibility further.

3.4 The possible future effects on new members

3.4.1 For the purposes of illustration, we have projected defined contribution pensions using the central assumptions described in part 2.10. Briefly, we have assumed that a man contributes 10% of his salary for 30 years with retirement at age 60. The projected pensions as a percentage of final salary are shown in the table below, for three pre-retirement investment strategies. Further details of the basis for projection are given in appendix 3.

Pension as a percentage of salary after 30 years' contributions at 10% of salary

Investment medium	Level pension at retirement	Index linked pension at retirement
Equities	26%	18%
Gilts	20%	14%
ILGs	18%	12%

3.4.2 These results show that pensions are likely to be expensive, and imply that members should plan to contribute significantly more than 10% of salary for a considerable period. (Though evidence is scarce, we believe that a 10% contribution would not currently be considered atypical, and lower contributions are common.)

3.4.3 However, we emphasise that these results depend more on assumed real returns than on expected or actual inflation. To the extent that our assumptions are broadly reasonable, pensions will cost more in future than the public might expect, based on the experience of pensioners who have retired recently, who have benefited from much better returns than we assume will occur in the future.

3.4.4 It would be possible to investigate likely pension costs using a stochastic model. If this had the same central assumptions as we have used, then the results would be in line with those quoted above, but with a margin of uncertainty around the derived costs. The size of this margin would depend on the assumptions made. We expect that, in practice, there will be considerable variation in the amount of pension received, and this is borne out by our analysis of historic conditions, given below.

3.4.5 We are also concerned that personal pension projections may also be creating a public misconception of the true cost of pension provision. Personal pension providers issue projections based on returns of 5% and 9% (only recently reduced from 6% and 12%). Whilst some providers provide useful commentaries on their projections, others avoid any meaningful discussion about the effect of inflation. Some investors must be interpreting such projections as if they are based on likely real returns. While real returns may well turn out to be this good, it would represent an unusually optimistic view of the future.

3.4.6 In this respect, we note the publication of Exposure Draft 37 by the Faculty and Institute of Actuaries, which covers benefit illustrations. The Exposure Draft stresses that the objective of a projection is to improve the member's understanding of the likely costs and benefits of a pension plan. We strongly support this emphasis.

3.5 The likely impact of low inflation on a current member

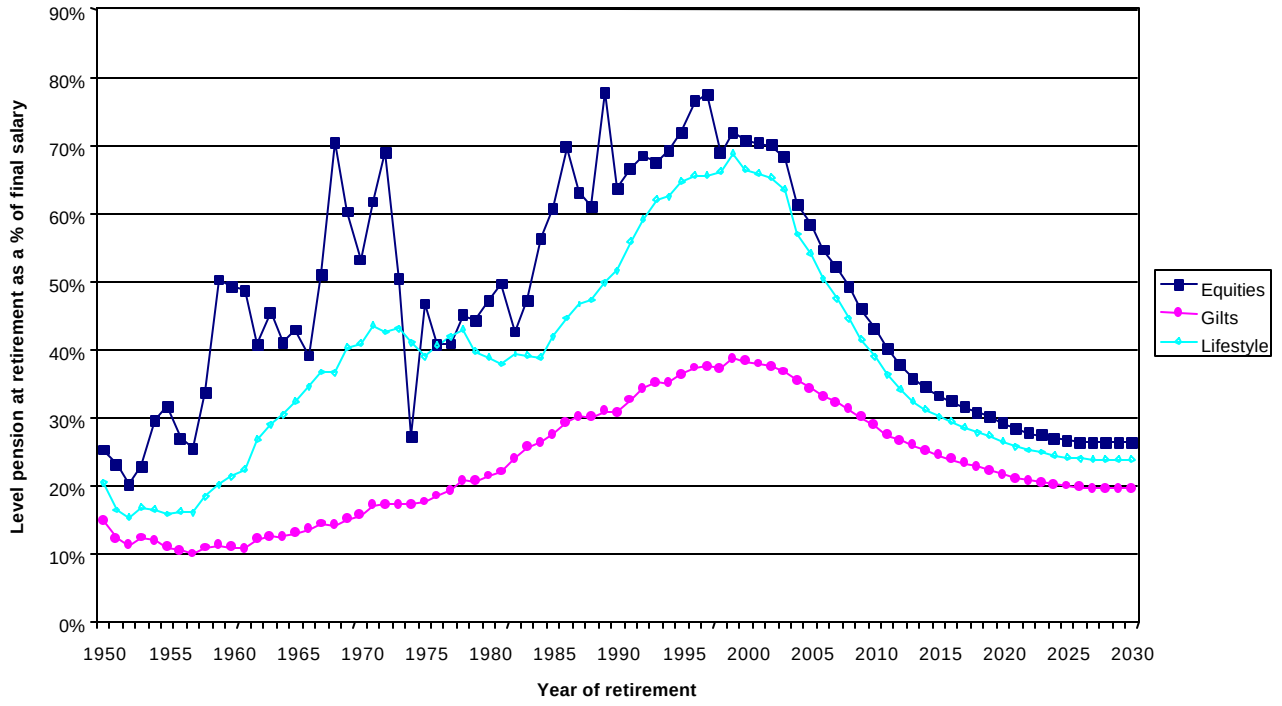
3.5.1 It seems reasonable to ask what we can learn from history about the effect of low inflation on defined contribution schemes. We have examined the effect of historic conditions using the contribution pattern described above. The results are summarised in the graphs below. Further details of the basis of projection are given in appendix 3. A table giving more details of the results is given in appendix 4.

3.5.2 Periods of low or high inflation in the past will have been affected by other circumstances which will often not be replicated in the future, and this should be borne in mind when considering the results. For convenience, a history of UK inflation is attached in appendix 5.

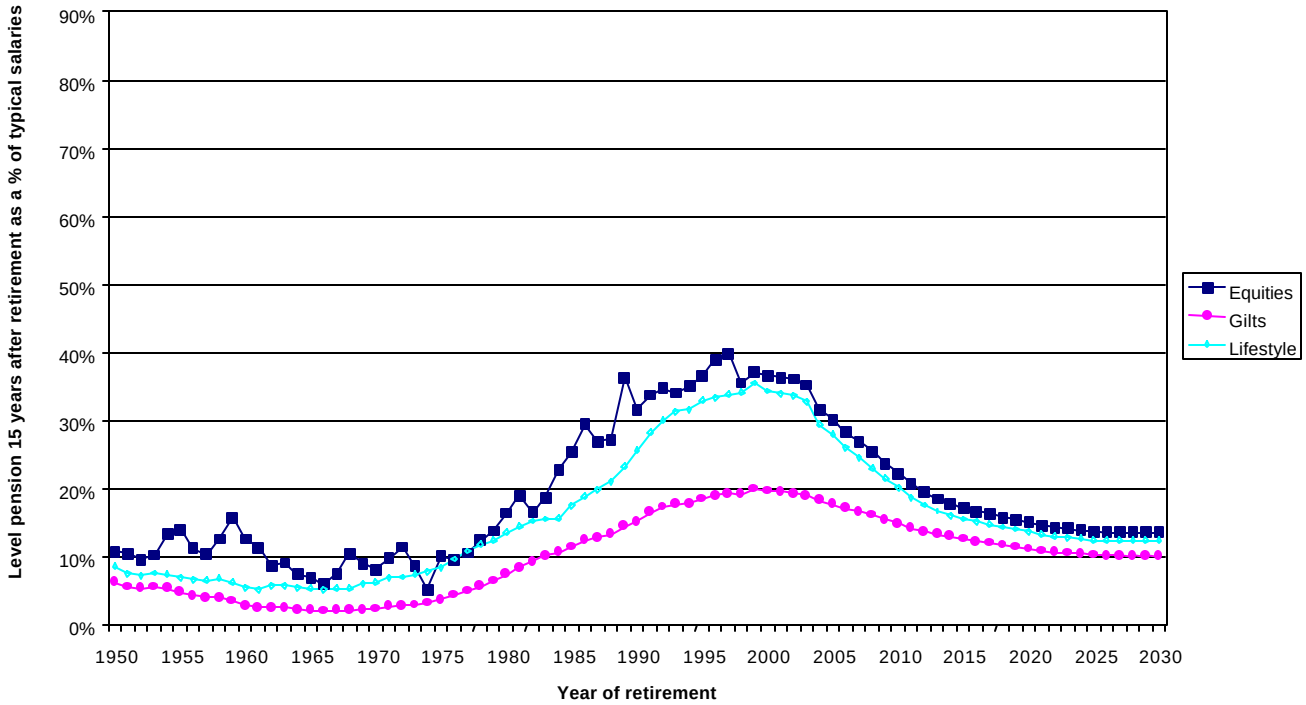
3.5.3 The graphs refer to the purchase of level pensions, since index linked yields were not available before 1982. In the second graph, we have attempted to illustrate the effect of inflation by showing the real value of the level pension fifteen years after retirement. This illustration after 15 years of retirement also shows the effect of salary inflation (which erodes both level and RPI-linked pensions, when they are compared to typical wages).

3.5.4 For retirements after 1998 we have assumed that inflation and real rates of return after 1998 will be in line with our long-term assumptions, as described above. The illustrations show expected pensions gradually reducing to the long-term averages described above, as the favourable historic returns gradually drop out of the projections.

Level pension after 30 years' contributions at 10% of salary



Pension 15 years after retirement, after 30 years' contributions at 10% of salary



3.5.5 Looking at the retirements up to end 1998, we can make the following observations:

- Defined contribution plans do not provide any consistency between retirements in different years. Pensioners retiring just a few years apart can achieve materially different pensions. Different generations of worker can achieve wildly different pensions, for effectively identical contribution patterns.
- Over time, there has been a marked improvement in pensions achieved, due to improving real investment returns. This has resulted in recent pensioners achieving very good value from their contributions. This will presumably lead to heightened expectations for current workers.
- Lifestyle investment strategies would historically have depressed returns, though in recent years only to a limited extent.
- Inflation does not explain the improvement in pensions over generations of workers. If our assumptions for inflation in the next few years are remotely accurate, then recent pensioners will continue to have far more favourable treatment than earlier pensioners.
- Inflation, even in the current benign climate, will severely erode level pensions payable to long lived pensioners. Unsurprisingly, pensioners retiring in the late 1960s have been particularly badly hit.
- While current pensioners are receiving arguably reasonable benefits well into retirement, historically this has not been the case. Once subsequent inflation took its toll, pensioners retiring up to the early 1980s would have been left with very small pensions. This implies that workers should plan to save far more than 10% of salary, even including those who will manage to make consistent savings over thirty years.
- Recently there has been much media coverage of falling annuity rates. Our calculations suggest that pensioners retiring now should expect to receive slightly lower pensions than those retiring a couple of years ago, but that much of the effect of expensive annuities is offset by increased real fund values. Annuitants retiring now will often have enjoyed very favourable real investment outcomes compared to historic conditions.

3.5.6 The projections for future retirements illustrate our proposition that, in future, pensions may well cost more than the public might expect, based on recent investment conditions, and this is regardless of the rate of inflation. Low inflation may just make the outcome more transparent.

3.5.7 Our projected shortfall for a lifestyle strategy relative to all equity is about 9%. This may seem acceptable with inflation low and with increased uncertainty about the equity risk premium assumption, which generates the differential, given the probability of lower correlation between equity and bond returns.

3.6 Other issues

3.6.1 In this section, we briefly consider three other relevant issues:

- ‘pensioner inflation’,
- improving mortality,

- the Government's 'minimum income guarantee'.

3.6.2 In our discussions we have tended to use the main RPI index as the measure for prices inflation. However, an alternative index, RP21, is published by the Office for National Statistics, which gives prices inflation as experienced by pensioner households. This index differs slightly from the main RPI index. This difference is not significant for our discussions, not least because we are unaware of any pension scheme, which indexes pension by reference to RP21. However, for completeness we have given some background on this index in appendix 6.

3.6.3 For simplicity, our projections given above do not make any allowance for changing mortality over time. However, we observe that:

- improving mortality increases the cost of pensions, once it is reflected in annuity rates (or funding assumptions),
- the increase in the cost of level pensions should be more significant in times of low inflation than in high.

3.6.4 Currently, it appears that mortality is improving and so this will increase the cost of pensions at a time when lower inflation is also increasing costs (the first bullet in the previous paragraph). Note that our projections have been based on mortality from the '1980' series.

3.6.5 However, in itself, lower inflation does not greatly exacerbate the effects of improving mortality (the second bullet). For example, if improving mortality increased the cost of a level annuity by 9% when valued at 8% interest, then a shift to 5% interest would merely increase the cost of the mortality improvements by a further 3%. (Of course, such a shift in interest rates would also increase the cost of the annuity by about 30% without any change in mortality.)

3.6.6 Further details are given in appendix 7.

3.6.7 The Government has announced that there will be a 'minimum income guarantee' for pensioners. Effectively, this will be a means tested benefit payable to older people with low incomes. The current rate is at least £75 per week, depending on age and marital status. It is the Government's stated intention that this amount will increase in line with average earnings, though this is not guaranteed.

3.6.8 Given the link between the guarantee and average earnings, and given that the Basic State Pension is linked to RPI, then over time the guarantee will become quite significant.

3.6.9 We observe that this may represent a situation where there is little incentive for workers on average earnings (or less) to make any additional private provision for their retirement, since the individual will bear the investment risks.

3.6.10 This issue is discussed further in appendix 8.

3.7 Key issues for pensions funding

3.7.1 The most important conclusions we reached are:

- defined contribution scheme members should consider paying more money into their schemes for a longer period, possibly with the intention of retiring later and probably with the expectation of lower pensions than might have been the case in the recent past,
- sponsors of defined benefit schemes should seriously consider the possibility that their pension costs may increase significantly,
- the pensions industry as a whole should seek to provide better information to members and potential members. Benefit projections should be clear, realistic, and complete. This effort should be part of a wider campaign to improve general financial understanding.

4 DEFINED BENEFIT PENSION SCHEMES

4.1 The defined benefit pension promise

4.1.1 The impact of low inflation and low real returns on the cost of pension provision has been considered in the previous section. Though these cost impacts were described in terms of defined contribution arrangements, they are directly applicable to defined benefit plans. This section examines some other features of defined benefit pension provision in the UK, and the problems that low inflation and low real returns could cause.

4.1.2 Although much attention is focussed on the trend towards defined contribution arrangements, defined benefit arrangements remain the dominant form of provision.

4.1.3 There is a high level of public confidence in defined benefit schemes, despite a few highly publicised incidents. They are perceived as providing good benefits and, with appropriate advanced funding within a trust structure, providing good security.

4.1.4 The promised benefits from a defined benefit scheme are generally clear to the individual and have considerable statutory protection. The consequences of the assets proving insufficient to meet the promise are therefore very significant.

4.1.5 All parties to pension provision - beneficiaries, trustees, scheme sponsors and shareholders, regulators and government - have an interest in maintaining the integrity of the defined benefit system, though the interests of the parties (and even subgroups within the parties, such as pensioner and active members) may be very different.

4.2 Design

4.2.1 Although defined benefit schemes have been in existence for many years, the real growth in coverage of the UK general working population came in the 1970s. A key factor was a growing realisation that money purchase benefits were providing inadequate income in retirement for much of the population.

4.2.2 Scheme benefits were designed at a time of high inflation and with the expectation that, even if inflation were brought under control, there would inevitably be periods of high inflation during economic cycles.

4.2.3 A key general feature of the development of defined benefit schemes is that the elements of discretionary benefits have become guaranteed, as surplus emerged during the 1980s. This is particularly the case for pension increases. This has significantly removed the flexibility of schemes to adapt to periods of unfavourable experience.

4.2.4 Specific design features of defined benefit schemes leave many ill-equipped to deal with low or negative inflation. The key problems are discussed below, with more detailed comments in appendix 9.

- All schemes are now required to provide Limited Price Indexation (LPI) in payment on accruing benefits. Low inflation makes this effectively RPI linking. As LPI has a floor of 0%, periods of deflation would see rises in the real value of pensions.
- There are still many schemes, especially small schemes, providing fixed pension increases in payment of 5% a year.
- Fixed rate revaluation on GMPs is currently set at 6.25% a year for those leaving service. Set against an inflation target of 2.5% a year this is now an extremely high real rate of revaluation. If inflation falls then the real rates are even more significant. Although no GMPs accrue after March 1997, there is still a considerable level of accrued GMP, which, if inflation remains low, will take many years to reduce to non-material levels. The historic fixed rates of revaluation of 8.5%, 7.5% and 7% a year now look very generous.

4.2.5 From the member's perspective these features could result in a higher real pension at retirement than he might have anticipated. That pension may then maintain its real value, or even increase in real terms, during retirement. Provided there are sufficient assets to ensure the benefits are paid, low inflation and the unintended consequences of many common scheme structures are positive for the member.

4.2.6 Scheme sponsors and shareholders will view the additional cost associated with such benefits unfavourably. For future service, benefits can be modified or replaced by defined contribution arrangements. The minimum financial exposure for benefits already accrued is usually the (MFR-based) 'debt on employer' calculation. However, withdrawing support above that level would be unacceptable for many employers for public and industrial relations reasons, except in dire circumstances.

4.3 Expectations of cost

4.3.1 The experience of recent history has meant that the cost of providing benefits has been considerably lower than projected by pensions actuaries. Section 3.5 illustrates the impact of equity returns on the benefits provided by defined contribution savings. In defined benefit schemes there has often been a continuing element of equity investments after the benefit has come into payment, serving to further reduce the historic cost.

4.3.2 The working party believes that a strong expectation has developed amongst some companies and trustees that the actuary's estimate of the cost of providing the benefits will always, in the long-term, prove greater than the actual cost of providing those benefits. There are significant dangers for defined benefit schemes and actuarial advisers in this expectation.

4.3.3 Even if the actuary is clear in his communication, there is a danger that members, trustees, management and shareholders may assume that the figures contain greater levels of prudence than is the case and make decisions based on that assumption.

4.3.4 Members, quite reasonably, do not have a detailed understanding of the way their pensions are funded and, in the simplest terms, may think of their benefit as a promise by the employer, which is guaranteed by the assets of the pension fund. Actuarial reports showing the pension scheme fully funded on MFR and ongoing bases support that understanding.

4.3.5 GN9 requires disclosure of whether the assets are sufficient to cover the liabilities on a discontinuance funding basis and a description of the consequences *"without necessarily quantifying"* the priority order on wind-up. There is little understanding amongst members that in the event of the scheme winding up the assets may not be sufficient to guarantee the liability, and that for those in lower priority classes the reductions can be significant.

4.3.6 If, by assuming the actuary is overstating the cost, benefits are perceived by members to be less valuable than they really are, defined benefit pensions may be an inefficient tool for the recruitment and retention of staff.

4.3.7 Trustees may not appreciate the risks in the contribution rate they agree with the employer or in the investment strategy they choose. Since the majority of schemes in the UK are primarily invested in equities, then equity market behaviour is key for UK schemes. Even if equities outperform other asset classes in the long term there can be sustained periods of under-performance.

4.3.8 Short-term volatility of equities relative to the solvency liabilities creates further difficulties for trustees. Pressure to switch investment strategy to a matched position can be acute when the relative prices of gilts and equities move unfavourably, but this locks in the relative loss and removes the possibility of the trust benefiting from any future out-performance by equities.

4.3.9 Decisions by management may reflect the expected cost, which may be very different from the pension costs, which are ultimately experienced. In particular, a decision to remove pension provision or replace defined benefit with defined contribution may be postponed if the cost of meeting the defined benefit promise is understated. Conversely, defined contribution contributions could conceivably be set at too generous a level, though that does not seem to be a serious problem for the time being.

4.3.10 The question of the range of possible costs may never be explored. If the actuary is advising the trustees then the variability of the company's future costs may not be a primary concern. There is a danger that the employer becomes a third party to actuarial advice, reading the report to the trustees rather than taking its own advice - which might have a very different emphasis.

4.4 Impact on UK schemes

4.4.1 One of the features of defined benefit provision is the variety of its forms. This flexibility (though increasingly restricted by legislation) has allowed employers to tailor schemes to their own needs. The variety also makes it impossible to generalise about the impact of economic circumstances on particular pension schemes. Further, professional judgement of actuaries will not necessarily provide a consensus, which we can apply.

4.4.2 However this should not be allowed to obscure the key message to all concerned parties that a low inflation/low investment return environment increases the cost of providing a given level of defined benefit.

4.4.3 Further, design features of the scheme may mean that the benefits provided are higher than the beneficiaries or the provider expected, for example fixed 5% increases in payment may have been expected broadly to give inflation linking, whereas in a low inflation environment it gives considerable real increases.

4.4.4 For schemes, which secure benefits at retirement by purchase of an annuity, low expected future inflation and low real investment returns are being reflected now in expensive annuity rates.

4.5 Sample schemes examined

4.5.1 Given the variety of defined benefit schemes currently operating in the UK, it was not possible for the modelling to reflect the full range of possible effects on pension schemes of operating in a low inflation environment. However, the four model schemes chosen are intended to highlight the issues which, in the opinion of the working party, will be of most concern to trustees and sponsoring employers.

4.5.2 The details of each model scheme are set out in appendix 10 and summarised briefly below.

- Model 1: 'Typical' self-administered scheme

  - *open to new entrants, stable membership*

- Model 2: Mature scheme

  - *closed to new entrants, ageing membership*

- Model 3: Scheme with fixed rates of pension escalation

  - *open to new entrants, stable membership, 5% fixed escalation in payment*

- Model 4: With-profit deferred annuity scheme

  - *closed to new entrants, ageing membership, 5% fixed escalation in payment*

4.6 Bases and method

4.6.1 Although the MFR is currently under review, we used the MFR as the simplest clearly defined basis on which to determine an initial funding level and initial funding rate for each of the schemes modelled. In each of the four model schemes examined, we assumed that the initial MFR funding level was 110% and that the scheme's funding objective was to target an MFR funding level of 110%.

4.6.2 We carried out deterministic projections of each of the specimen schemes to examine the effects of a 10 year period of low investment returns on scheme funding levels, contribution rates and buy-out solvency. The starting point for our projections is based on financial conditions at 30 June 1999. Equity dividend yields at that date were about 2.25% whilst 15-year gilt yields were just below 5%. Given these financial conditions, the working party considered that an initial MFR funding level of 110% was not an unreasonable starting point.

4.6.3 We have assumed that the contribution rate is initially set to continue to target 110% of MFR. Whilst we appreciate that many schemes adopt funding objectives not directly related to the MFR, we consider that the assumed contributions are not untypical of rates (excluding contributions in respect of risk benefits and expenses) currently payable into defined benefit schemes. Indeed, the latest NAPF survey (1998) shows the average contribution rate for UK defined benefit schemes to be just 9.0% of pensionable payroll. This compares with an assumed rate of 12.5% for the Model 1 'typical' scheme in our projections.

4.6.4 The projections were carried out using the central financial assumptions described in section 2.10 of this paper. The central rates of return effectively assume that equities will outperform gilts by 2% a year on average. The asset mixes used in the projections are intended to reflect broad matching of assets to liabilities, and are summarised in the table below. One of the key features is the sensitivity of the results to the relative performance of the asset classes.

Scheme	**Proportion invested in:**			
	Equities	**Fixed Interest**	**Index linked**	**Cash**
Model 1	65%	20%	10%	5%
Model 2	30%	30%	30%	10%
Model 3	65%	30%	-	5%
Model 4	-	100%	-	-

4.7 **The results**

4.7.1 The results are summarised below in tabular form, showing the initial position, together with the position after 3, 5, 7 and 10 years.

4.7.2 The funding level is the ratio of assets (at market value) to accrued liabilities, based on projected final salaries. The cost of future accrual is the contribution rate required to fund for the following year's accrual, again based on projected final salaries and valued by reference to the central assumptions described in section 2.10.

4.7.3 The 'total contribution required' is the future service rate with an adjustment to meet the funding deficit or surplus over members' future working lifetimes.

4.7.4 The buy-out solvency levels show the estimated percentage overall asset cover if the scheme was to wind up and secure accrued benefits through the purchase of deferred and immediate annuities from an insurance company. Buy-out costs have been estimated using guidance on the price of securing benefits produced by the leading insurance companies in the market.

4.7.5 The projections show that the assumed contributions in each model fall far short of the actual rates required to fund for the promised benefits at retirement, should low inflation and low interest rates persist in the future.

Model 1: The 'average' scheme

Years from projection date	0	3	5	7	10
Funding level	103%	99%	97%	95%	92%
Assumed actual contributions (110% of MFR rate)	12.5%	12.5%	12.5%	12.5%	12.5%
Cost of future accrual	17.7%	17.7%	17.7%	17.7%	17.7%
Total contribution required	17.1%	18.0%	18.6%	19.2%	20.1%
Buy-out solvency level	64%	61%	60%	58%	57%
Residual buy-out solvency level for non-pensioners	57%	53%	51%	48%	46%

4.7.6 In the first model, the initial funding level is 103%. However, the actual contribution required to fund fully for the benefits due is 37% higher than the assumed contribution rate. Consequently, the funding level deteriorates, to 97% after 5 years and to 92% after 10 years. If contributions continue to be paid at the same rate, after 10 years they will have fallen to some 62% of the true required funding rate of 20.1%.

4.7.7 On a buy-out basis, the initial solvency level is 64%. After securing pensioner liabilities, which represent roughly 20% of the total accrued liability, the remaining assets are only 57% of the estimated buy-out costs for non-pensioner liabilities. As contributions are insufficient to meet the full cost of future accrual, the solvency position worsens over time. After 10 years, the solvency level is 57% and, after buying-out pensioner liabilities, there remains just 46% cover for the non-pensioner liabilities.

4.7.8 The overriding Statutory Priority Order introduced by the Pensions Act 1995 (and the interim priorities for wind-ups commencing before April 2007) complicate the position on buyout. In practice, the split of assets between pensioner and non-pensioners will not be as straightforward as in 4.7.7, which assumes that the pensioner liabilities, including pension increases, have first priority. Nevertheless, the figures illustrate that the reductions when securing liabilities low in the priority order are substantial.

Model 2: The mature scheme

Years from projection date	0	3	5	7	10
Funding level	96%	94%	93%	92%	91%
Assumed actual contributions (110% of MFR rate)	18.0%	18.3%	18.6%	18.9%	19.2%
Cost of future accrual	23.8%	24.3%	24.6%	25.0%	25.5%
Total contribution required	26.2%	28.6%	30.5%	32.9%	38.0%
Buy-out solvency level	79%	77%	76%	75%	73%
Residual buy-out solvency level for non-pensioners	62%	56%	51%	46%	38%

4.7.9 In the second model, the funding level is less affected by inadequate contributions since, in the mature scheme, the proportion of liability represented by active members is relatively small. Funding levels are generally lower than in the first model, as the scheme is assumed to be predominantly invested in fixed interest and index-linked gilts, and therefore achieves rather lower investment returns than the Model 1 scheme.

4.7.10 The projections illustrate the problems inherent in mature closed schemes, of rising funding costs and a shrinking pensionable workforce. The cost of future accrual, which is calculated on a projected unit basis, increases over time due to the ageing membership. The deficit in the scheme accumulates rapidly as a proportion of pensionable payroll, as the scheme has a closed and diminishing membership. If contributions in this scheme are paid at a rate of 110% of the MFR regular cost then, after 10 years, they are only 50% of the required rate to meet the true cost of the benefits.

4.7.11 The initial buy-out solvency level is 79%, falling to 73% after 10 years. After securing pensioner liabilities, which represent almost 60% of the total accrued liability after 10 years, the remaining assets are only 38% of the estimated buy-out costs for non-pensioner liabilities.

Model 3: The scheme with fixed pension increases

Years from projection date	0	3	5	7	10
Funding level	96%	92%	89%	87%	85%
Assumed actual contributions (110% of MFR rate)	14.4%	14.4%	14.4%	14.4%	14.4%
Cost of future accrual	22.6%	22.6%	22.6%	22.6%	22.6%
Total contribution required	23.5%	25.1%	26.1%	27.2%	28.8%
Buy-out solvency level	65%	62%	60%	58%	56%
Residual buy-out solvency level for non-pensioners	57%	53%	51%	49%	46%

4.7.12 The third model illustrates the extent to which schemes with fixed escalation rates may be under-funding in a low interest rate environment. The MFR regular cost for this model scheme is 13.1% based on the prescribed MFR assumptions. However, in a low interest rate environment, the MFR regular cost far understates the true cost of funding for benefits with fixed 5% escalation rates. Our model suggests that the true cost of future accrual is 22.6% - some 57% higher than the assumed rate payable. With such a significant shortfall in contributions, the scheme rapidly builds up a deficit.

4.7.13 The Model 3 scheme may well historically have been funded on the same basis as the Model 1 scheme, with no recognition that fixed 5% increases were more valuable than LPI. The initial funding level of this type of scheme may well be worse than the average we have used, adding to the funding difficulties.

4.7.14 On wind-up, the scheme would face similar problems to those described for the Model 1 scheme.

Model 4: The with-profit deferred annuity scheme

Years from projection date	0	3	5	7	10
Funding level	88%	85%	84%	82%	80%
Assumed actual contributions (110% of MFR rate)	20.7%	21.0%	21.2%	21.4%	21.7%
Cost of future accrual	32.9%	33.4%	33.7%	34.0%	34.5%
Total contribution required	43.1%	48.8%	53.9%	60.2%	74.7%

4.7.15 The final model considers, on a simplified basis, the problems faced by small insured schemes whose sole investment is a with-profit deferred annuity. The actual assets underlying these contracts varies from one insurance company to the next and, as discussed earlier, the returns generated by the contract can at times bear little resemblance to the returns on the underlying assets.

4.7.16 The contract used in our model is assumed to be gilt-backed. To some extent, this overstates the problems faced by WPDA schemes, since many WPDA contracts do hold a proportion of equity investment, which will prove favourable if equities do out-perform in future.

4.7.17 We have not considered buy-out solvency levels in this scheme, as they will depend on the surrender value of the WPDA contract, and surrender penalties can vary widely from one insurance company to another. However, given the projected solvency levels in Models 1 to 3, together with the results of the ongoing funding projections for model 4 discussed below, the potential problems on wind-up should be apparent to advisers of these insured schemes.

4.7.18 A larger-than-average proportion of insured schemes have fixed rates of pension escalation, at least for pre-1997 service. The results of the projections on this model illustrate the particular problems faced by gilt-backed schemes with fixed escalation in prolonged periods of low interest rates. The problems are further exacerbated by the fact that the scheme is closed to new entrants.

4.7.19 The Faculty and Institute of Actuaries has already publicly raised its concerns about the level of actuarial resources available to ensure that statutory requirements are met for such schemes. There is a danger that, unless actuaries are proactive in raising long term concerns about these schemes, they will only be examined in detail at the time when problems arise, which may be too late to take remedial action.

4.8 Key issues for defined benefit pension schemes

4.8.1 By having a well funded, regularly monitored defined benefit sector UK pension provision has been in a strong position with a high level of public confidence. However there are concerns as to how defined benefit schemes would cope with a period of sustained low inflation and low investment returns.

4.8.2 Benefit design is inflexible with a low discretionary content, meaning unfavourable experience hits the funding level of guaranteed benefits:

- Design features of some schemes leave them particularly vulnerable to periods of low inflation.
- Actuarial techniques, and in particular the use of long-term assumptions, have coped well with past situations but are vulnerable to a sustained period when those long term assumption are not met. Schemes, which continue to be funded based on assumptions that have not been materially revised to take account of a possible prolonged period of low inflation and low investment returns, are likely to be storing up problems for the future.

- Given the evidence of contribution rates currently being paid into defined benefit schemes, it appears that rates will need to be revised upwards considerably, should low interest rates persist in the future. The longer the increase in contributions is delayed, the larger the accumulating shortfall becomes and the higher the increase required. The burden of rectifying inadequate funding is particularly pronounced in closed schemes, where an accumulating deficit will be spread over an ever-decreasing pensionable payroll.
- The above projections illustrate the extent of the problems of solvency on wind-up. Without significant reductions in buy-out costs, the majority of schemes will not be able to secure benefits in full on wind-up. In mature schemes, with a relatively high pensioner liability, the residual assets to meet non-pensioner liabilities may be hugely inadequate, even in schemes which are funded over 100% on the MFR basis.
- There is a lack of understanding of the nature of the pension promises made in defined benefit schemes, and in particular that the level of funding is not generally sufficient to guarantee the benefits. It will be difficult to communicate this to members without undermining confidence in defined benefit provision.

5 CONCLUSION

5.1 Investment returns

5.1.1 Lower inflation and high investment returns have been extremely beneficial to those who have retired in recent years, and to their employers. Consequently, future expectations are high. However, if maintenance of a low level of inflation is now anticipated and discounted by investors, then the scope for a further significant reduction in the equity risk premium is very limited and the future real return on investment is very likely to fall.

5.1.2 With trend economic growth and without further increase in the valuation of equities relative to their underlying economic activity, we project that the cost of all pension arrangements will rise significantly from that recently experienced. Also, on the basis of the long US history of open capital markets, risks may well increase, with respect to both the equity/bond mismatch and the overall volatility of return.

5.2 Defined contribution

5.2.1 For defined contribution schemes and personal pensions, current contribution levels are unlikely to be sufficient to provide a satisfactory income throughout retirement. For example, when a man now aged 30, contributing 10% of salary with lifestyle investment retires aged 60, we project a level pension of 24% of final salary: this compares with 66% for those recently retired, for the same contribution pattern.

5.2.2 We believe that most benefit projections remain on too optimistic a basis, implicitly incorporating assumed inflation in investment returns, yet a level pension on retirement. On our equity risk premium assumption of 2%, with risks of lower correlation between equities and bonds and greater overall volatility, there is a case for greater use of lifestyle arrangements to guard against poor annuity rates at the time of retirement. Actuaries need to provide leadership, in restraining unrealistic expectations and ensuring that the risk of holding equities is appreciated, particularly close to retirement.

5.3 Defined benefit

5.3.1 Defined benefit scheme sponsors must be made aware of the substantial costs and risks involved in providing tightly prescribed benefits in a low inflation, low return and potentially more volatile environment. Also, many practical issues of scheme design still seem to reflect past inflation and should be changed without waiting for the pressure of adverse experience.

5.3.2 The MFR is currently under extensive review by the profession, reflecting the difficulty of getting a satisfactory regulatory structure. Schemes are generally well overweight equities, relative to liabilities, and the scope to increase potential returns (and reduce costs) by more mismatching is limited. Also, on our assumptions, it is likely to be much less effective than in the past, and riskier. Indeed, the imminent danger seems to be of further forced “regulatory” buying of a limited supply of sterling denominated long bonds.

5.4 Communication

5.4.1 Inevitably, much media comment on pensions is based on marketing briefings and has failed to identify the exceptionally benign transitional effects of lower inflation and the erosion of the equity risk premium. Unless real investment returns substantially exceed our assumptions, then there is a coming cost ‘crunch’. This may shock many scheme members and trustees and be unpalatable to sponsors, who are also facing new accounting standards on pensions and high levels of take-over activity.

5.4.2 We believe that the simple message for the future is “lower pensions or higher contributions”.

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Appendix 1

Terms of Reference

To consider the implications for pension (both defined benefit and defined contribution) arrangements of a prolonged period of low inflation and low interest rates, including implications for:

- solvency
- funding
- investment strategy
- membership

To recommend what steps the profession should take in response to these implications in relation to:

- individuals with pension arrangements
- scheme sponsors
- members of the profession
- regulators
- the media

Appendix 2

Executive summary of Bishop (1999)

'An explosive brew of circumstances is unfolding in the UK financial system. An ageing population with longer life expectancy — is swelling the cash available to pension and life funds. But a massive yield distortion is penalising pensioners and annuitants because a traditional asset — long gilts — is unlikely to be supplied in the desired quantities by a prudent government. The yield problem may even worsen — unless the UK joins EMU or the sterling bond market expands even further.

The basic problem: Life expectancy has risen — even since the 1980 calculations.

Politicians of all parties have exhorted the British public to save for retirement, and they have. But, because of low annuity rates, that very success is creating an income penalty at the moment of retirement.

Pension funds are progressively confronting the implications of the Minimum Funding Requirement (MFR).

This may catalyse a structural response to the ageing membership — beefing up their need for £3 billion annually of long sterling bonds. If they move decisively to cut their asset/liability mismatch, their demands could rise by a further, and staggering, £12 billion annually for many years to come.

Life companies are the prime beneficiaries of the savings inflows.

As the ageing population seeks to convert pensions and units into annuities — for an ever longer lifetime — the life companies may seek to match more closely. Their annual demand for long sterling bonds could be £11 billion.

Government funding is unlikely to satisfy this demand.

With the budget remaining roughly in balance, debt management policies for maturing securities may barely meet a fifth of the potential demand.

Result: A massive distortion already.

A distortion is already evident: long gilt yields are about a percentage point below German yields, while forward rates are three percentage points lower —suggesting that, for the first time since 1949, the 3.5% War Loan is at risk of repayment. The costs fall squarely on annuitants who have to make a lifetime decision at these distorted rates. Moreover, the MFR risks creating a spiral as surging demand for illiquid long gilts pushes yields lower — and thus the present value of pension fund liabilities upwards.

Solutions: Expand the sterling private bond market and/or join EMU.

The sterling bond market is experiencing unprecedented issuance, even though pension funds have not played much of a role yet. This is an ideal opportunity for Foreign Direct Investors to use sterling strength to hedge exposures. Joining EMU would open up a government market nearly six times the size of gilts and a private market that is running at nearly 12 times the sterling volume.

Increased belief in EMU entry could trigger a major anticipatory sell-off in long gilts as yields converge. The corresponding surge of euro bond purchases could weaken sterling significantly. Overall, an unstable and explosive brew for the next few years.'

Appendix 3

Defined contribution projections and historic illustrations

1 In the defined contribution section we illustrate the discussion with examples of:

- projected pensions based on future long term conditions in section 3.4,
- illustrated pensions based on historic investment conditions, extrapolated into the future in section 3.5 and appendix 4.

2 We summarise the assumptions made in these projections below.

Pension projections

3 The projections are based on a man aged 30 contributing at 10% of salary for thirty years, and then retiring aged 60. The accumulated fund is used to purchase a joint life annuity, with a five year guarantee and 50% widow's pension.

4 Investment returns in service are assumed to be:

	Future real returns Percent a year
Equities	4.5%
Gilts	2.5%
ILGs	2.0%

5 Inflation is assumed to be 2.5% a year.

6 Salary is assumed to grow at 2% above inflation.

7 Mortality in payment is PMA80 (U=1999)

8 Expenses of investment and administration in service are 1% of the fund each year.

9 Level annuities are assumed to be purchased based on unadjusted gilt yields with a 2% loading on the purchase price.

10 RPI linked pensions are assumed to be purchased based on index linked yields less 0.25%, with a 2% loading on the purchase price.

Historic illustrations

11 The graphs and table which illustrate historic conditions, are based on the same investment pattern and assumptions as for the projections described above, except that investment returns during the calendar years 1920 to 1998 are based on actual UK returns, as published in the Barclays Capital Equity-Gilt Study 1999 edition.

12 The lifestyle strategy involves investment in equities up to 10 years before retirement. From that point, 10% of the fund is switched to gilts each year, until one year before retirement, at which point the whole fund is invested in gilts.

13 The illustrations use the same 2% real salary growth over the period. It would be possible to use historic salary growth in these illustrations. This would complicate our analysis, which is more concerned with the variation in price inflation and investment conditions, rather than variation in real salary increases.

14 In practice, the available statistics on salary growth before 1960 are not ideal. Data is available in British Labour Statistics: Historical Abstract 1886-1968, published by the Department of Employment and Productivity in 1971. This gives indices of basic weekly wages for manual workers from 1920 to 1968, by which point National Average Earnings indices are available. The indices are built up from four other indices, which are not necessarily directly comparable. They show wide variations in real earning growth over calendar years. On average, they show growth of a little over 1% a year over the whole period, which is not inconsistent with our 2% assumption, which can be taken to include an element of promotional earnings growth.

Appendix 4

Effect of historic investment conditions on defined contribution pension schemes

Accumulated fund and pension as a percentage of final salary at retirement, and pensions as a percentage of typical salaries fifteen years after retirement

Assumes contributions of 10% of salary for 30 years to age 60, for three investment strategies

Year of retirement (Dec)	Equities					Gilts					Lifestyle					Year of retirement (Dec)
	Fund at retirement	Level pension at retirement	Level pension 15 years later	RPI pension at retirement	RPI pension 15 years later	Fund at retirement	Level pension at retirement	Level pension 15 years later	RPI pension at retirement	RPI pension 15 years later	Fund at retirement	Level pension at retirement	Level pension 15 years later	RPI pension at retirement	RPI pension 15 years later	
1950	427%	25%	11%			250%	15%	6%			345%	20%	9%			1950
1955	478%	32%	14%			166%	11%	5%			239%	16%	7%			1955
1960	672%	49%	13%			149%	11%	3%			291%	21%	6%			1960
1965	545%	43%	7%			166%	13%	2%			413%	32%	5%			1965
1970	526%	53%	8%			155%	16%	2%			405%	41%	6%			1970
1975	325%	47%	10%			123%	18%	4%			271%	39%	8%			1975
1980	342%	47%	17%			156%	21%	8%			282%	39%	14%			1980
1985	548%	61%	25%	33%	25%	249%	28%	12%	15%	11%	379%	42%	18%	23%	17%	1985
1990	575%	64%	32%	35%	26%	277%	31%	15%	17%	13%	466%	52%	26%	28%	21%	1990
1995	818%	72%	37%	47%	35%	415%	36%	19%	24%	18%	736%	65%	33%	42%	32%	1995
1998	1040%	69%	36%	50%	37%	563%	37%	19%	27%	20%	999%	66%	34%	48%	36%	1998
2000	1016%	71%	37%	49%	36%	550%	38%	20%	26%	20%	954%	66%	34%	46%	34%	2000
2005	839%	58%	30%	40%	30%	493%	34%	18%	24%	18%	777%	54%	28%	37%	28%	2005
2010	619%	43%	22%	30%	22%	415%	29%	15%	20%	15%	560%	39%	20%	27%	20%	2010
2015	477%	33%	17%	23%	17%	352%	25%	13%	17%	13%	433%	30%	16%	21%	15%	2015
2020	419%	29%	15%	20%	15%	311%	22%	11%	15%	11%	381%	27%	14%	18%	14%	2020
2025	382%	27%	14%	18%	14%	287%	20%	10%	14%	10%	347%	24%	13%	17%	12%	2025
2030	378%	26%	14%	18%	13%	282%	20%	10%	14%	10%	344%	24%	12%	16%	12%	2030

Appendix 5

History of UK inflation index

Year	Annual average	Year	Annual average	Year	Annual average	Year	Annual average	Year	Annual average
1750	6.6	1800	17.6	1850	10.9	1900	9.7	1950	35.1
1751	6.5	1801	19.7	1851	10.6	1901	9.8	1951	38.7
1752	6.8	1802	15.2	1852	10.6	1902	9.9	1952	40.5
1753	6.6	1803	14.3	1853	11.5	1903	10.0	1953	41.5
1754	6.9	1804	14.1	1854	13.3	1904	10.1	1954	42.3
1755	6.5	1805	17.1	1855	13.7	1905	10.0	1955	43.7
1756	6.8	1806	16.4	1856	13.7	1906	10.0	1956	45.8
1757	8.2	1807	16.1	1857	13.0	1907	10.3	1957	47.3
1758	8.2	1808	16.6	1858	11.9	1908	10.6	1958	48.7
1759	7.6	1809	18.2	1859	11.6	1909	10.6	1959	49.2
1760	7.2	1810	18.8	1860	12.1	1910	10.7	1960	49.8
1761	6.9	1811	18.2	1861	12.4	1911	10.8	1961	51.2
1762	7.2	1812	20.7	1862	12.1	1912	11.2	1962	53.0
1763	7.4	1813	21.2	1863	11.6	1913	11.2	1963	54.0
1764	8.0	1814	18.5	1864	11.5	1914	11.1	1964	55.8
1765	8.3	1815	16.5	1865	11.6	1915	13.7	1965	58.4
1766	8.4	1816	15.1	1866	12.4	1916	16.2	1966	60.7
1767	8.9	1817	17.2	1867	13.2	1917	19.6	1967	62.3
1768	8.8	1818	17.2	1868	13.0	1918	22.6	1968	65.2
1769	8.1	1819	16.8	1869	12.3	1919	23.9	1969	68.7
1770	8.0	1820	15.2	1870	12.3	1920	27.7	1970	73.1
1771	8.7	1821	13.4	1871	12.3	1921	25.1	1971	80.0
1772	9.7	1822	11.6	1872	13.1	1922	20.4	1972	85.7
1773	9.6	1823	12.4	1873	13.3	1923	19.4	1973	93.5
1774	9.7	1824	13.4	1874	12.7	1924	19.5	1974	108.5
1775	9.2	1825	15.7	1875	12.3	1925	19.6	1975	134.8
1776	9.0	1826	14.9	1876	12.0	1926	19.1	1976	157.1
1777	8.9	1827	13.9	1877	12.3	1927	18.7	1977	182.0
1778	9.3	1828	13.5	1878	12.0	1928	18.5	1978	197.1
1779	8.5	1829	13.4	1879	11.2	1929	18.2	1979	223.5
1780	8.2	1830	12.9	1880	11.6	1930	17.6	1980	263.7
1781	8.5	1831	14.2	1881	11.4	1931	16.4	1981	295.0
1782	8.7	1832	13.1	1882	11.5	1932	16.0	1982	320.4
1783	9.8	1833	12.3	1883	11.1	1933	15.8	1983	335.1
1784	9.8	1834	11.4	1884	10.9	1934	15.7	1984	351.8
1785	9.4	1835	11.6	1885	10.4	1935	15.9	1985	373.2
1786	9.4	1836	12.8	1886	10.0	1936	16.4	1986	385.9
1787	9.4	1837	13.1	1887	9.7	1937	17.2	1987	402.0
1788	9.8	1838	13.2	1888	9.7	1938	17.4	1988	421.7
1789	9.6	1839	14.2	1889	9.9	1939	18.9	1989	454.5
1790	9.8	1840	14.5	1890	9.9	1940	21.8	1990	497.5
1791	9.8	1841	14.1	1891	10.0	1941	23.9	1991	526.7
1792	9.9	1842	13.1	1892	10.0	1942	24.0	1992	546.4
1793	10.2	1843	11.6	1893	9.7	1943	23.9	1993	555.1
1794	11.0	1844	11.6	1894	9.5	1944	24.1	1994	568.5
1795	12.3	1845	12.1	1895	9.1	1945	25.4	1995	588.2
1796	13.1	1846	12.6	1896	9.0	1946	29.0	1996	602.4
1797	11.8	1847	14.1	1897	9.4	1947	31.0	1997	621.3
1798	11.5	1848	12.4	1898	9.5	1948	33.3	1998	642.6
1799	12.9	1849	11.6	1899	9.4	1949	34.4		

Source: Office of National Statistics. Note that this is an unofficial, unpublished index to 1910

Appendix 6

Inflation for Pensioners

1 In our discussions we have tended to use the main RPI index as the measure for prices inflation. However, an alternative index, RP21, is published by the Office for National Statistics, which gives prices inflation as experienced by pensioner households. There are two indices, for one or two person pensioner households. Both are available from 1987.

2 The existence of these indices does not substantially affect any of the points discussed in this report. However, people may not be familiar with the pensioner indices so we give details of the values and methodology below.

3 By the end of 1998, both indices were lower than the usual RPI index (excluding housing), by about 3% (two pensioner households) and 6% (one pensioner households), over the twelve years available.

RP21 Pensioner indices: issued by the Office for National Statistics

Index in Q4	Index for one person pensioner households	Index for two person pensioner households	Retail Prices Index (excluding housing)	Retail Prices Index (including housing)
1987	102.0	102.3	102.9	103.3
1988	106.6	106.8	107.7	110.3
1989	113.2	113.4	113.7	118.8
1990	122.4	122.6	122.6	129.9
1991	129.9	130.4	131.5	135.7
1992	132.6	133.7	135.6	139.2
1993	135.0	136.8	139.5	141.9
1994	137.8	139.9	142.4	146.0
1995	141.7	144.2	146.6	150.7
1996	144.3	147.6	150.7	154.4
1997	146.1	150.1	154.3	160.0
1998	148.6	152.8	157.3	164.4

(13 January 1987 = 100)

Source: Office for National Statistics

Note that the RPI excludes pensioner households and those in the top 4% of the income distribution.

Extract from the ONS manual "The Retail Prices Index: A Technical Manual"

The weights for the RPI explicitly exclude Family Expenditure Survey data on households consisting only of pensioners, at least three quarters of whose income is from state benefits. Separate indices are produced for one and for two pensioner households (there are very few private households consisting solely of three or more pensioners). These indices use the same price data as the RPI.

The indices are only published for quarters, rather than months.

The main differences from the RPI in the construction of the pensioner indices are as follows. Section weights are derived from information on expenditure, by one and two pensioner households, respectively. Canteen meals (including state school meals) and all housing sections are excluded: the exclusion of workplace and school meals is obvious; the exclusion of housing sections was made on the grounds that the price indicators used in the all items RPI would not be appropriate and would overstate the price increases experienced by these pensioners, as they would mostly be cushioned against some rises by rebates. Also, it would be technically difficult to compile separate house price indicator items for these households.

Other items are also excluded, including NHS prescription, dental and eyesight test charges, which are not paid by pensioners. For rail and bus fares, special pensioners' rail and bus fare indices are substituted for the normal index household indices to allow for fare concessions available in some areas.

The item weights differ from those in the RPI in the following sections, where there is evidence that expenditure patterns within the section are very different for pensioner households:

Milk	Domestic services	Maintenance of motor vehicles
Soft drinks	Fees and subscriptions	Rail and bus fares
Sweets and chocolates	Other clothing	Other travel
Other food	Footwear	Books and newspapers
Takeaways	Personal articles	TV licences / rent
Beer and wine (on- and off-sales)	Chemists' goods	
Other tobacco	Personal services	

The impact of improving mortality in times of low inflation

1 For simplicity, our projections do not make any allowance for changing mortality over time. However, we observe that:

- improving mortality increases the cost of pensions, once it is reflected in annuity rates (or funding positions),
- the increase in the cost of level pensions should be more significant in times of low inflation than in high.

2 To illustrate this second point, we compared the effect of nominal interest rates falling from 8% to 5% on typical level joint life annuities based on:

- PA(90)
- PMA92 / PFA92 (U1999)

3 The joint life annuities are based on a man aged 60 with a five year guarantee and 50% widow's pension. The annuities do not make any allowance for expenses.

4 On both mortality bases, the cost of an annuity increased by about 30% as the nominal interest rate fell, however the increase was about 4% more on the stronger mortality basis (that is 33% compared to 29%).

5 The effect of lighter mortality increased the cost of an annuity by about 9% using an interest rate of 8%, but in the lower inflation environment the increase was 12%.

6 Thus, improving mortality will increase the cost of benefits, and this effect may be worse in a low inflation environment. However, the inflation effect (rather than the mortality effect) is not too significant, compared to say a few months' actual investment performance.

7 In fact, the effect of improving mortality will be most significant in schemes which provide RPI linked increases. At 2% interest, the difference between the joint life annuities for the mortality bases described above is 18%. This effect is regardless of the rate of inflation, and depends only on the real yields available.

8 These effects are summarised in the table below:

Effect of changing mortality and nominal interest rates on annuity prices

	Heavier mortality		**Lighter mortality**
Higher inflation	PA(90) at 8%	+9%	1992 series at 8%
	+29%		+33%
Lower inflation	PA(90) at 5%	+12%	1992 series at 5%

Appendix 8

The Government's 'minimum income guarantee'

1 The Government has announced that there will be a 'minimum income guarantee' for pensioners. Effectively, this will be a means tested benefit payable to older people with low incomes. The current rate is at least £75 per week, depending on age and marital status. It is the Government's stated intention that this amount will increase in line with average earnings, though this is not guaranteed.

2 Currently, £75 a week represents around 20% of average full-time earnings. The basic state pension (BSP) is £66.75 a week or say 18% of average full-time earnings. However the BSP is linked to prices, not average earnings. So, in forty years the BSP could easily be say 10% of average earnings. Thus, the Government's message appears to be that a worker on average wages who contracts-out and saves through a defined contribution pension scheme, will not gain *any* financial advantage from saving enough to purchase a pension of 10% of his salary.

3 Of course, the contracting-out rebate will contribute towards the cost of a pension. The rebate in a COMP currently varies between 2.2% and 9%, with 9% payable only to employees from their late forties.

4 We observe that this may represent a situation where there is little incentive for workers on average earnings (or less) to make any additional private provision for their retirement, since the employee will bear the investment risks. Using similar assumptions to those detailed in appendix 3, we have attempted to illustrate this effect. The annuity at retirement uses index linked gilt yields minus 1%, as a proxy for the link to National Average Earnings.

5 Consider a worker on average wages who contracts-out via a COMP and contributes a further 5% himself for thirty years. This would be expected to produce a pension of around 13% of salary if invested in index linked gilts, or 18% if invested in equities, payable from age 60. Thus, at age 65, he would receive either 3% or 8% of salary as a pension in excess of the minimum income guarantee, plus his additional state pension earned before he contracted-out. At best, there is a danger that it may not appear worthwhile to save towards retirement, except for those, who are

- on relatively high earnings,
- willing and able to save at a material percentage of salary consistently for many years, and
- prepared willing to invest in risky assets and those assets subsequently deliver.

Appendix 9

Review of pension scheme design and administration

1 The working party was asked to recommend steps the profession should take in response to our analysis of the consequences of low inflation.

2 It is ultimately for employers to agree employment terms with their employees, including the level of pension provision. However, we feel that it is important that actuaries appointed to advise scheme sponsors ensure that the consequences of long term low inflation for scheme design are understood by those scheme sponsors. Without the issues being specifically flagged to them, they may be unaware of potential cost consequences, which could be very significant for the business as a whole.

3 There are considerable obstacles to amending benefit design, both legal and commercial:

- Accrued benefits are protected from alteration without member consent by Section 67 of the Pension Act 1995. This has strengthened the protection provided by general trust law and, in particular, has made it difficult to achieve changes where the revised benefit is expected to be of equivalent value but the actual benefit received by the member is dependent on future events.
- Scheme sponsors may be reluctant to reduce the accruing benefits of employees because of public and industrial relations difficulties it can cause. The working group also recognises that the need for simplicity of administration and the desire to avoid, where possible, the need for administrators to treat periods of service differently.

4 We have not attempted to produce an exhaustive list of problems but rather to illustrate the areas that concerned us when considering the impact of low inflation:

- The requirement to provide LPI increases on post April 1997 pensions in payment means little can be done to restrict the benefit. It might be desirable for schemes to have the flexibility to reduce pensions in times of deflation. Whilst, it may not be good for the perception of the profession for actuaries to be seen to lobby for such flexibility in the absence of an overwhelming need to do so, it may be better to act now, rather than to wait for the problem to arise.
- Fixed rate increases to pension in payment remain relatively common, especially for smaller insured schemes where fixed 5% increases in payment are not uncommon and are sometimes also provided in deferment. The 1998 NAPF survey shows that 22% of private sector schemes covered by the survey guarantee fixed increases in respect of pre-1997 service. 6% of schemes guarantee increases of 5% a year. Although not analysed in detail by the NAPF, 16% of schemes surveyed guaranteed increases for post 1997 service greater than LPI. The experience across all UK schemes may show a higher proportion, as the NAPF survey is weighted towards larger schemes.
- Fixed increases may have been introduced for simplicity but, in addition to cost implications, large annual real increases may well bring members up to Inland Revenue maximum benefits, necessitating additional administration to determine what those limits are and to monitor that benefits remain within them.
- Fixed rate revaluation of Guaranteed Minimum Pensions (GMPs) in deferment is used by the majority of schemes. Although GMP no longer accrues, it is a material element of the benefits in many schemes. If the scheme revalues the GMP benefits of current leavers by 6¼% a year, it may be appropriate to consider opting to use Section 148 Orders for future leavers. As yet we have no indication of the likely fixed rate that will apply after 5th April 2002 but, whatever level is set, it may prove high relative to earnings growth actually experienced.

5 Other less common design features that could be included in any review are listed below:

- Schemes which base the pension benefits on the best historic salary (for example the best 3 consecutive years in the last 10) but which apply fixed per annum uplift factors to historic salaries. Set with the intention of mitigating the loss in real value terms on historic salaries, these may in future enhance benefits.
- Fixed minimum returns on money purchase underpins or AVCs invested within the scheme.
- Cost of RPI with a minimum greater than 0%. This can either be a minimum each year or a minimum cumulative from retirement. In particular, schemes designed to give the Inland Revenue maximum increase in payment each year of the greater of the increase in the RPI and 3% may prove very costly.

6 The actuary should be alert to potential problems with the administration of underpins and anti-franking requirements which may start to bite when inflation is low. These may have been set at a low level, not affecting benefits for many years, and so have become overlooked. Anti-franking requirements may become very material for schemes using fixed rate GMP revaluation.

7 As ever, care is needed in costing benefit improvements, as changes that may be perceived as low or no cost, such as the guaranteeing of funded discretionary benefits, may in different financial circumstances prove expensive. This can be in the form of a direct impact on the cost of pension provision, or indirectly via lost flexibility.

8 Low inflation will cause problems with the interaction of GMP and SERPS. The derivation of SERPS and its interaction with GMP is complex and a particular problem is highlighted here. Statutory increases on GMP after state pensionable age are 0% for pre-1988 GMP and RPI up to a maximum of 3% for post 1988 GMP. The National Insurance Contributions Office manual CA14 (April 1999) states of post 1988 GMP increases in section 12.19, “Any balance of the inflation proofing above 3% is provided via the state Additional Pension”. The working party suspects that this wording, or variations thereon, is repeated in much of the communication to members.

9 However the Additional Pension will only provide full inflation proofing of the GMP when the GMP is less that the notional SERPS benefit (calculated by the state as if the individual had remained contracted in prior to April 1997). If national average earnings growth remains significantly below fixed rate revaluation, the GMP may exceed the notional SERPS pension at state pensionable age and then no increases from the state will be paid until the notional SERPS pension has increased to above the level of the GMP.

10 Members may feel misled and any claims are likely to be directed at the scheme rather than the state. The working party did not have a view as to whether such claims could be successful (it would be very dependent on what members had been told) but feels that, as a minimum, scheme communication should be reviewed to modify anything that promises inflation linking on GMP without qualification.

11 The Trust Deed and Rules will often require trustees to provide options to the member on an equal value basis or require the actuary to certify that the terms for such member options are reasonable, for example, commutation of pension for cash at retirement. Some schemes opt to have a frequently reviewed “market related” basis for such options. Many scheme trustees and sponsors prefer to have a fixed basis for simplicity and to assist members in planning. If such bases have been in place for years they may have been agreed by the trustees or certified by the actuary in very different economic circumstances. If the actuary believes the change to low inflation and low gilt yields is permanent then option terms should be reviewed.

Defined benefit projections: model pension schemes

Details of each of the four model pension schemes used in the projections in section 4 are described below.

Model 1: 'Typical' self-administered scheme

Consideration of information such as the annual NAPF survey suggests that the 'typical' defined benefit scheme in the UK at present is a contracted-out scheme, with 1/60ths accrual, 50% spouses' benefits and LPI escalation on pensions in payment. These are therefore the main features of our first model scheme. The membership of this scheme is assumed to be relatively stable and to be open to new entrants.

Model 2: Mature scheme

In recent years, many schemes have become closed to new entrants or, in contracting industries, have an active membership very much smaller than non-active membership. Closed and virtually closed schemes tend to face issues that are often not applicable to open schemes including ageing membership, rising funding cost as a percentage of pensionable payroll, cashflow management and investment constraints. The second model scheme considered by the working party is therefore a mature scheme which has been closed to new entrants for several years. The benefit structure of this model scheme is assumed to be as for Model 1.

Model 3: Scheme with fixed rates of pension escalation

A number of defined benefit schemes have fixed guarantees within the benefit structure. The most commonly occurring fixed guarantee is a fixed rate of pension escalation – typically either 3% or 5% a year. Whilst the majority of schemes now provide LPI escalation for post-97 accrual, there are a significant number of schemes retaining liability for fixed increases in respect of pre-97 accrual. Indeed, some schemes continue to provide fixed escalation for all service.

The third model scheme therefore is a scheme with guaranteed escalation of 5% per year on pensions in payment (and all other features as for Model 1).

Model 4: With-profit deferred annuity scheme

The with-profit deferred annuity (WPDA) contract is the sole investment of many insured schemes in the UK. These schemes are more likely than the average scheme to have features such as fixed pension increases. The majority of WPDA schemes are small and many are now closed to new entrants.

The final model scheme considered by the working party is therefore a small scheme which has been closed to new entrants for several years and whose sole investment is a WPDA. The benefit structure of this model scheme is assumed to be as for Model 3.

Returns under WPDA contracts are generated through a bonus system, whereby bonuses are declared in advance in each year. If actual investment returns are volatile over the year, then the mismatch between actual investment returns and bonuses declared can be significant. The mismatch of this asset against MFR and other liabilities is a feature of these contracts. In a period of sustained unfavourable experience the lack of flexibility of the contracts may make their position considerable worse.

To mitigate the effects of this potential volatility, a number of WPDA contracts are now invested in gilts – others may well move to a gilt basis in the future. For the purpose of our projections, we have assumed that the contract is fully invested in gilts and that the bonus distribution is broadly in line with actual gilt returns in each year.

Benefit structure

Details of the benefit structures for the model schemes used in the projections are as follows:

- Benefits are 1/60 of salary at the date of retirement for each year of service.
- Normal retirement age is 65 for all members.
- Pensions are payable monthly and guaranteed for 5 years.
- Spouses' pensions on death after retirement are 50% of the member's pension at death.
- There are no member contributions.
- The Schemes are contracted out of SERPS and, at the base projection date, 25% of accrued pension, on average, is assumed to be GMP.
- Escalation is LPI on all pensions in payment in the 'typical' and 'mature' models and 5% fixed on all pensions in payment in the 'fixed benefits' and 'WPDA' models.
- Statutory rates of revaluation apply to preserved pensions prior to retirement.

Demographic assumptions

Post retirement mortality:	PMA80/PFA80 (Entry year 1999) unadjusted
Pre retirement mortality:	none
Early/late retirements:	none
Withdrawals:	On average, 3% of the membership (by salary) is assumed to leave each year in the 'typical' and 'fixed benefits' models. No withdrawals assumed in the 'mature' and 'WPDA' schemes.
Marital statistics:	80% of males and 70% of females assumed married, with wives 3 years younger than husbands on average.
Salary escalation:	no explicit promotional salary scale
New entrants:	In the 'typical' and 'fixed benefits' models, new entrants are assumed to replace leavers, such that average ages and past service of active membership remain broadly stable. No new entrants assumed in the 'mature' and 'WPDA' schemes.

Membership

The membership of the model schemes at the base projection date is as follows:

	Typical	Mature	Fixed benefit	WPDA scheme
Active members				
Total pensionable payroll (£m)	40	15	40	1.5
Average past service (years)	10	12	10	12
Average age	45	50	45	50
Deferred pensioners				
Total preserved pension (£m)	1.5	2	1.5	0.2
Average age	40	45	40	45
Current pensioners				
Total current pension (£m)	2	5	2	0.5
Average age	70	70	70	70