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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 of America 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.

KEYWORDS

Pensions; Inflation; Investment Returns; Defined Benefits; Defined Contributions; Minimum Funding Requirement; Solvency

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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 A. 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 United Kingdom inflation will average 2.5% p.a.

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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 U.K. 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 their 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 R. A. Brealey and Dr S. D. 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% p.a. 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 hence 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. However, 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.

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1.3 *Structure of this Paper*

1.3.1 Section 2 reviews financial markets and the impact of inflation. In particular, the United States 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 U.K. 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 those of the U.S.A. and the U.K.

2.1.2 The data that we have analysed are from the U.K. (from 1919) and from the U.S.A. (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 are available. German and Japanese data are limited to post 1945, and the early years are heavily influenced by their extraordinary recoveries after the war.

2.1.3 The U.S.A. has undoubtedly been the more stable economy, albeit

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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 U.K. economy recovered only slowly and belatedly from the ravages of two world wars and the loss of Empire, with exchange controls persisting until 1979. Arguably, the inflation of the 1970s was worse in the U.K. 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 U.S. experience is the more 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; and
— the correlation of real equity and bond returns.

2.2 *Return*

2.2.1 Figures 1 and 2 show the average real returns for U.K. and U.S. securities over the periods from 1919 and 1926 respectively.

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

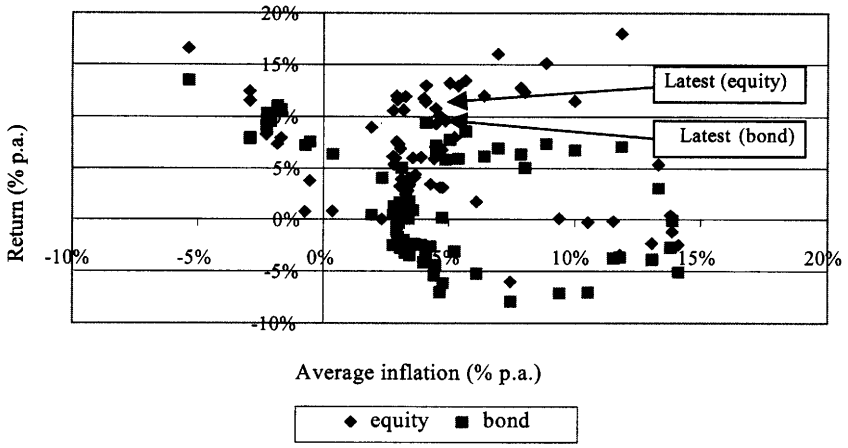


Figure 1. U.K. 10-year real equity and bond returns

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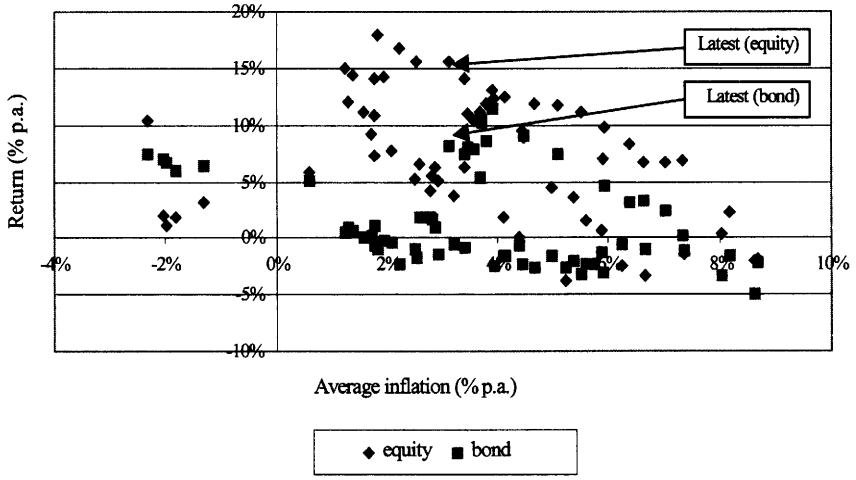


Figure 2. U.S. 10-year real equity and bond returns

2.3 *Volatility*

2.3.1 Figures 3 and 4 show the average real volatility for U.K. and U.S. 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 U.K. 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 U.K. appear to have been during very high inflation periods (but note that this is for a very few observations).

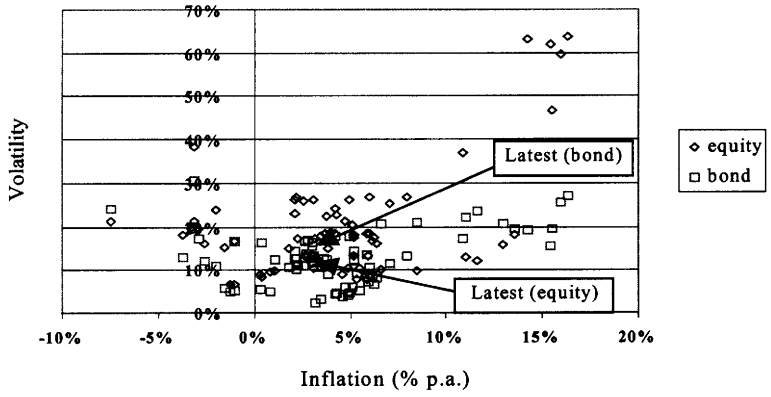


Figure 3. 5-year real volatility (U.K.)

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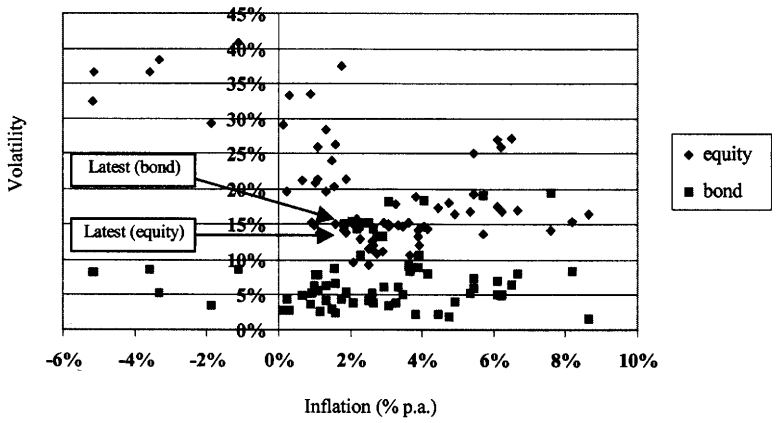


Figure 4. 5-year real volatility (U.S.A.)

The converse appears true for the U.S.A., with high equity volatility during low inflation periods and in all periods of deflation.

2.4 *Correlation*

2.4.1 Figures 5 and 6 show the average correlations between equities and bonds for the U.K. and the U.S.A., over the periods from 1919 and 1926 respectively.

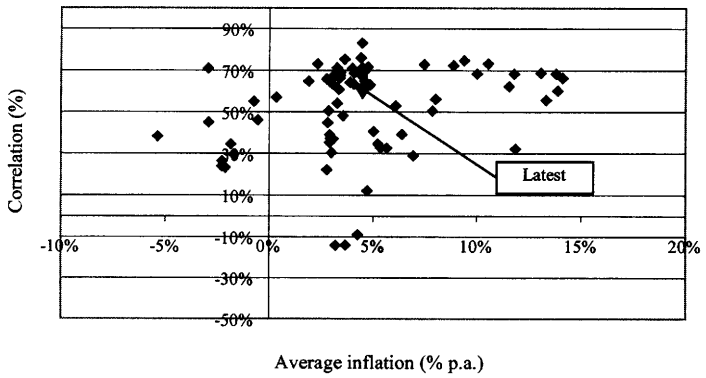


Figure 5. U.K. equity/bond 10-year correlation (real)

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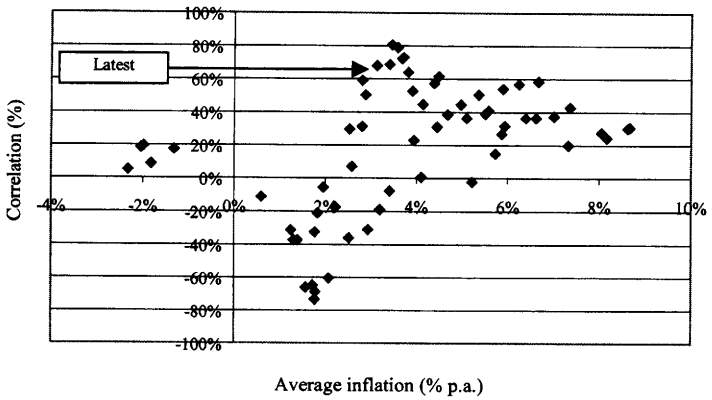


Figure 6. U.S. equity/bond 10-year correlation (real)

2.4.2 The U.K. data do not suggest any relationship. For the U.S. data, 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*

Considering the two sets of data:

— U.S. data indicate that low inflation may lead to higher volatility and lower correlations between equity and bond returns. There is evidence of assets providing high returns in the period running up to stable prices.
— U.K. 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

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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 (1995) noted that the experienced risk premium for equities over fixed-interest bonds in the U.K. had been around 7% p.a. 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% p.a., and possibly up to 4% p.a. in the long term. These estimates were based on equities initially yielding around 1% p.a. above index-linked gilts, and dividend growth being around 1% p.a. in real terms.

2.6.3 The assumptions for the analysis in this paper allow for a risk premium on equities of between 2% p.a. and 2.5% p.a. (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 U.K. equities) is consistent with the historically observed return on equities. Examples are shown in Section 2.11 (Table 2).

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 U.K. to fall from a figure that was generally accepted as being around 1.5% p.a. to its current level of around 0.5% p.a., 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 U.K. 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; and
— 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

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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 in 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 will be discussed further in a later section.

2.8 *Equity Investment*

2.8.1 Many defined benefit pension funds in the U.K. are currently overweight in equities (relative to bonds), as defined by the MFR legislation. Also, a significant proportion of actuarial opinion believes that bonds are a more appropriate matching asset than equities, even for active member liabilities. The proposed U.K. 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 U.K. 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 premiums. This recently culminated with the views expressed by Glassman & Hassett (1999), who predict that the Dow Jones Index (DJIA) 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 & Hassett's analysis is based on earnings rather than on dividends. Risk premiums 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. Figures 7 and 8 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 premiums 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

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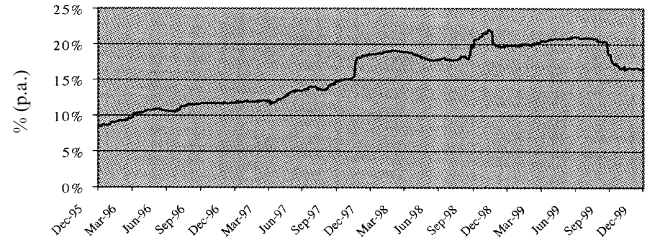


Figure 7. DJIA annualised daily closing volatility (% p.a.)

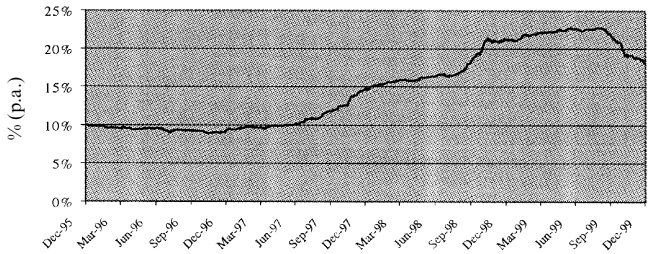


Figure 8. FTSE 100 annualised daily closing volatility (% p.a.)

to be *increased* in line with the changes to Retail Price Indexation (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% p.a., 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 that 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

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Table 1.

	Current yield % p.a.	Adjustment % p.a.	Total real assumption (rounded) % p.a.
U.K. equities	2.26	2.25 (1)	4.5
Bonds			
— U.K. 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% p.a.
(2) Inflation taken as 2.5% p.a.

least 'best guess'). The assumptions allow for market yields as at 30 June 1999, and are shown in Table 1.

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 U.K. equities, index-linked bonds and fixed-interest bonds.
— The dividend yields are compared with the earnings yield (the inverse of the price/earnings (P/E) ratio), 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 the trend in economic growth (taken as 2.25% p.a. in the U.K., 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-interest 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% p.a.), or if this will change (for example, due to government action, or joining the euro).

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Table 2.

Date	Dividend yield % p.a.	Plus GDP % p.a.	Plus P/E ratio contraction % p.a. *	Total % p.a.	Actual % p.a.
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 ratio 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 *Equity Return Assumptions*

2.11.1 The methodology for setting assumptions, outlined in Section 2.10, can be compared with the historical returns over the last 30 years. Table 2 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).

2.11.2 Table 2 shows that the expected assumptions — after allowing for any 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 Table 2, by allowing for the changes to the P/E multiple over the period.

2.12 *Distortions in the U.K. 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 Figure 9) is inverted, a condition that is usually a sign that short rates are expected to fall (or of the expectation of a recession). The U.K. curve is the only major government bond index which has recently been inverted.

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

— U.K. base rates would be between 3% and 3.5% p.a.; 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

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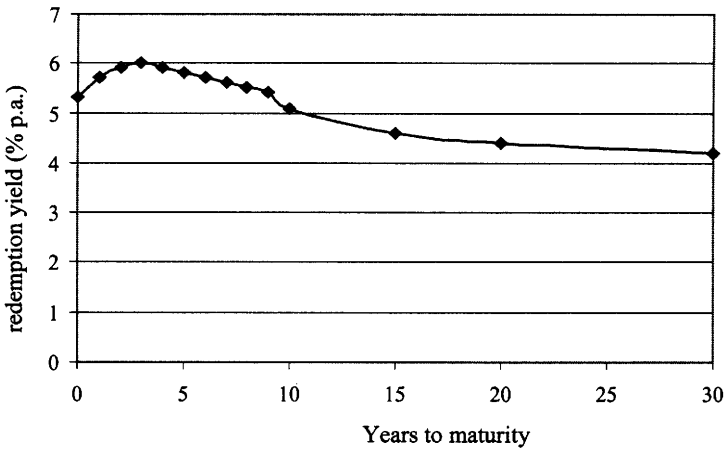


Figure 9. Yield as at 8 November 1999

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 the following:

— Solvency measures have been introduced which disadvantage pension schemes that are underweight in 'minimum risk assets' (defined as long-dated bonds), and which are overweight in equities. The terms underweight 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, 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.

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Table 3. Holders of 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

2.12.6 It is worth considering the overall liability framework in the U.K. when trying to understand the scope for this demand. Data for 31 December 1998, sourced from Watson Wyatt, suggest that 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. Table 3, showing holders of long-dated U.K. gilts, illustrates this.

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 U.K. 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 U.K. 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 B.

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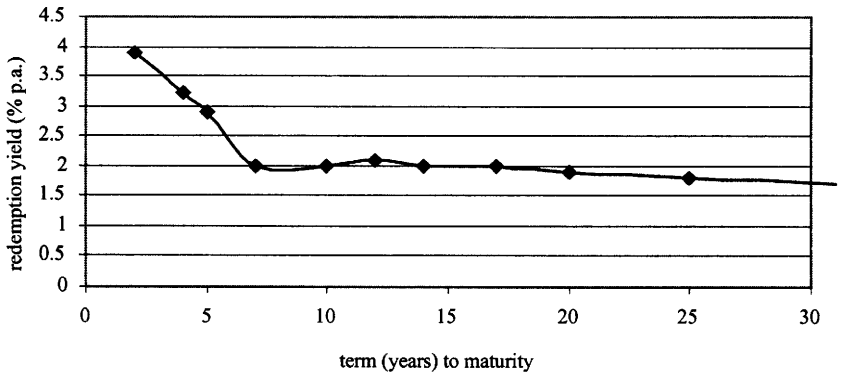


Figure 10. Yield as at 8 November 1999

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 U.K. 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 Figure 10.

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 in Figure 11. It should be noted that the overseas markets are generally of shorter duration than the U.K. market.

2.13.3 The immediate rationale might be that a 'convenience premium' is being applied again to U.K. markets due to high demand for U.K. 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 *et al.* (1999) it was identified that the measurement of European inflation was structurally around 0.7% p.a. to 1% p.a. lower than U.K. inflation. Likewise, Boskin *et al.* (1996) identified that U.S. inflation might be around 1% p.a. too high, primarily due to distortions in the quality of goods, but also due to substitution and discount shopping.

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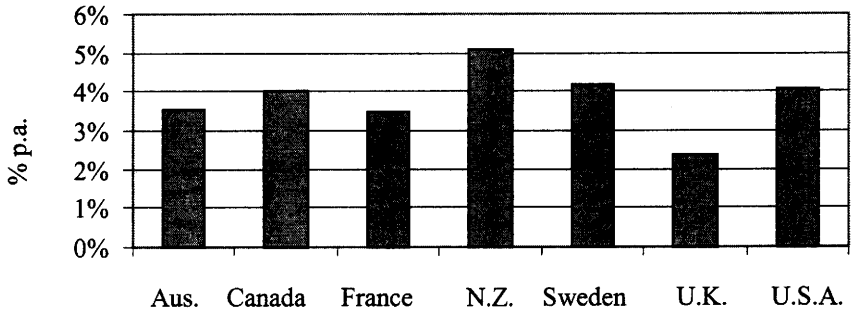


Figure 11. Index-linked markets

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 that much lower yields are expected on government bonds in a low inflation environment, it will become attractive for many investors to target the added yield from corporate bonds. Figure 12 shows the current level of additional return (over government debt), and also the historical risk of default. The data analysed are from the U.S. market, simply due to the

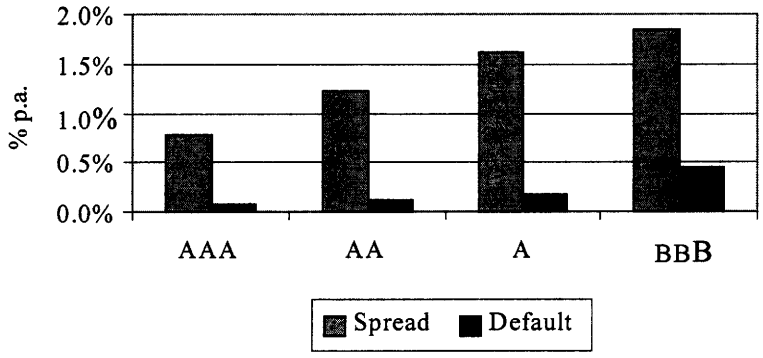


Figure 12. Corporate bonds; additional yield and default rates

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much wider range of bonds that have been available in that market for a long period. The data cover 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.

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:

— Markets have bought into 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 on 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*

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 should 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 prevent 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).
— The Debt Management Office should reconsider the current issuance profile. In addition, the Debt Management Office should consider 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

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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 conclude 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; and
— 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 by 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; and
— nevertheless value the level pension more highly than the alternative index-linked pension.

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3.2.2 In a period of prolonged low inflation, such investors are forced to purchase annuities which, it is hoped, will not decrease in real terms as quickly as they have in the past, when inflation was higher. This might imply that, in periods of low inflation, members should be able 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 feeling 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 U.K. 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 government action to lower U.K. 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 Section 2.10. Briefly, we have assumed contributions of 10% of salary for 30 years

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Table 4. 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%

with retirement at age 60. The projected pensions as a percentage of final salary are shown in Table 4. Further details of the basis for projection are given in Appendix C.

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, currently, a 10% contribution would not 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.

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.

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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 determined the effect of historic conditions using the contribution pattern described above. The results are summarised in Figures 13 and 14. Further details of the basis of projection are given in Appendix C. A table giving more details of the results is given in Appendix D.

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 U.K. inflation is attached in Appendix E.

3.5.3 Figures 13 and 14 refer to the purchase of level pensions, since index-linked yields were not available before 1982. In Figure 14 we have attempted to illustrate the effect of inflation by showing the real value of the level pension 15 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. The illustrations show expected pensions gradually reducing to the long-term averages, as the favourable historic returns gradually drop out of the projections.

3.5.5 Looking at the retirements up to the end of 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 workers can achieve wildly different pensions, for effectively identical contribution patterns.
— Over time, there has been a marked improvement in pensions achieved, due to improving 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 only to a limited extent in recent years.
— Inflation does not explain the improvement in pensions over generations of workers. Assuming 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

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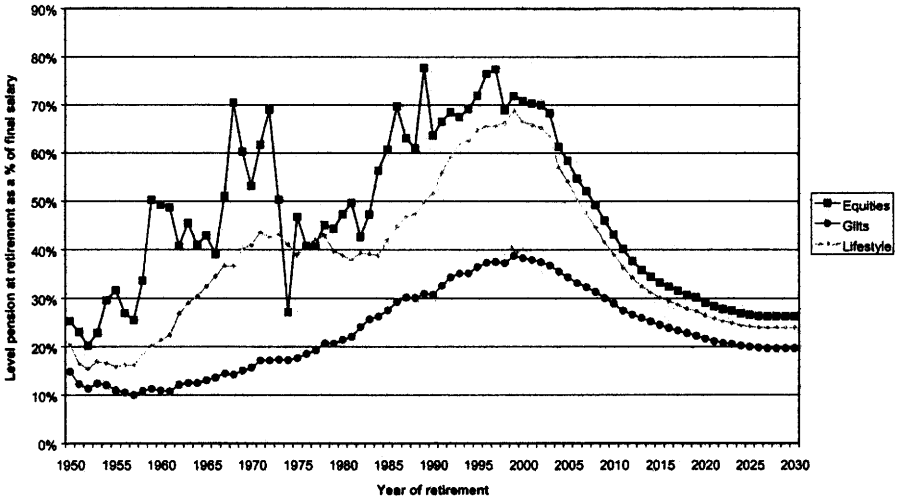


Figure 13. Level pension after 30 years' contributions at 10% of salary

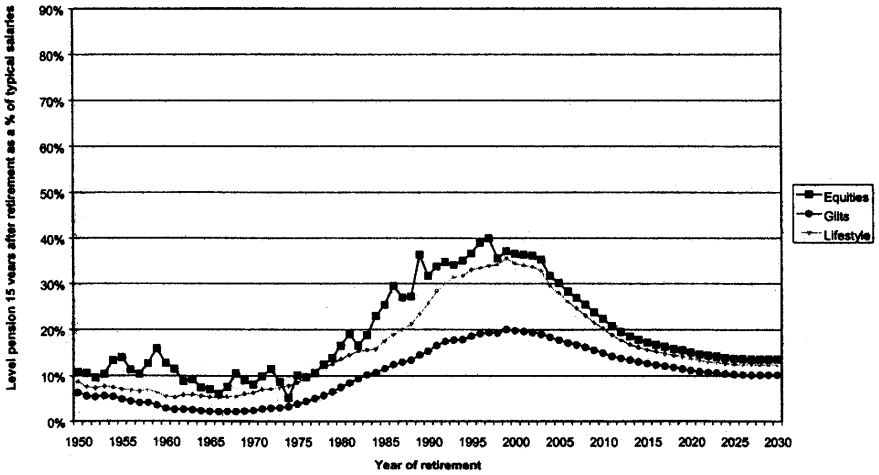


Figure 14. Pension 15 years after retirement, after 30 years' contributions at 10% of salary

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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 fund values. Annuitants retiring now will often have enjoyed very favourable 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; and
— 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 price inflation. However, an alternative index RP21 is published by the Office for National Statistics, which gives price 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 F.

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); and
— the increase in the cost of level pensions should be more significant in times of low inflation than in high.

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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 point in ¶3.6.3). 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 point in ¶3.6.3). 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 G.

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 H.

3.7 *Key Issues for Pensions Funding*

The most important conclusions that 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

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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 U.K., and the problems that low inflation and low real returns could cause.

4.1.2 Although much attention is focused 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 U.K. 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 I:

— 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.

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— There are still many schemes, especially small schemes, providing fixed pension increases in payment of 5% p.a.
— Fixed-rate revaluation on guaranteed minimum pensions (GMPs) is currently set at 6.25% p.a. for those leaving service. Set against an inflation target of 2.5% p.a., 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% p.a. 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 that there are sufficient assets to ensure that 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 that projected by pensions actuaries. Section 3.5 illustrates the impact of equity returns on the benefits provided by defined contributions savings. In defined benefit schemes there has often been a continuing element of equity investment 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 that their pensions are funded, and, in the simplest terms, may

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think of their benefits 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 that 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 U.K. are primarily invested in equities, then equity market behaviour is key for U.K. 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 U.K. 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

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on particular pension schemes. Further, the 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 U.K., 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 J, and summarised briefly as:

— 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; and

— Model 4: with-profits 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

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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 U.K. 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 1. The central rates of return effectively assume that equities will outperform gilts by 2% p.a. on average. The asset mixes used in the projections are intended to reflect broad matching of assets to liabilities, and are summarised in Table 5. One of the key features is the sensitivity of the results to the relative performance of the asset classes.

Table 5.

	Proportion invested in			
Scheme	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 in Tables 6 to 9, showing the initial position, together with the position after three, five, seven 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.

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Table 6. Model 1, the 'typical' 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%

Table 7. 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%

Table 8. 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%

Table 9. Model 4, the with-profits 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%

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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.

4.7.6 In Model 1 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 five 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) complicates the position on buy-out. In practice, the split of assets between pensioners 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.

4.7.9 In Model 2 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

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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.

4.7.12 Model 3 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, historically, may well 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 that 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.

4.7.15 Model 4 considers, on a simplified basis, the problems faced by small insured schemes whose sole investment is a with-profits deferred annuity (WPDA). 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 later, 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 have already publicly

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raised their 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, U.K. 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 that 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.

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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 U.S. 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 an employee, now aged 30, contributing 10% of salary with lifestyle investment, retires aged 60, we project a level pension of 24% of final salary compared 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 in 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 in 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.

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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 may 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".

References

Bishop, G. (1999). *Why are long gilts the richest bonds in the world, and getting richer?* Salomon Smith Barney, London.

Boskin, M.J., Dulberger, E.R., Gordon, R.J., Griliches, Z. & Jorgenson, D. (1996). *Final report to the Senate Finance Committee by the Advisory Commission to study the consumer price index*. Washington.

Glassman, J.K. & Hassett, K.A. (1999). *Dow 36,000; the new strategy for profiting from the coming rise in the stock market.* Times Books.

Martin, W.J. (1999). *The value of Q.* Phillips & Drew, London.

NAPF, (1998). *National Association of Pension Funds: twenty-fourth annual survey of occupational pension schemes.* Times Books.

Nowell, P.J., Crispin, J.R., Iqbal, M., Margutti, S.F. & Muldoon, A. (1999). Financial services and investment markets in a low inflation environment. *B.A.J.* **5,** 851-897.

Scott, Sir Bernard (1981). *Inquiry into the value of pensions*. Cmnd.8147, HMSO.

Wilkie, A.D. (1995). The risk premium on ordinary shares. *B.A.J.* **1,** 251-293.

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APPENDIX A

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; and
— 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; and
— the media.

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APPENDIX B

EXECUTIVE SUMMARY OF BISHOP (1999)

An explosive brew of circumstances is unfolding in the U.K. 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 U.K. 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

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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.

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APPENDIX C

DEFINED CONTRIBUTION PROJECTIONS AND HISTORIC ILLUSTRATIONS

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

— projected pensions based on future long-term conditions (Section 3.4); and
— illustrated pensions based on historic investment conditions, extrapolated into the future (Section 3.5 and Appendix D).

C.2 We summarise the assumptions made in these projections below.

Pension Projections

C.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 five-year guarantee and 50% widow's pension.

C.4 Investment returns in service are assumed to be:

	Future real returns p.a.
Equities	4.5%
Gilts	2.5%
ILGs	2.0%

C.5 Inflation is assumed to be 2.5% p.a.

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

C.7 Mortality in payment is PMA80 (U = 1999).

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

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

C.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

C.11 The figures 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 U.K. returns, as published in the Barclays Capital Equity-Gilt Study, 1999 edition.

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C.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.

C.13 The illustrations use the same 2% p.a. 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 the variation in real salary increases.

C.14 In practice, the available statistics on salary growth before 1960 are not ideal. Data are 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 earnings growth over calendar years. On average, they show growth of a little over 1% p.a. over the whole period, which is not inconsistent with our 2% p.a. assumption, which can be taken to include an element of promotional earnings growth.

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APPENDIX D

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

	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	Year of retirement (Dec)
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 E

HISTORY OF U.K. INFLATION

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

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APPENDIX F

INFLATION FOR PENSIONERS

F.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 (ONS), which gives price inflation as experienced by pensioner households. There are two indices, for one or two person pensioner households. Both are available from 1987.

F.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.

F.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.

Table F1. RP21 pensioner indices

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.

F.4 *Extract from the ONS Manual,* The Retail Prices Index: A Technical Manual

F.4.1 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

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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.

F4.2 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.

F4.3 Other items are also excluded, including NHS prescriptions, 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.

F4.4 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	

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APPENDIX G

THE IMPACT OF IMPROVING MORTALITY IN TIMES OF LOW INFLATION

G.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); and

— the increase in the cost of level pensions should be more significant in times of low inflation than in high.

G.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); and

— PMA92 / PFA92 (U1999).

G.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.

G.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%).

G.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%.

G.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.

G.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.

G.8 These effects are summarised in Table G.1.

Table G.1 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%

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APPENDIX H

THE GOVERNMENT'S 'MINIMUM INCOME GUARANTEE'

H.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.

H.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 40 years' time 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.

H.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.

H.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 C, 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.

H.5 Consider a worker on average wages who contracts-out via a COMP and contributes a further 5% himself for 30 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 to invest in risky assets *and* those assets subsequently deliver.

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APPENDIX I

REVIEW OF PENSION SCHEME DESIGN AND ADMINISTRATION

I.1 The Working Party was asked to recommend steps that the profession should take in response to our analysis of the consequences of low inflation.

I.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.

I.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 of equivalent value, but 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 the public and industrial relations difficulties that it can cause. The Working Party also recognises the need for simplicity of administration and the desire to avoid, where possible, the need for administrators to treat periods of service differently.

I.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 that little can be done to restrict the benefit; although 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 pensions 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, with 6% of schemes guaranteeing increases of 5% p.a.

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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 U.K. 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 6.25% p.a., 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 5 April 2002, but, whatever level is set, it may prove high relative to earnings growth actually experienced.

I.5 Other less common design features that could be included in any review are:

— schemes which base the pension benefits on the best historic salary (for example the best three 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; and

— 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.

I.6 The actuary should be alert to potential problems with the administration of underpins and anti-franking requirement, 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 requirement may become very material for schemes using fixed rate GMP revaluation.

I.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.

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I.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.

I.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.

I.10 Members may feel misled, and any claims are likely to be directed at the scheme rather than at 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.

I.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 that the change to low inflation and low gilt yields is permanent, then option terms should be reviewed.

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APPENDIX J

DEFINED BENEFIT PROJECTIONS: MODEL PENSION SCHEMES

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

Model 1: 'Typical' self-administered scheme

Consideration of information such as the annual NAPF survey suggests that the 'typical' defined benefit scheme in the U.K. at present is a contracted-out scheme, with 1/60ths accrual, 50% spouse's benefit 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, cash flow 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% p.a. or 5% p.a. Whilst the majority of schemes now provide LPI escalation for post-1997 accrual, there are a significant number of schemes retaining liability for fixed increases in respect of pre-1997 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% p.a. on pensions in payment (and all other features as for Model 1).

Model 4: With-profits deferred annuity scheme

The with-profits deferred annuity (WPDA) contract is the sole investment of many insured schemes in the U.K. 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.

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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 considerably 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 Structures

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 members' pensions 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

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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

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ABSTRACT OF THE DISCUSSION

The President (Mr C. W. F. Low, F.F.A.): It is my pleasure to welcome, as an official guest of the Faculty, Mr George Russell of the Government Actuary's Department. I also welcome one of our Honorary Fellows, Dr Hans Bühlmann, and offer him our formal congratulations on being awarded the James Anderson Award in America last autumn, for being the leading actuary in the last 50 years of the last century.

Mr K. Kneller, F.F.A. (introducing the paper)**:** Our report was commissioned by the Pensions Board to consider the implications for United Kingdom pension schemes of a prolonged period of low inflation. This follows the work of a previous working party (Nowell *et al.,* 1999), which covered the background to low inflation and the implications for life insurance companies.

From a U.K. pensions perspective, low inflation is new, uncharted territory. Our collective practical experience tends to come from periods of relatively high inflation, which were also characterised by good, real investment returns. Looking forward, we may well be entering a period of sustained low inflation. At the same time final salary schemes are more generous and inflexible than they once were. Money purchase schemes are becoming more common. Our challenge, as a profession, is to help smooth this transition for the pension schemes which we advise.

Low inflation raises some immediate practical issues for many final salary pension schemes. Fixed increases in payment are not unusual. Fixed revaluation for guaranteed minimum pensions (GMPs) is common. Option terms may reflect significant expected inflation. The effects of short periods of deflation may be ambiguous. For some schemes these are issues which have significant financial implications, some of which may well be ameliorated by prompt attention. Certainly, assessing these issues should be a priority for all pension schemes before any other benefit changes are considered.

As well as these practical issues, we have also considered what other factors might affect U.K. pension schemes over the next few years, in particular the level and volatility of investment returns. In itself, low inflation does not affect the real cost of pension schemes. Cost depends on the real value of the benefits provided and the returns achieved by any assets held against those liabilities. I do not know what real returns will be delivered in the future, but clearly they will have a major impact on the cost of final salary schemes and on the benefits produced by money purchase schemes. It seems essential to consider the impact of low inflation in the context of the expected investment returns.

History is little help in predicting real investment returns in periods of low inflation. Data are limited, though there is some evidence from the United States of America that, in periods of low inflation, volatility of returns may be higher and the correlation between equity and bond returns may be lower. One immediate outcome, if that were repeated in the U.K., is that this would increase the Minimum Funding Requirement (MFR) risks for mismatched schemes. However, I should emphasise that we did not spend much time considering MFR, since that is properly the remit of other working parties.

We do know that U.K. gilt yields are lower than in the past, and they imply either sustained low inflation or poor returns from fixed-interest assets. Index-linked yields are far below most actuaries' assumptions for long-term real returns. It is impossible to be sure, but it does seem that current equity prices have been supported by the transition to a low inflation environment, and an acceptance by investors of a lower equity risk premium. Clearly, neither of these factors can be repeated indefinitely. This suggests that future equity returns will be lower than in the past, unless there is significant growth in underlying economic activity and corporate profitability.

We have made projections using some assumptions which are given in Table 1. We have assumed that current market bond yields are sustainable and that there is an equity risk premium of 2.5% over index-linked gilt yields. Some would argue for a higher margin; others would say

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that pension schemes should not take credit for equity outperformance until it happens. On balance, we believe that our assumptions are sufficiently realistic to give a useful insight into future funding developments.

We do note that there are supply and demand problems in the long gilts market. Corporate debt issuance is rising sharply to fill that gap. It may be that, in time, yields may be higher than at present, helping to make pensions more affordable.

Using our assumptions, we conclude that the cost of pensions may well be higher than in the past. This is best illustrated by Figures 13 and 14. These graphs clearly show the volatility of pensions costs in the past, and that recent returns and conditions have been much more favourable than the long-term average. On our assumptions, it appears that money purchase pensioners will get lower pensions than they enjoyed in the recent past. Final salary schemes will cost more. At the same time, final salary schemes will have less flexibility to deal with adverse experience. Benefits, particularly pension increases, are more rigid than before, and the pace of funding more strictly prescribed by MFR and accounting developments. In addition, these financial effects may appear against a background of steadily improving longevity.

It should be noted that pensions are expensive — 10% of salary for even 30 years may not be enough. Anecdotal evidence suggests that this is more than many members and employers are keen to pay. Money purchase schemes may continue to give very volatile outcomes. Final salary schemes may have volatile costs. It may turn out that recent pensioners will have retired at the most favourable time of all.

Against this background, good investor understanding will be vital. Money purchase members must have better communications material. We must ensure that final salary scheme sponsors appreciate the true cost of their commitments, and the potential volatility of that cost.

We warn that traditional funding methods may be slow to react to a change in the inflation environment. Apparently reasonable funding plans can mask a steady erosion in the true funding position. MFR calculations may give false confidence, both in terms of ongoing costs and of discontinuance solvency. Annuity buyout costs are currently high.

Once a deficit starts to emerge, it may lead to dramatic falls in security for the members in the lowest priority classes. Scheme Actuaries must consider carefully the impact of the changing financial environment on their clients' schemes, and ensure that the trustees and sponsors fully understand the implications. The differences between ongoing funding levels, statutory solvency and discontinuous liabilities may be dramatic.

Mr M. D. Craig, F.F.A. (opening the discussion)**:** The main issues addressed in the paper are the impact of low inflation on future investment returns and the consequence of rising pension costs for both defined contribution and defined benefit arrangements. Arguably, the crux of the paper relates to the assumptions outlined in Section 2.10. Does low inflation inevitably result in rising pension costs? The authors acknowledge that the assumed real rate of return on equities is significantly lower than has historically been the case in the U.K. They go on to state that the assumption for equity growth to be higher than the GDP growth would imply a net transfer from individuals to shareholders. I would invite further discussion of how unreasonable this assumption might be in practice. What are the macro-economic implications of this?

If, as the paper suggests, a sustained period of low inflation inevitably leads to rising pension costs, then the consequences are clearly significant. It would appear that we face a future where, at best, pensioners are disillusioned with their income in retirement, and, at worst, there is a complete breakdown of the fabric of funded pension provision in the U.K.

The paper highlights three principal stakeholders, which may have to be persuaded of the potential consequences of a low inflation environment. These are: scheme sponsors; scheme members; and the Government and the regulatory bodies.

Scheme sponsors

Sponsors of defined benefit arrangements would appear to be most affected by a low

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inflation environment. Paragraph 2.7.4 outlines the three practical choices available to scheme sponsors if the cost of pension provision increases in future: to increase contribution rates; to reduce member benefits; or to invest in higher returning assets. What will sponsors do when faced with such options? Is there a potential risk that scheme sponsors will either: ignore the warnings given, on the basis that actuaries have 'cried wolf' too often before; or decide to limit the liability by, for example, closing the scheme to new entrants?

Necessarily, neither action will be of benefit to the scheme members, but will be a realistic consequence of poor communication to scheme sponsors.

Scheme members

Scheme members, particularly those individuals who are contributing to defined contribution arrangements, face a difficult future if pension costs rise significantly. A recent Mintel survey highlighted that, to enable a comfortable lifestyle to be enjoyed, a majority of individuals needed their retirement income to exceed £15,000 p.a. This equates to approximately 75% of current national average earnings. What would be particularly shocking for many scheme members, therefore, is the income in retirement that they could more realistically expect if the cost of pension provision does, indeed, increase in future. This is illustrated in Sections 3.4 and 3.5, in particular the example of a 10% contribution, invested in equities, over a 30-year period, providing, at best, a pension of just 25% of salary.

The authors are correct to emphasise that the results are dependent upon actual experience matching the assumptions made in Section 2. However, if the key assumptions are realised, what is the likelihood of individuals questioning the point of making financial sacrifices during their working lifetime for such an apparently miserly income in retirement? Can the profession do anything to mitigate this outcome?

The Government and the regulatory bodies

The final group of stakeholders which are affected is the Government and the regulatory bodies. One point, highlighted in Section 3.6, is the impact of the minimum income guarantee, which is currently approximately 20% of national average earnings. In a low inflation environment, potentially this acts as a huge disincentive to many individuals to make private pension provision. Should the profession be questioning the very foundation upon which the Government's welfare reform programme is based, particularly in respect of the Government's target market for the new stakeholder pensions?

In conclusion, I believe that we need to consider carefully the impact of low inflation on future investment returns, particularly the prospects for future equity returns. If pension costs do rise significantly, then the profession faces many challenges to ensure that a sustained period of low inflation has a positive, rather than a negative, impact on the funding of pensions in the U.K.

The President (Mr C. W. F. Low, F.F.A.): In opening the meeting to discussion, I would remind members that the original subject that we expected to be discussing was the profession's submission to the Department of Social Security (DSS) on the MFR. The Debt Management Office has advised the profession that they regard our thoughts on that matter as market sensitive, and we are therefore restricted, officially, to the comment that we have been asked by the DSS to advise on the MFR by spring 2000. So, I remind any member who serves on a working party, committee or board of the profession that remarks relating to the profession's view on the MFR should not be made in this discussion. However, the MFR is but the manifestation of reality, and reality, most certainly, can and should be debated — hence this paper. The notice convening this sessional meeting made mention of a paper by Dr Andrew Cairns (Cairns, 1999). Any member who wishes to speak about the MFR, giving his personal views, is welcome, and indeed encouraged, so to do.

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Reference

Cairns, A.J.G. (1999). An analysis of the level of security provided by the Minimum Funding Requirement. *B.A.J.* **5**, 585-610.

Mr J. R. Gibb, F.F.A.: I begin with ¶5.4.2, where the authors produce a simple message for the future. I think that it is incomplete. The message should be: "lower pensions, or higher contributions, or higher pension age". The really startling thing about this paper is that there is no mention, so far as I can see, of a higher pension age. It deals throughout with a typical scheme: 30 contributing years, a pension age of 60, which means that, with present trends in mortality, there will be 20 pension years. This is, patently, so disproportionate that no such scheme could be anything other than wildly expensive. Pension ages will have to increase.

I think that the profession, in general, has a very powerful message to try to get across. If people insist on retiring at age 60, they will have to accept lower disposable income while they are working, because of higher pension contributions.

In ¶2.10.3 the question of an appropriate real return is raised. There is some historical evidence and, I think, some theoretical justification for believing that the real return on equities will not exceed the GDP growth rate, it will almost invariably be less. The principal reason is that considerable accumulations of capital are a necessary condition for growth in GDP, and that, in practice, the reward on the extra capital snaffles some of the growth that would otherwise accrue to existing capital.

Professor R. S. Clarkson, F.F.A.: I very much welcome the opportunity that this paper offers us to discuss what new bearings for pension fund investment strategy might be appropriate in an era of low inflation. The paper itself, however, causes me serious concern for two main reasons. First, the authors seem to have fallen hook, line and sinker for the financial economics definition of investment risk as being synonymous with volatility of return. What I would want, instead, is some measure of shortfall in return, if any, against an appropriate benchmark, which, in the case of pensions investment, is clearly the RPI. Second, I believe that the authors have seriously underestimated the likely real rate of return on U.K. equities, and, accordingly, that their concluding paragraphs are unduly alarmist.

I deal first with risk. Suppose that some financial entity has net assets of 100 at present, and requires, at some future date, net assets of 110 or more for the outcome to be satisfactory to all concerned — 'happiness' in Mr Micawber's terms. If the net asset value is 106 or less, we have insolvency — Mr Micawber's 'misery'. We can invest either in asset class A, which gives 105 with certainty, or in asset class B, which gives either 110 or 120 with equal probability. It should be blindingly obvious to anyone with a grain of common sense that we should go for 100% investment in asset class B. However, in the eyes of the financial economist, asset class A, which leads to insolvency with certainty, has zero volatility of return, and hence is the 'risk-free' asset. If we interpret asset class A as gilts and asset class B as equities, we have what I see as the unsound logic that pervades the paper as far as long-term investment returns are concerned. Gilts are unthinkingly taken as being the 'minimum risk' asset and the yardstick against which 'mismatching' is alleged to occur, despite convincing evidence that the probability of equities outperforming gilts rises to near certainty as the investment horizon moves longer.

My much simplified example suggests that risk is downside only in nature, and relates both to the frequency and the severity of shortfalls below some benchmark return. This is precisely the approach that I have developed and advocated for more than ten years. If we take the 1918 to 1998 data, as the authors did, for U.K. equities and conventional gilts, and, for horizons of one year, two years, three years, and so on, up to 20 years, calculate this downside risk, using RPI as the benchmark, in a similar manner to that described in my recent paper (Clarkson, 1999), the results are extremely illuminating. Only at one, two and three years is the equity risk higher than the gilts risk; at four years and longer the equity risk is lower than the gilts risk. Furthermore, the equity risk peaks at five years, and then decreases steadily towards zero. The gilts risk, on the

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other hand, increases linearly right up to 20 years, and, in particular, is around five times the level of the equity risk at ten years. Given, also, that the average real rates of total return from 1918 to 1998 are 8% p.a. for equities and only 2.4% p.a. for gilts, the case for gilts being not only the 'minimum risk' asset, but also the matching standard for long-term pension fund investment, seems hollow in the extreme.

Even allowing for a somewhat lower outperformance of equities over gilts in the future, this commonsense downside approach to risk, with RPI as the benchmark, suggests that, to horizons of five years or longer, equities are far less risky than gilts. This has far-reaching practical implications for long-term pension fund investment strategy, and, in particular, it makes a nonsense of so-called lifestyle arrangements that start to switch out of equities into gilts all of ten years before retirement age.

Interpreting risk as volatility of return can also result in nonsensical conclusions over shorter-term timescales. I refer, in particular, to ¶2.8.3, where the authors suggest that the increase in U.K. equity volatility from the middle of 1997 to the middle of 1999, as portrayed in Figure 8, shows that equity risk was increasing over this period. I would argue that the diametrically opposite conclusion can be drawn. In the light of highly satisfactory economic and corporate news, the previously modest rate of uptrend in the U.K. equity market began to accelerate from the middle of 1997, and by the middle of 1998 valuation levels had probably become somewhat overextended. The rise in volatility over this period is upside in nature, and simply reflects the many strong daily rises that were necessary to take the market to its much higher level. In August and September of 1998 the Long-Term Capital Management hedge fund fiasco and the collapse of the Russian economy led to worldwide investor panic, and the *FTSE* All-Share Index fell 25% in only three months. The sharp rise in volatility during August and September 1998 is downside in origin, and reflects the small number of spectacular daily falls that generated this savage correction. The equally spectacular subsequent rises, once it was realised that the financial world was not, after all, coming to an end, led to very strong upside contributions to volatility. My interpretation of this period of increasing volatility is that an understandable market uptrend became overextended, and, on the trigger of two items of unexpected bad news, was followed by a healthy correction to an overly pessimistic level, from which a very strong recovery was inevitable, unless our entire capitalist system came to an end. Viewing intermittent market corrections, such as this, as an invaluable safety mechanism that reduces the probability of a much more serious downturn in equity markets, I regard the mid-1997 to mid-1999 increase in volatility as supporting, rather than contradicting, what I see as the low risk characteristics of equities over anything other than the shortest of investment horizons.

I come now to the authors' 'best guess' of 4.5% p.a. as the real yield on U.K. equities, the rationale for which is summarised in Table 1 and ¶2.10.2. Taking the current yield as still being of the order of 2.25%, I too would make an initial upward adjustment of 2.25%, but not for the reason that the authors suggest, namely that this is the trend rate of U.K. economic growth since 1970. As Mr Gibb has already said, there tends to be leakage in terms of abortive new capital projects, and normally it is unsound to assume that the full rate of economic growth comes through to real dividend growth. However, in the concluding section of Wilkie (1995), the author stressed that the great unknown as regards equity share returns is the future real growth rate in dividends, and he pointed very perceptively to four possible bases for future projections:

(1) a continuation of the 1% real growth rate from 1923;
(2) a real growth rate of −1% if it was thought that real dividend growth had peaked and was about to swing downwards;
(3) an intermediate position of zero real growth; and
(4) one that is in tune with the parameters of this paper — a high real growth rate of, say, 2% p.a. to take into account a possible economic recovery and also a low and stable inflation rate.

Given the present low inflation background and the recent upward revision of the trend rate of U.K. economic growth, I would take Wilkie's estimate on his most optimistic scenario (4), and

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raise it by a marginal 0.25% to 2.25% p.a. Returning now to Mr Gibb's point about leakage from abortive capital projects, we have had a new, and probably continuing, feature of the U.K. corporate scene over the past five years. Companies with surplus equity capital and little idea of how to employ it profitably have, very commendably, tended to give it back to shareholders by way of capital distributions. Also, there is now intense pressure on even the bluest of blue chip companies to take firm corrective action very promptly if their profitability declines markedly, and the name Marks & Spencer comes readily to mind here. Eliminating the poorest outcomes has a very powerful upward effect on average values, and my guess is that these enhancements to profitability could increase the rate of dividend growth by around 1% p.a.

Another fairly recent development, driven partly by tax changes, but not exclusively, is a reduction in the relative importance of dividends as a component of the total return on equities, with many companies trying to maximise what they see as shareholder value, and often raising dividends by less than the increase in earnings per share. Also, in the so-called 'new industry' TMT sectors of technology, media and telecommunications, the creation of wealth is predominantly through capital value rather than through income. Again, I think that this non-income contribution to total return might be equivalent to a further 1% p.a. growth in dividends.

My prospective estimate of the annual real yield on U.K. equities is now 2.25% + 2.25% + 1% + 1%, which is 6.5%, a value all of 2% above the authors' estimate of 4.5%, but still 1.5% below the historic average of 8% since 1918, a period which has involved three episodes of acute economic dislocation, the depression years of the 1930s, the Second World War and the chronic inflation years of the 1970s.

Clearly, it is essential to check the reasonableness of my prospective estimate by some retrospective approach, which takes account of what has actually happened in the past and then makes any appropriate adjustments for the future. In my article entitled 'The Long-Term Case for Equities', in the December 1999 issue of *The Actuary*, I arrived at 5.1% p.a. as my best estimate of the differential between the real yields on equities and conventional gilts on the basis of historic data. Given the upward revaluation of equities in recent years, some reduction below 5.1% p.a. is clearly required for an estimate of the future value of this differential. While concluding, in that article, that equities, rather than gilts, seemed to be the 'natural' or 'minimum risk' asset class for long-term investment, I gave a crucial caveat: from time to time (such as in 1972) all but the most perceptive of investors will fail to realise that equity prices have run dangerously far ahead of sustainable levels. The question is: "Are U.K. equity valuation levels seriously overextended at present?" My answer to this is 'no', based mainly on the fact that we are, at present, not far away from the valuation levels of 1998, when the healthy market correction that I discussed earlier, in a different context, blew away any froth that might have been building up in valuation levels. This suggests that only a modest reduction of, say, 1% p.a. might be appropriate, which takes me, in round terms, to a differential of 4% p.a. for U.K. equities over conventional gilts. Adding on the uncontroversial real gilts yield of 2.5% p.a., then gives 6.5% p.a. for the real yield on equities, precisely the figure that I had arrived at earlier from a quite different perspective. My 'best guess' is, therefore, 6.5%, rather than the authors' 4.5%.

I shall be very interested to hear what real equity yield others regard as being appropriate in current circumstances, but I shall be surprised if everyone is happy with 4.5% p.a. I therefore suggest that, for the *British Actuarial Journal* version of this paper, the authors should be asked to include a new appendix showing Tables 6, 7, 8 and 9 reworked with 6.5% p.a., rather than 4.5% p.a., as the real yield on U.K. equities. Results for values other than 4.5% p.a. or 6.5% p.a. could be estimated by interpolation or extrapolation.

Reference

Clarkson, R.S. (1999). A continuous performance investigation of selected United Kingdom equities. *B.A.J.* **5**, 801-822.

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Mr J. Hastings, F.I.A.: I was rather disappointed by some of the content of the paper, although this disappointment largely relates to the analysis of financial markets in Section 2. However, that section does set the framework for the later sections. While I appreciate that statistical data are scarce and hard to analyse, I found some of the authors' conclusions hard to reconcile and rather backward looking.

I could find no evidence from the data presented of any causal link between a low inflation environment and an increase in stock market volatility. I would have thought that the extended nature of the bull market is the most likely reason for the current level of volatility. The data shown in Figures 7 and 8 are particularly unhelpful, given their short-term nature and the market conditions that they embrace.

In ¶2.7.3 the authors draw certain conclusions concerning the implied future inflation rate from the current historically low level of yields. I would have thought that the 'convenience premium', which the authors refer to in Section 2.12, is a rather better explanation.

It is disappointing that there appears to be steady pressure from within the profession to emphasise bonds and de-emphasise equities and other asset classes within U.K. pension funds. While I consider that the high priests of financial economics within the profession have added greatly to our understanding of the dynamics of markets and schemes, too many of the utterances of their less distinguished acolytes bear little evidence of progressive thinking. It would be sad if weight of numbers, rather than considered thought, led the profession to damage the future viability of pension schemes, particularly defined benefit pension schemes in the U.K.

I know of few market practitioners who would accept the views of Glassman & Hassett (1999), outlined in Section 2.8. Nor do I see a particular justification for the accusation against the quality press and trustees in ¶1.2.6. I remember once being posed the question of the value today of $1 invested some 500 years ago in what is surely the world's most successful emerging market — that of North America — earning a compound return of 8% p.a. That value would be approximately $51 thousand trillion. If this reveals anything, it is that extrapolation of trends is a dangerous idea.

It is perhaps unfortunate that the assumptions used in Section 2.10 and subsequently within the paper are based on a single set of deterministic assumptions, particularly bearing in mind the references to ranges of returns in Exposure Draft 37, as referred to in Section 3.4. I agree with Professor Clarkson that we should have more than one range, although I would like to see a deflationary scenario included as well as an optimistic projection.

I feel that the two statements that we can make with certainty about the assumptions in the paper are:

(a) these assumptions are unlikely to be correct; and
(b) the annualised returns are unlikely to be stable.

At this point it is perhaps worth stepping away from the paper and reflecting on the issues of market values and investment returns. It is too little stated that highly valued markets are not good news for investors. The most beneficial investment conditions for a pension scheme arise when it can buy yield, that is future investment return, cheaply. We should also remember that long-term returns have traditionally arisen largely through reinvestment of income. So, ideally, we want this condition of cheap yield to persist.

It is also interesting to consider the flip side, that is who benefits from highly valued markets. This is quite a long list which includes:

— investment managers whose remuneration is usually *ad valorem*; and
— disinvestors, which cover a wide range, including venture capitalists, entrepreneurs bringing their companies to the market (such as recent internet companies), highly rated companies engaging in paper-based takeovers, and, not least, senior managers with stock options, at least some of whom are in the position to influence the taking of pension schemes' contribution holidays, which, I suppose, might help boost their companies' cash earnings, thereby driving stock prices even higher.

So, here is a counter intuitive sound bite. Maybe a market collapse would assist pension schemes.

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Returning to Section 2, the authors give a brief analysis of index-linked securities and corporate bonds. One of the few conclusions that I could draw from Figure 11 was that market participants are very confused about how to evaluate index-linked gilts, not just in the U.K., but in other markets. I believe that, in the U.K., this asset class is subject to a strong convenience premium. In the U.S.A., however, TIPS are relatively illiquid, and are largely being ignored in current investment conditions.

I do not see index-linked markets developing strongly if low inflation is to persist. Further, the U.K. and the U.S.A. are currently withdrawing bond issuance quite aggressively from their government debt markets. This is, as the authors suggest, a worrying aspect for investors, particularly when the analysis of alternative asset classes is relatively immature.

Figure 12 shows the yield premium in corporate bonds, and, in ¶2.14.2, the authors assert that this premium implies concern about default risk. This entirely fails to explain why the widening of the premium over the second half of 1999 was most aggressive in AAA rated issues, and occurred as supply increased. Surely it is this increased supply which has led to the widening of the premium, and not default risk considerations.

I saw little evidence in the paper of any reflection of the impact of low inflation on risk levels, particularly the risk in bonds. For example, recent Japanese experience would suggest that the capital values of low yielding bonds are particularly volatile. Maybe equities and property are not really that risky, in relative terms, after all. Some scenario testing of these ideas would have been a useful adjunct to the paper.

This is an appropriate point to consider risk. I have heard many criticisms over several years of the risk inherent in the heavy equity weighting of U.K. pension funds. Nevertheless, when any other asset class is introduced, there is an immediate step taken to develop, that is to increase, the level of risk within that asset class, for example to engage in duration spread or default spread in bonds, to adopt wider asset allocation approaches, to employ total return funds, or to increase the use of venture capital. One can only assume that investors favour risk and the use of risk within portfolios.

This should give us some pointers for how I think MFR should develop. If it is to be meaningful it has to embrace all of these ideas. It has to cease being restrictive, and, instead, become inclusive of other asset categories. It has to embrace ideas such as the declining home bias of equities within schemes, the attractions of property as a high-yielding asset class and wider use of alternative asset classes. I hope that, in this area, the minds, or at least the doors, are not entirely closed.

I have confined myself to consideration of Section 2. I feel that the authors have confused low inflation with low investment returns, and I do not believe that that is a necessary outcome. Investment conditions may well be worse or better going forward, so we really need to develop the ideas in this paper much more completely before it can be considered to be a wholly useful addition to actuarial thought in this matter.

Mr S. J. B. Mehta, F.I.A.: It seems strange to me that the Working Party has, in the analysis, completely ignored the recent trend towards the financial economic approach to analysing issues. Use of actuarial analysis, as evident throughout Sections 1 and 2, disguises a key fact — perhaps the key fact in U.K. pensions — namely that speculation on equities, combined with the use of archaic techniques, has led to the widespread bankruptcy of typical U.K. defined benefit pension funds.

Funding positions are now 20% or 30% less than they were two or three years ago. To my mind this is really the crucial issue for the profession to get to grips with. Let us have some sound financial management of U.K. pension funds. The authors refer to the need for sound management in Section 4.8. Is it satisfactory that pensioners may not receive their full pension because of a failure to understand risk?

It is probably worth stating the obvious; that a low inflation environment has been a major benefit to the U.K. economy. Pensioners, and many other segments of the economy, have benefited. Have defined benefit schemes costs risen? We really do not need a paper to tell us that index-linked gilt yields and nominal yields have declined. Bringing in the concept of equity returns and P/E ratio changes, etc. really is a red herring, just as the level of the gold price or

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Latin American debt levels have no relevance to the case of funding defined benefit pensions. It is to be hoped that many actuaries will be moving to market value standards and will cease to double count the equity risk premiums.

I would recommend that the authors peruse some of the recent papers on the financial management of pension funds, such as Exley *et al.* (1997) and Gordon (1999), and I hope that the published version of the paper would reflect some of this new thinking.

References

Exley, C.J., Mehta, S.J.B. & Smith, A.D. (1997). The financial theory of defined benefit pension schemes. *B.A.J.* **3**, 835-966.

Gordon, T. (1999). The price of actuarial values. Paper presented to the Staple Inn Actuarial Society.

Mr J. S. R. Ritchie, F.F.A.: On behalf of the Pensions Board, I chair a working party which is assisting the Government to draw up a statutory money purchase illustration basis. This paper has been included in our deliberations. I am hopeful that our work will be exposed in draft soon. Members of the profession will be able to draw their own conclusions as to whether we are being consistent with the conclusions of this paper. Having said that, I must emphasise that the strength of the basis is the Government's decision, not ours.

In ¶4.8.2, under the heading of: 'Key Issues for Defined Benefit Schemes', the third point concludes: "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". Surely, the key issue, in this context, is the prosperity and scale of the sponsoring employer. There is all the difference in the world between a shipyard in decline and an IT company which is growing rapidly, but has decided that its defined benefit scheme is not the right answer for the future.

I do, however, strongly endorse the sentiments of the next two points of ¶4.8.2, concerning the solvency problem on wind up and the danger that accurate communication of the solvency issues to defined benefit members will undermine their confidence.

Ten days ago I participated in a conference organised by the Cato Institute in New York. Its title was: 'Solving the Global Public Pensions Crisis II: the Privatisation Revolution'. From the floor, I read out the conclusion in the abstract of this paper that: "the cost of pensions will rise, possibly as much as doubling over the next 15 years". My question to the Cato Institute Conference was whether this might undermine the confidence of people whose social security pensions were being privatised. The answer given was that any positive investment return will still be better than the deal that they can expect from their own social security system. I hope that this is true, and that the various peoples affected by this trend towards the privatisation of social security pensions will understand it, but I think that it will take some communicating.

Dr A. J. G. Cairns, F.F.A.: I shall focus my attention on defined contribution pensions. Rather than consider the case where a level pension is purchased at retirement, I would like to think about a fully index-linked pension. The matching assets for such a personal pension policy are long-dated index-linked gilts. Suppose that a policyholder has a target pension of 10% of his final salary. Now consider the financial economic point of view. The best matching asset defines the economic cost of the pension. Thus, it is the real yield on long-dated, index-linked gilts that underpins the true economic cost of this target pension. The question then arises: "How variable might this economic cost be over time?"

Compare, for example, two scenarios, with the real yield on index-linked gilts being constant over time at 2% or 3%. If rates are 3%, then the target pension will require a 25% lower contribution rate than that under the 2% scenario in order to meet that particular target pension. This is a very simple and easy to understand problem. It demonstrates that there is a very significant difference, even for such an apparently small change in the real yield. One might

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postulate that the real yield on index-linked gilts might range over a long period from 1.5% up to 5%, extending the range just a little bit beyond what we have experienced over the last 20 or so years. This gives us a very wide range of contribution rates required to deliver the target pension. This is just the economic cost of the pension.

If we consider the possibility of investment in non-matching assets, such as equities, then other branches of financial economic theory will acknowledge that such assets may have higher expected returns than index-linked gilts. However, this is due compensation for the additional risks being carried. This provides a link with my recent paper (Cairns, 1999) on the risks associated with the investment strategies underpinning the MFR. In the present paper and my very simple example, I can conclude that there are significant downside risks that the equity-based strategy will, in fact, underperform the index-linked strategy. In this regard, I agree with Professor Clarkson's earlier comments that it is downside risk, or shortfall risk, that is important. When you are thinking about the individual's livelihood, and whether he or she has a good income in retirement, it is the downside that matters. If there is a big upside, that is a bonus. When you have underperformance, as I demonstrated in Cairns (1999), the equity strategy can perform very much less well than the index-linked investment strategy. Of course the probabilities are very much weighted in favour of higher equity returns, but we must not be conned by the historical results displayed in Figure 13 into thinking that equities will always outperform gilts 100% of the time.

Therefore, well-informed policyholders must make decisions on how to invest with the full facts before them. That is, they need to have more than just a few rather subjective deterministic projections of the future. It was interesting to hear the comments from Mr Ritchie that his working party is thinking about putting that into guidelines for advisers. Instead, we need to develop ways of presenting the inherent uncertainty in this type of policy, and provide prospective policyholders with the means to make a rational choice between low-risk, low-return assets and high-risk, high-return assets. This connects to a project that I have ongoing with two economists, Professor David Blake and Professor Kevin Dowd. We have been considering how utility theory can be used to help prospective policyholders choose between the different investment strategies.

The authors mention the Government's introduction of a minimum income guarantee. One consequence of this is that it will be in the best interests of personal pension policyholders paying low contributions to go for high-risk, high-return assets, in the sure knowledge that the Government will bail them out if things go wrong. Alternatively, potential policyholders might be well advised to save themselves the bother of saving for retirement, were it not for the imminent introduction of stakeholder pensions. The authors have done well to draw attention to the flaws in this piece of legislation.

Before I divert too far, I should come back to the present paper. The relative attractiveness of equities will, amongst other things, depend upon the risk premium anticipated by investors, the volatility of equities and their correlation with a salary-related liability. In Section 2 the authors use U.K. and U.S. data to imply that, in a low-inflation environment, volatility will rise and the relevant correlation will fall. Quite frankly, these inferences are statistical nonsense. The authors base their inferences on relatively little data based on overlapping 5 and 10-year intervals. I cannot think of any statistical tests that would throw up statistically significant results in support of the authors' claims.

I am not saying that the authors' claims are not true — only that they have not proved their claim. No claims are made about the risk premium, although this is crucial. However, the authors use further subjective reasoning to reduce the assumed equity risk premium over index-linked gilts to 2.5%.

However, these are just statistical niggles in an interesting paper which makes a number of good points.

Mr R. A. Scott, F.F.A.: I concentrate on areas within my comfort zone; namely the sections relating to defined contribution and defined benefit schemes. At least, it was my comfort zone before I started reading the paper. I found it very illuminating and somewhat alarming,

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especially since I am an employee in a defined contribution scheme, with a 10% contribution rate, and also a non-pensioner in a defined contribution scheme, with deferred benefits not very far up the wind up priority order. I am also significantly older than 30.

However, I do not see it all as doom and gloom. First, it will be interesting to hear if economists really believe that inflation has been beaten in the long term. Perhaps we are already hearing arguments against that. If you accept that inflation is beaten, I question whether salaries will continue to grow at 2% more than inflation. If so, in 20 years' time salaries will be about 50% higher in real terms, and in 30 years' time they will be about 80% higher. These are significant percentages in a low inflation environment, and such an increase will surely have an impact on inflation.

Assuming, however, that it does happen, then more money will be available for individuals to save, and therefore Figures 13 and 14 will be better than they appear. An interesting comparison would be a pension of two-thirds, which has been increased in line with price inflation rather than with salary increases.

One interesting point arising from Figure 13 is that an equity contract has only twice been beaten by a lifestyle contract — both times during periods of high inflation in the 1970s — and has never been beaten by a gilt portfolio. Indeed, both these trends are forecast to continue, and questions the advisability of investing in gilts, especially at a time when they are relatively overpriced.

I agree with the authors that communication is vital, and that actuaries should take a lead. Our first targets should be those companies with occupational pension schemes and the Treasury, which have a strategy of reducing inflation and interest rates as far as possible. However, such an environment is not good for savings, especially pension schemes. It can, in fact, be beneficial if inflation and interest rates are high. The contribution holidays and surplus refunds did a lot to keep companies afloat in the 1970s and 1980s. Whilst I am not advocating a return to the super-inflationary era, we should help the public to understand the overall financial position, that the reduced costs of low interest borrowing could, and should, be used to help offset the increased pension costs. Recently life offices tried to convey a similar message to holders of endowment mortgages, but were unsuccessful and too late. I fear that something similar may happen for pension schemes. Would it not be nice to hear Mr David Dimbleby, in his Budget analysis, note that: "The Chancellor has increased interest rates and is aiming for higher inflation. Good news for companies with pension schemes!"

I have two pleas to make. First, the illustration basis for defined contribution schemes should be reviewed as soon as possible, to prevent any confusion similar to that arising on endowment mortgages; and second, insurance companies should reduce their buyout rates. I understand the risks and expenses involved and also the constraints imposed by statutory valuations, but I cannot accept that the difference in cost to provide the guarantees is as great as the paper has highlighted. The confusion and ill feeling that result from differences in the costs will rebound on the profession, and especially on life offices, which are facing a double whammy: that their schemes are more likely to wind up; and that they are seen as responsible for charging high rates.

Possible solutions that I would propose are to remove the absolute guarantee of buy-out benefits and/or to look at setting up a pooled discontinuance fund run by a number of insurers, where economies of scale should help investment policy and reduce costs. An alternative option is to move ahead seriously with the, often maligned, central discontinuance fund.

Mr R. K. Sloan, F.F.A: I start by registering an objection to an American import which causes considerable confusion in the U.K. pension scene. I refer to the term 'defined contribution'. We, in the U.K., have, in the past, generally used the term 'money purchase'. While defined benefits is an excellent generic term, which includes not only final salary, but also revalued career average, flat rate benefits, and so on, the term 'defined contribution' would appear to have no redeeming features whatsoever, other than to distinguish it from the other. Indeed, its worst failing is the continuing confusion with defined benefits, particularly to the ears of non-pension

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technicians, who include scheme members and the financial press. While, perhaps, one can see the point of defined contributions for a company pension scheme, which is the context in which this paper is written, there can be no relevance for this term in the context of an individual personal pension scheme. Moreover, U.K. legislation still refers to money purchase schemes, not defined contribution, so I would urge a return to clear, unambiguous Anglo-Saxon, namely money purchase.

I now pick up a few points from the paper. First, there was a mention, in ¶3.2.2, of the purchase of decreasing annuities. I would point out that these already exist. I have previously made pleas for with-profits annuities and reference to the issue of anticipated bonus rates, but, of course, wherever individuals buy such an annuity with an anticipated bonus rate, they do, indeed, purchase a decreasing annuity, in the expectation that the bonus rate will give them a net increase. Then, allied to this, we have the propensity of investors to buy higher, but level, pensions. In my view they are quite right to do so instead of buying a lower pension with fixed escalation. Retail price inflation (RPI) is a different matter, as it is easy to demonstrate how long it takes for the cumulative position to overtake the 'bird in the hand'.

I am distinctly unhappy at the continuing growth in the switch from defined benefit to money purchase, which involves a transfer of risk from companies to employees. While the MFR is undoubtedly a driver in this, one can but wonder why, given the powerful real rates of investment return that have been achieved by most pension funds in recent years, so many companies are choosing now to change to money purchase. A cynic might even think that it was to save costs. Be that as it may, I would like to see the pensions industry come up with a solution that might be of help to scheme members rather than making life easier for financial institutions.

We have heard much talk of communication with scheme members; we have heard a complicated discussion about risk premiums; and yet even we cannot agree on the best way forward. Why do we need to give such a complex range of choices to individual members of the public? I am sure that they are not really interested in such detail.

So my plea is: could some investment institution not come up with a guaranteed return of, say, RPI plus 3% or 4%? This would effectively enable employees to secure a form of defined benefit, not too dissimilar to a final salary benefit, in return for their money purchase contributions.

If the industry says that this is too onerous a commitment to take on, despite its financial muscle, then pity the poor member who is expected to choose investments that can, or suffer the consequences if they do not. I believe that the transfer of risk to 'the man in the street' has already gone too far, and I would like to see the pensions industry come up with some positive ideas for a fairer sharing of risk between institutions and individuals.

Mr P. D. G. Tompkins, F.I.A.: I start with a general challenge to the argument that defined contribution (or money purchase) schemes transfer the risk to the employee. I put it back to you that a move to a money purchase environment is removing the transfer of the risk that had taken place previously from the employee to the shareholder. I would suggest that the defined benefit arrangements that have been in place have, to some extent, placed a burden on future shareholders for past contributions for individual employees. It is not necessarily the case that employers move to a money purchase environment solely in order to save costs. There may be control of costs; there may be an apparent saving of costs; but a lot of that move is in order to produce greater determinism in what the employees are seeing, and many sections of the workforce, particularly in the new economy, are the sort of people who would rather see fixed sums of money put aside for themselves rather than a long-term promise many years into the future.

We are currently reviewing the MFR, as has been mentioned by a number of speakers, and obviously details of that will emerge over the coming months and years. In that context, I think that the comments here about low inflation and lower returns in the future are very relevant to the point that Mr Mehta made, that pension schemes are significantly underfunded at the

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moment compared to the way they were two or three years ago. Measures like the MFR do not give the proper picture. The proper picture is given by schemes winding up and finding that they cannot, even after collecting the debt from the employer under the requirements of legislation, provide the benefits which the members have had promised. That is a major risk to the profession and a challenge for us when we review any funding requirement and provide illustrations to people of the level of solvency that they enjoy in their scheme.

One reason for this is, I would suggest, the loss of flexibility that was there with discretion in the past, and the fact that we have had legislation that has moved us to a position where so much of the benefit of the scheme is defined in terms of inflation, in terms of an inflexible set of benefits, and where the trustees have no room for manoeuvre to invest with greater flexibility. A move to higher retirement ages might well be the sort of move that could introduce some flexibility. Early retirement rights and rules are the one area, I suggest, where there can be major flexibility within a scheme today as opposed to pension increases and increases after people have left employment, which are effectively hardcoded against a low level of inflation. It is this low level of inflation and the fact that we have effectively an RPI-linked regime for those who have left employment today, which was not the position when the legislation was put through, which was effectively expecting a degree of release from time to time when inflation went above 5%.

In Appendix I there are some thoughts about the way in which scheme design might be changed. The comment is made there that we ought to be in an environment where the primary aim should be to ensure that pensions are paid, but not necessarily the guaranteed pension increases put in by legislation. Whilst it would be good if we could be in such an environment, I suspect that we are where we are, and that it will be very difficult to change.

In ¶2.15 the authors refer to the problems of phasing in of changes. In particular, if a revision to the MFR were to be produced, would it be helpful to phase this in over a period of time? I should like to challenge whether that would be the right thing to do. We have seen recently the introduction to the indices of many more stocks which do not carry dividends, or carry very low dividends, are depressing dividend yields, and thus are increasing the funding requirement. There are some very strong attacks on the whole basis of the MFR. I suggest that the more important emphasis is to see the contribution corrections, which we advise and which we are required to schedule, be over a long period of time, rather than that any change to the standard itself be phased in over a period of time. I would suggest that we want an immediate change to something new if a change is directed.

My other comment on the recommendations in ¶2.15 relates to the suggestion that the Debt Management Office considers its current issuance of gilt-edged stock. I would question whether or not we, or indeed anybody, should try to influence the Debt Management Office in the way in which it raises the necessary finance for the Government. Its job should surely be to manage the national debt in the best way possible for Government's requirements, rather than to suit the profiles of pension schemes. I would suggest that the demand for stocks of particular durations, types, shapes and so on, should drive the corporate market, and that we ought to be looking clearly to be advising clients, to be advising companies, to build up the demand that will then be there for stocks of different durations and types.

Mr P. J. F. Taylor, F.F.A.: As my recent experience has been entirely in general insurance, my comments concern some memories from 20 years or so ago, when I did work in pensions.

The assumptions from those days, which were used to value the pension fund with which I was associated, were summarised as ten, nine, and eight. Ten was the investment return, nine was the salary increases and eight was the RPI. Real rates were, therefore, 1% or 2% p.a. which do not seem enormously different to the assumptions of this paper. Perhaps cycles turn and return.

I also remember that the contribution rate was 24% of pensionable salary. This was for a standard index-linked 60ths scheme. It did not surprise me to read that a 10% contribution rate, whether for money purchase or for defined benefit, did not produce adequate results.

One thing that I have learnt from general insurance is that catastrophes, especially those that

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are perceived to be very rare occurrences, have a habit of recurring rather more often than one expects. Furthermore, when they recur, they are always 50% worse than they were the last time. Given that sort of scenario, I suggest that high rates of inflation, which were current 25 or 50 years ago, may well return.

I am concerned that the implied suggestion that 5%, or whatever, fixed revaluation rates are excessive. Looking forward from way back, it seems to me that it was always accepted that the various methods that one could choose were going to produce different results. In other words, there were going to be some winners and some losers. It would concern me if what is, perhaps, a transient position might result in pressure for the rights of those who are currently winning to be worsened.

Mr J. E. Paterson, F.F.A.: The comments by the previous speaker have provoked a few thoughts. The first is Section 2.10, where the authors propose what they consider to be realistic, middle of the road investment returns. I share the view of Professor Clarkson. These returns are much lower than anybody who has worked most of their life in the investment scene would find acceptable. However, I do think that they are realistic low-end assumptions, perhaps something like lower quintile. I think that the highest figures quoted by Professor Clarkson might be looked upon as upper quintile, and the ones that he favoured most, such as 6.5% are at the rosy end of median. I echo the request that we have figures covering these ranges. Nevertheless, the paper is a valuable one, in that it brings home exactly how much pensions cost if things do not go well.

It seems to me a big step to go beyond this and say that such and such must be done, that costs must be met, and so on. These are much more questions about balance in society than technical questions for any particular professional organisation. Our responsibilities, as actuaries, are to get a message over to politicians and, as far as we can, to the general public, about the risks of a particular course of action rather than demand specific action. One of the most important messages about pensions that should emerge from this paper is that the current balance of risk within defined benefit pension schemes is really rather dangerous for active members, and is liable to become worse. They will be far better going for defined contribution schemes, because, in defined benefit schemes, their benefits have a low priority on winding up. So, if things go wrong they will be the big sufferers, and if things go right they will not be gaining anything.

The sooner that we face up to the fact that all the force of logic is pointing towards defined contribution schemes, the better. The alternative is to sell defined benefits schemes on a different philosophy, namely spreading the inherent risks far more equitably between the various generations.

A criticism of the paper was made earlier that it did not contain enough stochastic work, although there is some useful stochastic work in Cairns (1999). Dr Cairns mentioned that there is no firm statistical backing for some of the figures in this paper. Of course there is no firm statistical backing for any financial economics. It is useful, it is fascinating, but it is all highly speculative. The reason why there is no firm statistical backing is that we are not dealing with a physical science. You cannot replicate experimental conditions. Financial economics is a social science which, of course, is not really a science at all. However, you can try to get some insights from what has gone on in the past, but it will be subjective.

The discipline of modelling is a very good one, because you can make sure that you are not making assumptions which are internally contradictory. It can let you grade and rank, but to imagine that it is impossible to produce anything useful without using financial economics is absolutely absurd.

I would have thought that there would have been a lot more humility, on the part of what sometimes seems like alien invaders from the planet Zog, since the collapse of the American so-called hedge fund! Much closer to home, the original Union Bank of Switzerland was brought to its knees by its derivatives specialist, who dominated the market for about three years and came very badly unstuck: it had to be rescued by Swiss Bank Corporation. UBS were financial economists, as they thought, and they tried to apply it to the market without any commonsense, and they received their come-uppance.

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I do believe that there is a danger that actuaries, and the rest of the financial community, reject financial economics entirely, because so many exaggerated claims are made for it. That would be a great pity, because it has a lot to contribute. However, it must be contributed in the light of experience, and with a degree of humility.

Mr I. A. Naismith, F.F.A. (closing the discussion)**:** I shall concentrate on a theme which Mr Kneller was directing us towards in his introductory remarks. The issues that we have been discussing must not simply lead to a theoretical discussion, however interesting that is to us. Having formulated a professional view, those of us who have contact with the press, with scheme sponsors and trustees, or with individuals making pension provision, must take responsibility for alerting them to the issues in a way which is understandable and relevant to them, and enables them to make informed decisions. Before we can do that we must, of course, come to an internal view on the likely scenarios, and here there was some disagreement.

The basic premise of the paper is that inflation would remain low for a very long time. There is an implicit underlying assumption that this is combined with a benign economy, rather than the recessionary environment of the 1930s. This premise was questioned by Mr Scott and Mr Taylor, but was generally accepted as a working assumption.

The paper then extrapolates a possible future scenario by considering the historical real returns on equities and bonds, particularly in the U.S.A. It suggests that low inflation could lead to higher volatility of equity returns. Mr Hastings and Dr Cairns disagreed with this conclusion, although I thought that Dr Cairns' own paper lent it some support. More fundamentally, Professor Clarkson argued that, if the long-term return is always higher for equities than for gilts, the volatility of equities is irrelevant, and they clearly carry a lower risk. He suggested that the assumed risk premium of 2% for equities over conventional gilts is too conservative, and that 4% would be more realistic, leading to an overall real return of 6.5%. This could make a significant difference to the authors' findings.

Dr Cairns argued that a more conservative approach may be needed. His research suggests that there is a significant risk that equities could underperform index-linked gilts, even over very long periods. I find this conclusion quite hard to accept, although I realise that it comes directly from extensive simulations using the Wilkie model. I do, however, agree with those who suggested that it would be helpful if the authors' results were recalculated using some other assumptions.

A number of speakers commented on the implications for individuals with money purchase provision. Mr Ritchie mentioned his membership of the group considering statutory money purchase projections. I am involved in an ABI initiative to improve the quality of material provided when individuals start money purchase plans, and, it is hoped, to increase their understanding of what they are buying. I believe that it is important that actuaries play their part in discussions such as these.

Mr Gibb suggested that one solution to the problem of lower pensions could be higher retirement ages, and I think that that could be communicated to those with money purchase plans as a possible scenario if returns are not as good as they hope.

We should also be making it clear that an inevitable consequence of low interest rates, particularly when combined with improving mortality, is more expensive annuities. They will, though, keep their value better in a low inflation environment. I agree with Mr Sloan's comment on with-profits annuities, which will increasingly come to dominate this market. I also agree with Professor Clarkson that 10 years is too long a switching period for 'lifestyle' investments. Our research suggests that switching should not normally be spread over more than five years.

Fewer speakers than we might have expected discussed defined benefit issues. However, Mr Kneller, Mr Scott and Mr Tompkins agreed that schemes have lost a lot of their funding flexibility because of legislative constraints and because surpluses have been used to improve benefits. A key issue here is that, in a low inflation environment, statutory LPI-linking effectively becomes RPI, and the position is even worse if we hit deflation, because LPI-linked pensions cannot fall. Many schemes may be underfunded without realising it, and this could cause major problems if real investment returns are low.

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The President (Mr C. W. F. Low, F.F.A.): We have had an excellent discussion at an opportune time. A plausible scenario was illustrated, but it takes no account of recent evidence of improving mortality. Mention has been made that many schemes in wind up are unable to secure members' accrued benefits, even where there is no outstanding debt on the employer, as the scheme is fully funded on the MFR basis. The MFR basis was set in 1995 and 1996. It is still assuming that annuities, for example, can be bought out at 8% interest, when we all know that the probability of such a rate in the immediate future is very slim indeed. The profession did make a submission to the DSS many months ago about recommended alterations to the MFR in the short term, and the DSS are quite happy that we make public the Minister's response: "There will be no short-term alterations to the MFR." What is not realised by the general public, though I am sure that it is realised in this audience, is that our recommendations were for an increase in the MFR level in order to maintain the same balance between members and plan sponsors as it was when it was introduced.

I ask you now to give a vote of thanks to the authors for their paper.

Mr P. M. C. Meredith, F.I.A. (replying)**:** The Working Party reached a high degree of consensus in concluding, on simple assumptions, which we felt should be generally acceptable, that there was a clear message for the future, namely one of lower pensions or higher contributions.

My personal perspective, which is somewhat longer than that of my colleagues on the Working Party, is that the pernicious inheritance of the high inflation and high tax era in the 1970s is an over-complicated framework in defined pension provision. Actuarial methods are attuned effectively to allowing surplus to emerge. Surplus has, indeed, emerged, courtesy of past discretion in some benefits and recently high investment returns, as inflation has gradually been squeezed. Whilst future circumstances will vary enormously from fund to fund, we expect the emergence of deficits rather than surplus in defined benefit schemes to come as a profound shock to all parties. So, we make no apology for our 'siren' call to the profession, or for adding to recent warnings from the pensions industry.

As we expected, some speakers feel that our assumptions are too conservative. They may be right, but I do not think that they can be certain, any more than we can. It is crucial to our thinking that the value of equity depends on its ability to earn a return on its associated economic activity. Company profits may gain (or lose) relative to other parties (payroll, rents and taxes), but not indefinitely. Historically there do seem to have been practical limits.

The opener, Mr Gibb and others mentioned our lack of justification for profit growth matching GNP. The difficulty of very long-term compounding was highlighted by Mr Hastings. Profits to GNP comparisons are corrupted, particularly in the U.K., by past inflation. Even the U.S. data are not satisfactory. Whilst there have certainly been some big oscillations in profits as a percentage of GNP, it would be hard to discern any long-term trend. However, we are now certainly high in the bracket of the last 20 or 30 years. Only in the 1950s and 1960s, when the U.S. economy was relatively closed and profit margins were very high, do you find percentages which are higher than currently.

We said in the introduction that we felt that the evidence of higher volatility and lower correlation with low inflation is fairly weak. To those who made that point, I just hope that we did not 'over-egg' it as a justification to become unduly alarmist.

There is no doubt that the 'new' economy is changing our lives, and, with inflation suppressed, investors may have dropped their required rate of return. We make no assumption about any reversion towards historic valuations. Lest there be any doubt, we assume that the current price earnings ratio of 27.7 times for U.K. equities is set to continue. However, we do assume that future profits will do no more than match overall economic growth and that investors will not further lower their required rate of return. These are only assumptions, but we believe that you would be unwise to reject the resulting scenario as implausible. As we strive to make financial sense of the future, we must surely be particularly careful about projecting recent experience, when it has been so favourable. I was surprised that our attempts to disaggregate the returns on U.K. equities in Table 2 were not picked up. We see this as important.

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Professor Clarkson and others suggested that ten years for lifestyle arrangements is too long. Maybe it is, but it is quite prevalent; we wished to illustrate common practice. With regard to the issues which divide him and Mr Mehta, I can only reiterate that our paper is a contribution to the debate, in terms which we hope will be useful for practising professionals. However, there were several requests for our tables to be extended. With the President's approval, I will now conduct a poll of those who feel that the equity risk premium, relative to fixed interest, is outside the range 1%-3%. [A few indicated above 3% and a few below 1%.] There is a handful. We will take that into account in any additional work.

Mr Hastings asked whether a market collapse would help pension funds. To the extent that future investment would yield higher returns, then eventually it would, but I also think that the people whom it would really help would be actuaries. It would force these issues into the open and ensure that nettles are grasped sooner rather than later. Mr Hastings also made the point about confusing low inflation with low investment returns. There may be substance in that comment, but our mandate from the Pensions Board was to consider low inflation and low interest rates, which are a component of low investment returns. This may have encouraged us, marginally, towards a conservative view.

In the light of comments made about market levels, I cannot resist joining the fray. In the paper we were reluctant to take a view, because we thought that there was a powerful message without this additional complication, which always risks generating more heat than light. However, I will do so now, albeit as temperately as possible. Our case for reasonableness is supported by some recent studies in the U.S.A., which suggest that earnings yields have some forecasting ability for the long-term return on equities, albeit well outside the practical time horizon implicit in most investment managers' contracts. Moreover, any significant further reduction in the required return on equities would threaten to take it below the yield on government bonds. We will include references in our written response.

Also, speaking personally, rather than on behalf of the Working Party, encouraged by Mr Paterson's comment about the unscientific nature of investment and Professor Clarkson's enthusiasm for total shareholder return and the TMT contribution, I find significant evidence to suggest that it would be prudent to regard current equity market levels to be above those which are likely to be sustainable, on average, in the future. All established measures imply a significant degree of over-valuation by past standards. The growing volatility, as documented in the paper, plus the recent quite extraordinary swing of some 13% in the Techmark Index relative to the FTSE, quickly reversed, combined with IPO fervour and margin trading, plus extreme sector focus and emphasis on total shareholder return (which, frankly, is often management massaging the share price), all suggest that markets could be particularly vulnerable to any disruption to confidence. Against that background, it behoves us to be particularly careful. We did not consider this in our paper, as we felt that there was enough substance without it to provide food for thought, even some ammunition for those who might decide to take a less positive view of potential future returns.

The profession needs to be practical and to communicate well. We kept our paper simple and focussed to this end. Radical solutions may be required. Later retirement has been mentioned, but other possibilities include combining it with flexible working; hybrid schemes and final salary schemes based on less than full salary for highly paid staff. I only hope that we have made a useful contribution to the debate.

Mrs J. M. Harrison, F.I.A. (replying)**:** The key message from our paper is that pensions are going to cost more in the future if our assumptions are anywhere near borne out in practice. In both defined benefit and money purchase schemes, scheme sponsors are going to need to face the fact that they will have to pay more or benefits are going to need to be cut. As Mr Gibb said, a third option would be to raise the pension age. Higher pension ages should be considered. That is one very sensible way of reducing the cost of members' benefits, and is applicable both for money purchase and for defined benefit schemes.

A key question is whether we are doing enough, as a profession, and as individual advisers,

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to ensure that scheme sponsors and members are aware of the simple message: higher costs or lower benefits. It is clear that there is a very real need for improved communications, both with scheme sponsors and with scheme members. I think that it is interesting, looking into the latest NAPF survey, that there seems to be evidence that we have not been active enough in communicating the message to scheme sponsors. For example, 30% of private sector schemes are currently on contribution holidays. There is limited evidence of funding levels within the survey, but what exists points to average MFR funding levels of around 120% to 130%. Such schemes are not exceptionally well funded, and the fact that the schemes are taking contribution holidays suggests to me that Scheme Actuaries have not been allowing for the potential low interest rates, low inflation scenarios, in the future.

As one speaker noted, the first reaction of scheme sponsors, faced with an increase in cost, might be to close the scheme. Obviously this cannot reduce the past service costs, but can limit the costs for the future. There are clearly problems in winding up schemes at present; buy-out costs, as our projections indicated, are significantly higher than ongoing costs. We need to make sponsors and members much more aware of the difference between buy outs, solvency levels and ongoing funding levels. All too easily, in the past, in actuarial valuation reports for defined benefit schemes, we have included a blithe comment saying that discontinuance funding levels are not necessarily representative of actual wind-up solvency levels. That is a huge understatement. We need to think about how to give details of estimated buy-out costs, even for schemes that we are not anticipating winding up in the short term.

There may be scheme sponsors which see an MFR funding level of just over 100% and think: "I will be okay on wind up; no debt on the employer". However, because of the priority order on wind up, and the buy-out costs for pensioners being significantly more than the MFR costs, a scheme which is 100% funded on the MFR will not have enough money to meet transfer values for non-pensioners. This is something that, probably, we should be communicating to scheme sponsors and to members.

Moving on to money purchase schemes, we need to think very carefully about the assumptions used in producing benefit projections. It is good to know that this is being seriously considered by the Government. I do hope that the Government will take account of the views and the concerns of the profession, and will come up with some very sensible recommendations. I think that there is a danger that the move to money purchase schemes will be seen as the next mis-selling exercise.

There has been some discussion about whether a move from defined benefits to money purchase is a cost cutting or a cost control exercise. It is often sold as a cost control exercise, but the simple message is that you get the same benefits for the same costs. If a company thinks that it can reduce its costs by going to money purchase, then it is going to reduce members' benefits as well. So, if an introduction to money purchase is being introduced for cost-cutting reasons, I think that that needs to be communicated very clearly.

Mr Scott questioned our salary assumption. We have assumed that salaries will increase in line with our RPI plus 2%. The assumption is based primarily on historic evidence, which has obviously been in much higher inflation scenarios than we are in at the moment. The argument was that real salary increases will reduce, but there is a counterargument that, in a low inflation environment, the absolute amount of salary increase reduces, and employees dislike this. Therefore, there may be pressure from members to sustain a substantial increase above RPI. I do not think that there is much scope for significantly lower assumptions.

WRITTEN CONTRIBUTIONS

Professor R. S. Clarkson, F.F.A.: In addition to the areas of concern that I described in my contribution to the discussion, there are three other aspects of pension fund investment to which I should like to draw attention.

The first relates to the use of stochastic investment models in an endeavour to simulate future scenarios of investment returns. Since the most commonly used models, and in particular

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the Wilkie model, involve autoregressive time series that incorporate no significant medium-term or long-term 'memory effect', the simulations will generate far more highly unsatisfactory equity returns to horizons of five years or longer than is consistent with the empirical data from 1918. Accordingly, the use of such models will lead to recommendations of lower equity investment than would otherwise be the case with models that broadly reflect the realities of the investment world. This will increase the long-term investment risk as measured in the downside manner that I believe is appropriate.

The second relates to the implicit assumption throughout the paper that the performance of U.K. equity portfolios will always be in line with the FTSE All-Share Index. Many 'old economy' shares with reasonable growth prospects are currently standing on dividend yields of 3% or more. It should be possible, by using 'Graham & Dodd' or 'Warren Buffett' techniques to assess dividend growth prospects, to construct fairly well diversified portfolios from these shares, which are likely to show dividend growth of at least 1% p.a. in excess of real economic growth, which we might take to be 2.5% p.a. This would equate to an expected long-term real yield in excess of 6.5% p.a., the figure that I suggest for U.K. equities generally.

The third relates to the extremely worrying possibility that the MFR legislation, which was introduced by well-meaning politicians to give short-term comfort to pension scheme members, might destabilise equity markets by generating, when the next major economic downturn occurs, a potentially catastrophic chain reaction of selling, not unlike that caused by margin calls in the Wall Street Crash of 1929. Unless we ensure that the current review of the MFR leads to an inherently stable general framework that ignores the increasingly wild short-term gyrations of equity markets, and focuses, instead, on plausible long-term real rates of return. What we shall have put in place will be not an investment safety-net, but an investment time-bomb.

The authors subsequently wrote: The Working Party is grateful for the many contributions. We welcome this additional opportunity to respond in two areas. Firstly, several speakers requested projections on different assumptions and, secondly, our investment assumptions generated comment.

The projections of pensions, as a percentage of salary after 30 years' contributions at 10% of salary in Table 4, are extended to include other values for the equity risk premium in addition to our central assumption of 2% p.a.

Equity risk premium % p.a.	Equity real return % p.a.	Level pension at retirement %	Index-linked pension at retirement %
4	6.5	36	25
3	5.5	30	21
2	4.5	26	18
1	3.5	22	15

These figures suggest that, even with the most optimistic estimate of an equity real return of 6.5% p.a., there is still a significant reduction in prospective benefit relative to recent experience.

The projections in Tables 6 and 7 have been reworked as follows:

(a) an equity risk premium of 3% and a real return of 5.5% p.a.; and
(b) an equity risk premium of 1% and a real return of 3.5% p.a.

Even on the more optimistic assumption, the contributions still fall short of the actual rates required to fund for the promised benefits at retirement. Only in Model 1a does this not pose a problem on an ongoing basis — since, in this predominantly equity-based scheme, the surplus compensates for the fact that future contributions are less than the cost of future accrual. In all the projections the buy-out solvency levels remain worrying low — reflecting the high buy-out costs in a low interest rate environment.

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Table 6a. Model 1a; the 'typical' scheme with assumed equity real returns of 5.5% p.a.

Years from projection date	0	3	5	7	10
Funding level	118%	115%	113%	112%	110%
Assumed actual contributions (110% of MFR rate)	12.5%	12.5%	12.5%	12.5%	12.5%
Cost of future accrual	14.9%	14.9%	14.9%	14.9%	14.9%
Total contribution required	11.6%	11.7%	11.8%	11.9%	11.9%
Buy-out solvency level	64%	62%	61%	61%	60%
Residual buy-out solvency level for non-pensioners	57%	54%	53%	52%	50%

Table 6b. Model 1b; the 'typical' scheme with assumed equity real returns of 3.5% p.a.

Years from projection date	0	3	5	7	10
Funding level	90%	85%	82%	80%	77%
Assumed actual contributions (110% of MFR rate)	12.5%	12.5%	12.5%	12.5%	12.5%
Cost of future accrual	21.2%	21.2%	21.2%	21.2%	21.2%
Total contribution required	23.5%	25.1%	26.2%	27.3%	28.9%
Buy-out solvency level	64%	60%	58%	56%	53%
Residual buy-out solvency level for non-pensioners	57%	52%	49%	46%	42%

Table 7a. Model 2a; the 'mature' scheme with assumed equity real returns of 5.5% p.a.

Years from projection date	0	3	5	7	10
Funding level	101%	100%	99%	99%	98%
Assumed actual contributions (110% of MFR rate)	18.0%	18.3%	18.6%	18.9%	19.2%
Cost of future accrual	22.2%	22.8%	23.3%	23.7%	24.4%
Total contribution required	21.6%	22.8%	23.8%	24.8%	26.8%
Buy-out solvency level	79%	78%	78%	77%	76%
Residual buy-out solvency level for non-pensioners	62%	57%	54%	51%	45%

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Table 7b. Model 2b; the mature scheme with assumed equity real returns of 3.5% p.a.

Years from projection date	0	3	5	7	10
Funding level	91%	89%	88%	86%	84%
Assumed actual contributions (110% of MFR rate)	18.0%	18.3%	18.6%	18.9%	19.2%
Cost of future accrual	25.6%	25.9%	26.1%	26.3%	26.6%
Total contribution required	31.2%	34.6%	37.5%	41.1%	49.4%
Buy-out solvency level	79%	76%	74%	72%	70%
Residual buy-out solvency level for non-pensioners	62%	54%	47%	41%	30%

Returning to the investment assumptions, Professor Clarkson made the case for a significantly more optimistic equity return. His detailed analysis of the observed risk premium does not incorporate any adjustment for the low returns on government bonds for much of the twentieth century, depressed by unanticipated inflation and the enormous expansion in government spending. Also, some caution is surely appropriate when the starting yield today is less than half that experienced, on average, in the period analysed, whether based on dividends or on earnings.

When Professor Clarkson incorporates the current yield in his projections, as we do in the paper, he adds two elements of 1% p.a., one for better use of capital and more aggressive management and the other for a 'non-income' contribution based on technology, media and telecommunications. Is it too cynical to suggest that we may have been here before, perhaps near previous market peaks? Also, it is at least arguable that the diversion of capital into a proliferation of unprofitable 'blue sky' ventures may actually reduce returns, and not just temporarily. Mr Gibb suggested that accumulations of capital are a necessary condition for growth, and may be expected to reduce the returns on old capital below the level of overall economic growth. Our assumption of profits matching economic growth is 'broad brush', but, we maintain, provides a plausible scenario and a simple base which others can adjust if they wish.

Financial economists struggle to explain the observed equity risk premium, but, if the concept is rejected, then there is little value in our equity projections. Their 'siren' call should be louder than ours.

Finally, in responding to the discussion, we suggested that the reasonableness of our assumptions is supported by studies which establish a relationship between valuation ratios and the long-term return to equities, including Shiller, R. (1996). U.S. equity returns are related to the overall economy by Phillips, T.J. (1999).

References

Shiller, R. (1996). Price-earnings ratios as forecasters of returns.

Phillips, T.J. (1999). Why do valuation ratios forecast long-run equity returns? *Journal of Portfolio Management*.

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