ABSTRACT
Recent developments which affect the financing of occupational pension schemes in the U.K. are reviewed. These point to the need for realistic bases, and an approach to finding a ‘best estimate’ is described. It is suggested that typical bases contain significant margins and the long-term dangers of using bases which contain margins are illustrated using a model fund. A review of funding methods suggests that the projected unit and entry age methods should be used for normal purposes in conjunction with a discounted income approach to the valuation of assets. Suggestions are made as to the degree of prudence appropriate for funding purposes.

KEYWORDS
Accounting; Actuarial Basis; Funding; Pension Schemes; Surplus

Realism: practice of regarding things in their true nature and dealing with them as they are, freedom from prejudice and convention (Concise Oxford Dictionary)

1. INTRODUCTION
1.1 The purpose of this paper is to draw together a number of threads which run through the increasingly important area of the financing of occupational pension schemes, including the way in which the cost of pensions is recognised in the accounts of the sponsoring bodies. The paper relates primarily to final salary schemes and to the United Kingdom scene, although many of the principles discussed would be valid elsewhere.

1.2 The fundamental question we address is whether the actuarial methods and assumptions typically in use, and conventional wisdom regarding funding strategy, continue to be suitable in current circumstances.

1.3 Many of the observations in the paper are made from the viewpoint of large, self-administered schemes which are mature, and which give adequate increases in pension. Such schemes are typical of those to which the vast majority of pension scheme members belong. Furthermore, young schemes mature, and it can be difficult to change funding methods and bases substantially in mid-stream, whilst the conclusions reached will be valid for small schemes, subject to slight variations, as needed. Hence, we believe that the results of our studies have application to almost all defined benefit schemes in the U.K.

1.4 Over the last 30 years there have been few major papers presented on
pension funding, despite major developments in this field. The 1960s and 1970s saw the establishment of many new schemes for manual grades employees, not normally as generous as existing schemes for staff employees, although in the 1980s most of such schemes were upgraded to the same level as for the staff and subsequently merged. This is certainly true amongst the large schemes in both the public and private sectors, and hence applies to the large majority of scheme members. Over the last 30 years, therefore, we have seen many schemes change from new immature schemes with relatively poor benefits to mature schemes with generous benefits. This trend has been reinforced by two further factors. One is the massive reduction in workforces over the 1980s which has accelerated the maturity of many schemes, and the other is the emergence of surpluses, which, under industrial relations pressure, have been at least partially used to improve benefits.

1.5 It would be remarkable if, given all this, there were no new issues to be addressed in the area of pension funding, quite apart from the new external influences described in the next section.

1.6 In this paper we have not made any distinction between situations where the actuary is advising the scheme trustees and those where he is advising the scheme sponsor. The extent to which the interests of these two parties may differ or even conflict should not in our view cloud the actuary’s judgement as to appropriate bases, methods and funding strategies. Indeed, it is only if the actuary is quite clear in his mind about these matters that he can provide sound advice to either party.

1.7 The earlier parts of this paper are devoted to consideration of assumptions rather than methods. The authors’ view is that this is where attention currently needs to be focused whilst there is much less need for concern about the funding methods being used. We return to the question of funding methods, however, in Section 8.

1.8 Finally we should say that the views expressed are those of the authors, although we have benefited greatly from the opportunity to exchange these freely with our partners and colleagues.

2. RECENT DEVELOPMENTS AND THEIR EFFECTS

2.1 External Influences

2.1.1 Over the last 15 years, we have seen a number of new external influences on funding strategy, and these are described in the following paragraphs.

2.1.2 The solvency requirements imposed on contracted-out schemes by the Social Security Pensions Act 1975.

These have not had much effect on large schemes, as most were funded comfortably above the level needed to secure guaranteed minimum pensions; some insured schemes had problems.

2.1.3 The requirements under the Disclosure Regulations introduced by the Social Security Act 1985.
Actuarial assumptions and methods have to be disclosed both in valuation reports, which now have to be prepared in accordance with Guidance Note GN9, and in the formal Actuarial Certificate which has to accompany a valuation report and which is incorporated in the trustees' annual report.

2.1.4 *The Surplus Regulations introduced under the Finance Act 1986, subsequently consolidated into the Income & Corporation Taxes Act 1988 (ICTA 1988).*

Where employers are not desirous of a refund of surplus from a scheme, there may be pressure on the actuary to adopt artificially conservative demographic assumptions in order to be able to include in the required valuation on the prescribed basis as high a value on the liabilities as possible. Where employers are seeking a refund of surplus, pressure is in the opposite direction.

Encouragement is given to liquidate surpluses rapidly by means of contribution holidays rather than more gradually, in order to avoid potential taxation on the investment income generated by an excessive surplus at some future date.

2.1.5 *Statement of Standard Accounting Practice No 24 (SSAP24) issued by the Accounting Standards Committee, in May 1988.*

Considerable discussion has arisen within the profession as to the meaning of the words 'best estimate'.

Much closer involvement with finance directors of sponsoring companies has resulted, leading to sharper debate on funding policy generally, and a better understanding by employers of the underlying principles of pension fund finance, generally leading to a reduction in funding levels.

2.1.6 *A succession of improvements in the minimum revaluation requirements for the preserved benefits of early leavers, culminating in the requirements already introduced under the Social Security Act 1990, whereby, for members leaving schemes after 31 December 1990, the whole of their preserved benefits in excess of Guaranteed Minimum Pension is subject to revaluation in line with price inflation up to 5% p.a. over the whole period to vesting.*

This has led to a narrowing of the gap between the level of funding required on an ongoing basis and the minimum level required to cover discontinuance solvency.

2.1.7 *The requirements to be introduced under the Social Security Act 1990 (once the financial implications for schemes of the Barber vs GRE judgment are clarified) whereby schemes will have to guarantee pension increases to match price inflation up to 5% p.a. (known as LPI) in respect of accruals of benefit after an Appointed Day which has yet to be announced, and in respect of accruals up to the Appointed Day for the first call on valuation surplus to be the provision of a similar guarantee to the extent to which it can be afforded.*

Guidance to be provided by the profession to its members (which has already been the subject of debate when Exposure Draft 8 was prepared, but has since been put on ice) will have to reconcile the pressures on the one hand for a strong valuation basis which does not underestimate the cost of such increases, but which produces a high contribution requirement on the employer, and a weak basis which accelerates the rate at which the pre-Appointed Day accruals of pension become eligible to receive guaranteed increases.
2.1.8. *In the foreseeable future we will also have the winding-up requirements to be introduced in due course under the Social Security Act 1990, whereby a shortfall of assets on winding up of a scheme below the level required to provide the accrued liabilities will become a debt on the employer, which will be all the more significant given the revaluation requirements now already introduced under the Social Security Act 1990.*

Funding methods based on the concept of targeting the level of assets needed to cover accrued liabilities in a winding-up will cease to be attractive; attention will be focused on the risk of debt falling on the employer in a winding-up if funding is at a low level.

2.2 Asset Liability Studies

2.2.1 Another recent development of a different nature is the gradual recognition of the value of mathematical studies of the implications of constructing alternative investment portfolios to match differing liability profiles. These tend to proceed by the use of stochastic methods, whereas actuarial valuations are typically based on a deterministic approach. It is not the purpose of this paper to explore the way in which such studies may prompt changes in the way in which actuaries approach the task of actuarial valuation. For the majority of cases the practical approach is likely to be to carry out the asset/liability study as a separate exercise to determine investment strategy, whilst continuing to carry out the valuation on a deterministic basis, reflecting the investment strategy adopted.

2.2.2 In any event, it will be necessary for the description of the bases used for valuation and funding purposes to be consistent with the assumptions incorporated in the investment models for the asset liability study. These assumptions will need to be chosen as the most realistic estimates possible. If unrealistic assumptions were to be used in asset liability studies the conclusions drawn could be seriously in error. In practice, the process whereby the underlying assumptions are discussed in depth between the client, the actuary and the investment manager should lead to realistic assumptions being identified.

3. THE NEED FOR REALISTIC BASES

3.1 The general thrust of all this (the exception being §2.1.4) is a move towards methods and assumptions which are in some sense realistic rather than artificial. As will be seen, we believe that actuaries have become accustomed to using bases which contain significant conservative margins without appreciating it.

3.2.1 Apart from the need for actuarial bases used for funding purposes to be more realistic, there are other pressing reasons for the actuarial bases used in connection with pension schemes to be realistic ones.

3.2.2 Members of occupational pension schemes now have the right to opt out and take out a personal pension contract with an insurance company or other provider. Such contracts are necessarily ‘money purchase’ arrangements where
the proceeds reflect the investment returns achieved net of expenses and the level of contributions paid. Any comparison of projected benefits with those from a ‘final salary’ scheme needs to be made as objectively as possible.

3.2.3 In response to the pressure which personal pensions have created, for defined benefit schemes to provide benefits which represent ‘value for money’ for contributions paid by comparison with alternative money purchase personal pensions, some occupational schemes have been modified to provide ‘money purchase underpins’, i.e. minimum benefits calculated on money purchase principles. To set an appropriate level of underpin and to cost the effect of such an underpin requires the use of realistic actuarial assumptions in a stochastic model.

3.2.4 Transfer payments between occupational schemes when groups of members are transferred, such as when a subsidiary company participating in a group pension scheme is sold, are often substantial in relation to the value of the purchase consideration. Whilst purchasers tend to seek payments based on ‘typical’ funding bases as a minimum, the reality is that any tendency for ‘typical’ bases to be conservative results in excessive assets being transferred and too low a price being paid for the business. Vendors may, in any case, prefer to use the basis adopted for SSAP24 purposes.

4. FINDING A BEST ESTIMATE

4.1 Up to this point we have simply outlined our reasons for suggesting that the actuarial bases used in connection with pension funds should be realistic. This raises the question of what we mean by ‘realistic’. Perhaps what we mean is that bases should reflect the real world rather than some special actuarial view of the world. Even this is a somewhat ambiguous definition—it could be said to be ‘realistic’ to fund a pension scheme on a ‘prudent’ basis. We are thus on safer ground if we first think about the ‘best estimate for a parameter, meaning by this a figure which is equally likely to be too great or too small. We can then consider what is meant by ‘realistic’, ‘prudent’, ‘cautious’, ‘conservative’ and similar terms, and how we might quantify them. The actuary might well choose to use assumptions for funding or some other purpose which are more conservative than best estimate assumptions. To the extent that a margin of caution is appropriate for the particular purposes, for example to make some allowance for future uncertainty, such a basis could still be a realistic one for the purpose, but it would certainly be desirable for the actuary to be aware of the extent of the margin he has taken relative to best estimate assumptions.

4.2 The starting point for arriving at a best estimate is the consideration of past history. This is, however, less simple than it sounds. Supposing, for example, that there is in existence an index of the past historic values of a particular parameter (price inflation for example) about which we wish to make a future assumption. The following sets of questions arise:

(a) Is the basis on which the index has been constructed sound, has it changed
over past periods, and does it properly correspond to the future assumption required?

(b) Over what past period should the index be reviewed, should 'exceptional' periods be excluded, and should it cause concern if a slight shift in the start or end date leads to a different conclusion?

4.3 In relation to the first set, there may be little choice about the index to be used, and all that can be concluded is that it would be wrong to adhere too slavishly to any derived trend lines or averages. In relation to the second set, there is greater difficulty as some period or periods will have to be used. The longer the period reviewed the more confidence one may feel in choosing a suitable period within it from which to derive statistics. On the other hand, the further into the past one goes the further one is departing from surrounding economic and social circumstances which bear some relation to the present. Occasional 'exceptional' periods seem to be a recurring feature of most indices and this is an argument for not seeking to avoid or exclude them. Given the long future period over which the liabilities of pension funds are expected to emerge in the normal course, a period of at least 20 or 30 years seems necessary to the authors, and a good feel for long-term trends can often be obtained by considering moving 20-year averages ending within the last 20 years or so. A purely mechanical approach of methodically basing assumptions on a standard past period of say 30 years, however, does not seem satisfactory. The most illuminating approach of all is to study graphical representations of the relevant statistics over as long a period as is available.

4.4 A review of past history needs to be tempered by some assessment of the future outlook. There are few other professional commentators taking as long a future view as actuaries, but some long-range economic forecasts are made. The actuary may be able to set a range within which the parameters about which he is making assumptions can be expected to lie on general grounds. Whenever possible the conclusions of a historical analysis should be checked against more general arguments from first principles.

4.5 There is a serious danger that too much weight is put on the events of the immediate past. Thus in the mid-1970s, actuaries were often criticised for being hopelessly optimistic in continuing to assume that future investment would provide a real return relative to pay inflation, whilst a few years later they were criticised for being far too cautious in not assuming indefinite future real growth of equity dividends at the levels experienced in the 1980s. Actuaries must be prepared to justify a longer-term view than is taken by their clients. It is extremely important to understand the cyclical nature of many of the parameters affecting pension schemes and to recognise that valuation results can fluctuate without invalidating the long-term assumptions made.

4.6 It is because of these difficulties in deriving reliable best estimate assumptions that actuaries tend to regard the choice of assumptions as a 'matter of professional judgement' rather than as a statistical exercise. The danger of this is that it is remarkably easy to delude oneself into believing in the reasonableness of the conclusions reached. Human nature is such that by sheer repetition one
becomes increasingly 'comfortable' with using a particular set of assumptions, which it is then too easy to reassure others not in a position to judge is 'typical' or 'normal'. From time to time some external influence provokes a change of view and a shift in the assumptions, perhaps discussion with another actuary or a client with strong views. At first the new basis may 'feel' weaker or stronger than normal, but soon this sensation passes off. The authors believe that this subjectivity has led to bases being further out of line with what would be justified by a more statistical approach than is desirable.

4.7 The concept of 'best estimate' assumptions, introduced into SSAP24, followed a similar requirement (but for each separate assumption) for best estimates in the corresponding accounting standard (FAS87) in the United States of America. At first this appeared to imply a single 'best estimate' basis, which would have been at odds with a situation in which different schemes advised by the same actuary used different financial assumptions, and certainly where the bases used by different actuaries, even within the same firm, might have differed. In practice, however, what has emerged is a general acceptance that in such a subjective area there is no unique 'best estimate' basis, and instead that there are several alternative bases which could be said to be 'best estimates'. In practice most auditors have been prepared to accept the basis for normal funding purposes as acceptable for SSAP24 purposes.

4.8 Best estimates will also need to be made about the various assumptions peculiar to the individual pension scheme, usually termed the 'membership' or 'demographic' assumptions. It is often very difficult to judge exactly what the underlying parameters are which the actual experience of the scheme portrays. For small schemes there are usually insufficient data to enable accurate estimates to be made of the various parameters, but even in large schemes there is often a number of isolated events which render it dangerous to take the experience of the scheme at face value. Furthermore, even with grouped experience there can be problems. For example, the mortality tables normally used in pension fund work are drawn up from investigations by the Continuous Mortality Investigation Committee (CMI); those tables derive from statistics gathered from insured pension schemes. Are these typical of large, self-administered schemes? This is a question to which we return later. One powerful way of introducing objectivity into the consideration of any scheme specific parameter is to ask the simple question: how does this compare with national statistics?

4.9 If the U.K. were a closed society, with all members in pensionable work, and exits from the workforce only occurring due to ill-health retirement or death, then the position would be clear: in aggregate, the experience of pension schemes would have to mirror society as a whole. It would certainly not be reasonable to assume that all pension funds would have experience which deviated from the national average in a single direction. This would especially be true for withdrawals from service. Any withdrawal from one scheme would have to be mirrored by a new entrant into another scheme, which is why it is usually reasonable to ensure that the pattern of entrants when using the entry age
method of funding properly reflects not the actual ages at entry, but rather the ages consistent with replacing members leaving in accordance with the withdrawal rates used in the valuation. Otherwise adventitious surpluses or deficits are likely to arise.

4.10 The members of occupational pension schemes do not, of course, constitute the whole of society. There is migration of work between the employed and the self-employed sector, with the latter gaining in importance with age. Married women leave the workforce to have families and do not necessarily return, or return in part-time work. Nevertheless, the basic concept still has broad validity.

4.11 This validity is obvious for basis elements where the national statistics themselves are based only on those economically active—in particular, rates of pay. Indeed, national statistics, especially through the General Household Survey and OPCS publications on mortality and marital status, will be the only reliable sources of information for such matters as proportions married amongst those dying, the proportions married amongst the living, proportions cohabiting at various ages, probabilities of remarriage and details of the number of dependent children, sub-divided by the age of parent.

4.12 Perhaps the most striking example of the use of national statistics is the question of how long employees stay in work and therefore what represents the average future working lifetime. In Appendix I we have set out the withdrawal pattern which we have assumed for our model pension fund, which leads to an average remaining working lifetime of 6.875 years. We would suggest that, if anything, changes in employment are more frequent than in our model, which would reduce the average future working lifetime even further. Yet, in how many pension schemes do the scheme specific withdrawal and early retirement assumptions lead to such a short period for SSAP24 purposes?

5. SOME EXAMPLES OF MARGINS

5.1 In this section we explore some of the aspects of assumptions where, in our view, what is often regarded as best estimate actually contains unwarranted margins. It is not feasible to explore every aspect on which assumptions have to be made in connection with pension funding, but we cover the major areas and hopefully demonstrate an approach which can be followed elsewhere.

5.2 Returns on Investments

5.2.1 One of the most important elements of an actuarial basis is the return which it is assumed will be achieved on investments in the future. A modern pension fund will invest heavily in equities, of which a good proportion will be in various overseas markets. Ideally, each of these should be considered separately to determine what will be the return expected from each. However, analysis of many of the overseas markets is difficult because of the paucity of statistics, and very often the main argument for going overseas is not so much the expectation of a better return, but rather to achieve a diversification of assets, each different
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5.2.2 As described elsewhere, the practice in valuations of applying actuarially assessed values rather than market values to investment portfolios has the effect of smoothing the run of investment results. In consequence, it is the actuarially assessed yield on equities with which we are concerned. This return is made up of two parts: the yield actually attained on equities, and the dividend increase achieved. We shall study each of these in turn.

5.2.3 Yield on Equity Investments. Figure 5.2.1 shows how the yield on the FT-Actuaries All-Share Index has moved since its inception in April 1962. From the graph it will be seen that the yield on the All-Share Index rarely strays beyond the range of 4-6%, and when it does stray it does not do so for long. The average yield over the 29 years is just under 5%, and there is little evidence of a trend in either direction away from this figure. Rather, there is slight evidence of a random step function, with discrete changes in the mid 1960s, mid 1970s and early 1980s. It is perhaps too early to say whether there has recently been a step
upwards to 5%, or whether the market will revert to the lower yield found in the latter half of the 1980s. In consequence, it is possible to suggest that for the future average yields might lie anywhere in the region of 4¼–5%, and our preference is to assume 4¾%.

5.2.4 It should be noted that the yield quoted on the All-Share Index is an historic yield, based on the lastest dividends declared by each company, including changes in the interim dividends since the last final dividend (even though the size of these changes is not included in the figures given for individual companies in the Financial Times). In consequence, the yield is always out of date by some 3 months worth of dividend increases. The exact lag does vary with the time of year, but on average it would be quite reasonable to take into account dividend increases as measured by the All-Share Index in the 3 months following a valuation date in establishing the true running yield on the All-Share Index at the valuation date. Secondly, it will be noted that dividends are paid at all times of the year. Once again, although there is some variation with the time of year, it is reasonable to assume that the yield on the All-Share Index is a force of interest, \( \delta \), from which the actual yield can be obtained. Thus, if the rate of growth of dividends is, say, 5% p.a., a running yield of 4¾% equates approximately to an actual annual yield of 4.9%,

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\text{(i.e. } \ln(1.049) = 4.78\% = 4.75\% \times (1.05)^{\frac{1}{4}})\.
\]

5.2.5 Increases in Dividend. Figure 5.2.2 shows how dividends, as measured by the FT-Actuaries All-Share Index and predecessor indices, have changed since 1940 when compared with the change in the General Index of Retail Prices. An analysis of the graph is interesting, because, at first sight, there are two features in recent years which do not appear: the effects of dividend restraint in the late 1970s which depressed dividends, and the recession of the early 1980s. The explanation lies in the fact that in practice dividend increases do not coincide with the inflation which gives rise to them. If, for example, there were a sudden burst of wage inflation, then one might expect that price increases would follow very quickly, and that a company would recalculate its selling prices to enable its margins to be resumed. However, the impact on the current year of the company's accounts would be small. It would only be the accounts of the following year that would fully reflect the inflation, and hence it is the dividend payable nearly 2 years after the event which would reflect the inflation which had occurred. From first principles, therefore, one might expect a lag of some 2 years between inflation and dividend increases.

5.2.6 We have therefore shown a second line on the graph (Figure 5.2.2) to illustrate the way in which dividends have changed when deflated by the change in prices 2 years previously. Immediately the two features looked for in the previous paragraph can be seen. Dividends are seen to have dropped sharply in the late 1970s, but to have picked up quickly when dividend restraint was taken off. In fact much of the shortfall in dividends was recouped by the payment of special dividends. However, this improvement was short-lived, as the economy
Figure 5.2.2. Index of share dividends according to FT-Actuaries All-Share Index and predecessor indices, adjusted by co-incident price inflation and inflation lagged 2 years.

went into recession in the early 1980s. In practice, linear regression analysis on the series suggests that 3 years lag between dividends and inflation is a better fit; this might perhaps reflect a reluctance of companies to allow fully the increase in profits to be passed into dividends, but also possibly the need to repair some of the ravages that the effect of sudden inflation might have caused, given the time it might take to respond.

5.2.7 We believe that from Figure 5.2.2, it is difficult to conclude other than that in the longer term dividends actually outpace price inflation. However, it is also clear that there are long fluctuations in the position, and a judgement has to be made as to how cyclical increases in dividends are, and where in the cycle one is. In consequence, we would not wish to be dogmatic about what should be regarded as an appropriate rate of increase. Our own view is that anything between $+\frac{1}{2}\%$ and $+2\%$ over inflation can be justified from the figures illustrated.

5.2.8 Since it is the investment return over pay increases which is most important to pension funds, we show in Figure 5.2.3 the way in which dividends have moved relative to pay 2 years previously. On the evidence of this graph, we believe that it would be possible to justify an assumed rate of increase in
dividends in line with increases in pay levels, and difficult to justify a rate of increase in dividends which falls short of the increase in pay levels by more than 1% p.a.

5.2.9 Total Return on Equities. Putting together the force of interest represented by the running yield and the rate of dividend returns suggested above, the evidence would suggest real yields on U.K. equities of between 5½% p.a. and 7% p.a. in excess of prices. This is indeed the range which has been borne out by rates of return on market values over various periods in the past, as confirmed by the research of various investment houses, and as Figure 5.2.4, based on the data underlying Figures 5.2.1 and 5.2.2, illustrates.

5.2.10 It is interesting to consider whether such increases can be justified by economic analysis. Suppose GDP in real terms grows as a result of increased productivity. That increased productivity is shared between wage earners and providers of capital. If the share of the economy applicable to each is to stay constant, each must grow in line with the growth in GDP. To the extent that one predominates, the other must grow more slowly. This inter-relationship suggests that pension schemes are particularly sensitive to the competing demands of wages and capital. If wage earners should seek to increase their share of the cake, pension funds will suffer twice over: above average pay rises coupled with below average dividend increases.
5.2.11 Over the years, the proportion of GDP comprising wages has remained broadly constant, at about two-thirds of GDP. In consequence, we might expect dividends to grow long-term in line with the increase in GDP. However, this analysis is over the whole economy. In the assessment of future prospects for equity investments of a pension fund, it is the growth per share which is important. Thus, one must deduct from the overall return the rate at which the quantity of shares expands by virtue of subscription of fresh capital. It follows that, from the return expected by the economic approach must be deducted the costs of right issues, and new issues which raise finance for a new venture, such as Eurotunnel. (New issues of existing companies, or privatisations, do not have to be deducted, as these simply represent a change of ownership—the initial growth in value has already occurred.) During the 1980s, such issues represented between 1% and 2% p.a. of the total capitalisation of the Stock Exchange. If one predicts a real growth in GDP of 2½% p.a., the net growth will thus be between ½% and 1½% p.a., which would suggest real equity returns of between 5½% and 6½% p.a.

5.2.12 It is recognised that this analysis is not rigorous, not least because the constituents of the All-Share Index increasingly include overseas elements, and the link with GDP is therefore imprecise. Nevertheless, it does provide a
convincing rationalisation of the results found from inspection of the historical figures.

5.2.13 *Dividend Cover*. Our analysis assumes that the present recession is temporary. However, there is one statistic which currently does give pause for thought: as shown in Figure 5.2.5, dividend cover has now reduced to levels not seen since the introduction of Advance Corporation Tax (ACT) in 1973: does this presage 10 years of poor dividend increases? This might appear to be the implication, but it must be remembered that the late 1960s and early 1970s saw a period when our trading patterns changed orientation, from Commonwealth to Europe; it is not surprising that this time coincided with slow economic growth. Furthermore, as profits are assessed by historic accounting methods, the true profit is overstated in inflationary times, which therefore requires higher apparent dividend cover, such as was seen in the late 1970s and early 1980s. It is true that if there is a need for a higher level of cover to be rebuilt, this could restrain the rate of growth of dividends, but the end of the present recession could also bring a recovery (in real terms) of profits, as happened in the 1980s.

5.2.14 *Allowance for Asset Mix and Expenses*. Within a pension fund, U.K. equities typically form over half of the assets, with the larger part of the balance being overseas equities. These might, as noted earlier, be expected to provide a comparable level of return (even if in practice they have not done so over recent years). The remainder would be accounted for mainly by cash, fixed-interest stocks, index-linked gilts and property investment. Over the past 20 years the real return on this remainder has been lower than on U.K. equities, although, particularly if inflation does abate permanently, it would be expected that better real returns would be achieved longer term. Nevertheless the return which will actually be achieved by a typical pension fund must allow for the mix of assets held and the proportion in cash. This can be allowed for by using an appropriate model for the assessed value. Alternatively, if an all equity model is used for valuing the assets, the asset mix can conveniently be allowed for by making a reduction of $\frac{1}{4} - \frac{1}{2}\%$ in the rate of dividend increase assumed. In addition, allowance needs to be made for investment management expenses expressed as a percentage of the assets. If not covered by a loading on the contribution rate, this could be done by a reduction in the assumed yield of say $\frac{1}{4}\%$ p.a. (for a large scheme). For a small scheme a higher reduction would be appropriate. Similarly as regards future investment, it is appropriate to make a reduction in the rate of return derived from U.K. equities to allow for the asset mix and for dealing expenses; and a reduction of $\frac{1}{2}\%$ from the U.K. equity return would cover both these points.

5.2.15 Our conclusion is, therefore, that in a typical large pension fund the best estimate of the real return (net of investment expenses) which should be attained in the future is between 5% and 6%. Against this analysis the real returns of 4% or 4½% often encountered in current valuation bases are undoubtedly conservative.
5.3 Salary Increases

5.3.1 The principle of using salary scales to project future benefit outgo for the purpose of funding calculations is very long established, dating back to the 1900s or even earlier. Throughout that time the method has been to determine a salary scale \( s_{x+1}/s_x \) which measures the change in salary during the year of age \((x, x+1)\). This ratio is then compared with the actual increase found in the experience investigation to test whether or not the salary scale is a good fit. Because of general escalation of salary levels, the ratio of actual to expected is unlikely to be 1·00. If at all ages the experience were to show an answer of, say, 1·08, the shape of the salary scale would be regarded as appropriate.

5.3.2 However, this analysis does not tell us whether the salary scale includes some element which is attributable to the general escalation of pay levels. To answer that, it is necessary to determine whether the general increase in pay was indeed 8\% or some other figure. If, for example, the salary scale \( s_{x+1}/s_x \) were replaced by the scale \( s'_{x+1}/s'_x \) where \( s'_x = s_x (1.01)^x \), then the experience by reference to the new scale would be 1·07 (strictly, 1·069) at each age. The new scale would still have the appropriate shape, but a different measure of general escalation would be indicated. The problem which then needs to be addressed is, which was the true rate of general pay escalation, 7\% or 8\%, and which is the true salary scale?
5.3.3 *Average Salary Profile*. To answer this question, it is necessary to study the average salary profile. In a stable workforce in a large scheme this should give a good indication of how much of the increase was due to salary scale, and how much to escalation of general pay levels. There are dangers with doing so, as successive pension fund textbooks have stressed, but there has been a change in emphasis over the years. Crabbe & Poyser gave prominence to the use of average salary levels, but pointed out the dangers. Lee states that using average salary profile 'cannot be relied on' and is ‘technically unsound’, and we suspect that less credence has been given to average salary profile in recent years.

5.3.4 In consequence, we believe that many actuaries have failed to realise that, for the vast majority of the employed population, pay increases, once the individual reaches age 40 and beyond, fail to keep pace with increases in earnings generally. This is not to say that salaries actually fall in real terms relative to prices, even in times of high cost inflation, rather that the increase in standard of living is less for the older employed than for the younger employed. This assertion is shown most clearly by the figures given annually in the New Earnings Survey. Tables given in Part E of that Survey contain details of earnings of individuals subdivided by age and by industry group. All industry groups show a similar pattern, as Table 5.3.1, extracted from the 1990 Survey, illustrates for national groupings. Earnings, as a proportion of national average, increase until individuals reach their forties. They then fall, to the extent that earnings in the 50s are of the order of 95% of earnings in the 40s, and earnings in the 60s are even less. The fall applies to manual workers and non-manual workers equally and, although this is not illustrated here, to gross pay and basic pay. Indeed, closer examination of individual companies would suggest that the fall extends to all employees except the most highly paid 1% or 2%, and there is some evidence that the more highly an individual is paid, the later the peak of earnings.

5.3.5 It is not surprising that this should be so. Once employees have learned

<table>
<thead>
<tr>
<th>Age</th>
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<th>Full-Time Females</th>
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<td>25-29</td>
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<td>30-39</td>
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<td>98</td>
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<td>50-59</td>
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<td>60-64</td>
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<td>18 and over</td>
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<td>86</td>
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*Source: 1990 New Earnings Survey*
their craft, trade or profession, they continue to grow in experience for many years, and that experience is valuable. However, eventually the extra worth of yet additional experience diminishes, and the skills of the individual become outdated, whilst the ability to adapt to new skills and methods grows less. It is not surprising in those circumstances to find that the older employee commands less in the market place than his younger colleague.

5.3.6 A Retrospective Analysis. In order to examine whether this pattern has endured over time, we have extracted some figures from a large company in a manufacturing industry who set up a new group pension scheme in the early 1970s. Figure 5.3.1 shows the average gross earnings in the year to 31 March 1990 of members in the scheme at that date. Fewer than 1% of employees are not included in the scheme. The earnings in the graph are by reference to all members of the scheme, since the differentiation between works and staff was removed some years back. Furthermore, before removal, there was a certain amount of regrading which makes it difficult to make proper comparison between generations. Also shown on the graph are earnings for the employees of the company in the year to 31 March 1976. To achieve comparability, those earnings have been multiplied by 4·35. It will be seen that there is very little difference between the 1990 pay and the 1976 pay (as adjusted) at each and every age.

Figure 5.3.1. Table showing progression of pay with age in a large company.
5.3.7 The change in national average earnings from mid-year point to mid-year point was 4.12, but 1976 was a year of very high inflation, and the appropriate comparable increase in national average earnings might be between 4.1 and 4.5, depending on the date in the year when pay is reviewed. In consequence, increases in general pay levels in the company in question over the 14 years have been very close to the national average. This is despite the industry concerned being in decline to the extent of the number of employees falling by two-thirds.

5.3.8 Whilst the experience of a single company cannot be extrapolated to the whole economy, we have encountered similar results in other cases. This appears to indicate that it is questionable to assume that general pay increases will vary greatly in the long run between different economic sectors. The information points to a uniformity of pay increases across the larger part of industry and commerce, caused by the number of employees who can change industries if pay gets out of line and the retention of differentials for the others. It is, of course, acknowledged that there may be particular cases where this general rule will not apply—but we consider that these are the exception; certainly we suggest that careful study should be made before assuming otherwise.

5.3.9 Another interesting point can be drawn out of this example. The third line in the graph is derived from the salary scale which was adopted for the staff membership at and before 1976, deflated (as described in §5.3.2) to the extent necessary to make the figures fit the average salary profile. Indeed, had the profile for the staff in 1976 been superimposed upon this graph, it would have been virtually indistinguishable from the salary scale: in only one instance was the quinquennial average pay more than 1 1/2% away from the salary scale. To fit the salary profile, that original salary scale has been deflated by 1.2% p.a. to give the scale shown on the graph. The interesting point is that the salary scale in question was chosen when the scheme started, as being that appropriate to the staff employees of an entirely unrelated industry in the early 1950s.

5.3.10 Salary Scales. When salary scales were first introduced into actuarial practice (which was before 1910), no explicit allowance was made for increases in cost of living, not least because the expected increase was zero at the turn of the century. In consequence, it was appropriate for the salary scales used for pension fund purposes to include the whole of the increase in general levels of earnings relative to constant prices. It was not until the late 1950s that valuation bases started to take into account the effects of future inflation, and direct allowance for general increases in pay levels at a rate different from the increase in prices started to be introduced soon after. In consequence, we suspect that in the original salary scale 1.2% was included for improving productivity, which it is no longer appropriate to include in the salary scale if escalation is measured by reference to increases in national average earnings.

5.3.11 Although this graph only relates to a single large company, it suggests that the shape of the average salary profile of industrial companies may have remained remarkably constant over more than 30 years. Furthermore, as is
shown by the New Earnings Survey figures, the shape is similar throughout the economy, at least above age 30, for both manuals and non-manuals. It is only at the young ages that there is a substantial difference in pay increases between works and staff. (In passing, this also suggests that the concept of cross-subsidy between high paid and low paid is mistaken—which further research beyond the scope of this paper confirms.)

5.3.12 Realistic Salary Scales. The two horizontal lines drawn on the graph represent the levels of pay 5% above and 5% below the average pay between ages 25 and 65. It will be seen that virtually no figures lie outside this range. However, we do not think that this should be taken to mean that no salary scale is required in a valuation basis. The statistics would indicate that pay peaks in the forties and comes down by about \( \frac{1}{2}\% \) p.a. from that age on. The past service liabilities for active members depend on changes in future pay levels predominantly in respect of this period. Therefore, ignoring the decline in pay as compared with national average at ages over 40 would imply a substantial over-estimate in the reserves required for active members. If a salary scale is used which continues to increase through to retirement, the over-estimate will be greater. Our conclusion is that the allowance for salary scales currently adopted often includes a margin equivalent to \( \frac{1}{2}\% \) p.a. during service.

![Figure 5.3.2. Index of wages adjusted by price inflation.](image-url)
5.3.13 We would accept that our conclusions need one slight qualification. The number of members in the sample in the New Earnings Survey does fall sharply between ages 40-49 and ages 50-59. Whilst some of this fall is attributable to deaths, a substantial proportion must be due to retirements. Clearly, if it is only the most highly paid who retire, this could at least partly explain the fall in earnings between these ages. Undoubtedly, this does happen to some extent, but the most important determinants of early retirement in our experience are length of pensionable service and state of health rather than level of pay, and we do not believe this invalidates our conclusions.

5.3.14 Salary Escalation. In § 5.2.8 we showed that it would be justifiable to assume a rate of increase of equity dividends in line with increases in pay levels and difficult to justify a rate which falls short by more than 1% p.a. This followed the conclusion in § 5.2.7 that dividend increases between +\( \frac{1}{2} \)% p.a. and +2% p.a. over price inflation can be justified. These two conclusions would imply that pay levels increase between 1\( \frac{1}{2} \)% and 2% p.a. more rapidly than prices. This is borne out by Figure 5.3.2, from which a rate of 1\( \frac{1}{4} \)% p.a. might appear to be a particularly stable and longstanding trend. It would be dangerous, however, to read too precise an interpretation into this graph. In recent years the trend line has been affected by historical restatement of the underlying indices and the furthest we would go would be to confirm the reasonable range for the assumed real rate of increase of pay levels to be 1\( \frac{1}{4} \)% to 2% p.a. In our experience bases at the present time typically allow for escalation of pay levels (in excess of any allowance for salary scale) at 2% p.a. The effect of compounding would reduce the true net rate to perhaps 1·9% p.a., but it is arguable that there is some overprovision.

5.4 Mortality in Retirement

5.4.1 In recent years the PA(90) tables have been widely used in the valuation of pension funds, although some funds have retained \( a(55) \) with suitable ratings to age, as being more appropriate to their particular mortality pattern. In the last three years, Reports 9 and 10 of the CMI have introduced new tables which show a marked improvement in mortality. However, those investigations were based solely on pensioners with insured contracts. It is clear from the figures given by the CMI that these are not representative of occupational pension schemes generally. In particular, very few of the pensions were subject to increase once in payment, and in consequence the weighting within the whole industry of pensions by amount at advanced ages is very small indeed.

5.4.2 Furthermore, the main tables are restricted to pensions arising from retirement at or after normal retirement date. Many years ago this may have been reasonable because almost all early retirements would have been on grounds of ill health. However, since the early 1980s there have been vast numbers of employees retiring early, with many schemes reporting that virtually none of their employees currently remain in service up to the normal retirement date. Providing that the health of the member was not a factor in determining who did
and did not take early retirement, this exclusion would not matter. However, other things being equal, those who feel themselves to be in poor health will be more likely to retire early than those who are fit and healthy. This self selection suggests that the mortality rates shown by the recent CMI investigation, at least at ages up to 75, may have reflected a spurious improvement, and thus understate mortality for retirements generally on grounds other than ill-health, especially on forecast bases.

5.4.3 It seems to us that there are strong reasons for suggesting that the standard table of mortality for pension schemes should be based on the mortality of all lives, regardless of the reason for retirement. Such rates will be correct in the following circumstances:

(i) Estimating the cost of future benefits for a member currently in service. This is so whether those benefits be defined benefits, money purchase or personal pensions. In particular, it must be wrong to assume that an appropriate personal pension coming into payment is a select life.

(ii) For the calculation of liabilities for pensioners in schemes where it is not known whether individuals have retired on ill-health grounds or otherwise.

(iii) In considering what changes need to be made to mortality tables if the numbers retiring on grounds of ill-health change. In such circumstances, there is no reason to believe that the underlying mortality of the population as a whole will be affected, but if, for example, the number retiring due to ill health increases, the mortality of the population of ill-health pensioners and the population of age pensioners can each be expected to lighten.

(iv) The shape of the mortality table is more likely to be followed by the whole population of pensioners in a scheme. The tables for age pensioners only will depend crucially on the number of ill-health pensioners, because the mortality of ill-health pensioners tends to have an element of anti-selection. In consequence, the mortality of the ill-health population tends to improve with age, and taking such a pattern out of the total population must leave a shape which will depend on the level of ill-health retirement.

5.4.4 One other area in which the CMI data may not be representative of pension funds generally is in the balance between staff employees and manual grades. Investigations of various pension schemes lead us to believe that there can be a difference in age rating between staff and manual grades of 1 or sometimes 2 years. Clearly much will depend on whether an individual pension scheme has the same proportion of staff and manual grades as in the CMI investigation. Furthermore, in individual schemes there has tended to be a gradual regrading from manual grades to staff, whereas the reverse could be happening with the CMI data as the works schemes set up in the 1960s and 1970s start to produce pensioners. Investigation into the mortality of pensioners of a
few large schemes advised by our firm shows that the pattern of mortality for staff pensioners is very close to the pattern found by the CMI Committee. However, the mortality found seems to be heavier by about 6 months of rating despite applying to data which is, on average, 5 years later than the CMI data. Furthermore, if we aggregate staff and works, the rating increases to a full year. The President of the Faculty, Alistair Neill, in his recent address to the 1991 Harrogate Convention, and in his Presidential Address, called for the results of investigations into the mortality of pensioners in self-administered occupational schemes to be made public. We have for some time been considering making a comprehensive study of pensioner mortality amongst our firm’s clients as a whole, which could cover some one million lives, but there are a number of practical problems to be overcome and it is likely to be some time before the results of such an investigation could be published.

5.4.5 One very important study of mortality which does not seem to have been given the prominence which it deserves is the work by Haberman & Bloomfield in the mid 1980s on the differences in mortality in Great Britain around 1981, sub-divided by reference to social class. The complete expectation of life at age 65 for social classes I and II was shown to be 13.7, which equates to PA(90) with an age rating of about 1.3 years. The expectation for social classes IIIN and IIIM was 11.8, equating to PA(90) with an age rating of 4.5 years, whilst for social classes IV and V the expectation of life was only 11.3 years, which equates to a rating of 5.5 years. The average staff scheme probably includes members from social classes I, II and IIIN. Manual grades schemes will cover IIIM and IV. The figures therefore support the idea that there should be a difference in mortality between staff schemes and manual grade schemes, which could be of the order of 2 years.

5.4.6 However, what is probably much more important to note is that the expectation of life of each group is very much worse than is given by PA(90), and therefore also than that given by the new tables, which are by reference to the same time as the census figures. Why is there such a large difference between the two investigations? Almost all men are economically active and we would expect the mortality of pensioners to follow national mortality fairly closely, whereas the mortality shown by the CMI is very much lighter than occurs nationally. One reason for this might be the better standard of living of the population with large pensions, which suggests that current mortality tables of pensioners are likely to be lighter than national statistics. However, with the gradual increase in the coverage of the population by pension schemes, and the relatively small pay range which covers the majority of the workforce, we do not think that this feature can continue indefinitely, and we would expect convergence with national statistics. But even allowing for this, we suggest that consideration of the national statistics confirms our view that in aggregate the assumptions indicated by the CMI Reports for scheme pensioners are probably too light.

5.4.7 Our suggestion that national statistics should be taken into account in setting mortality rates for pensioners would also appear to be supported by the
Government Actuary in his review of contracting-out terms for 1993-98. He too appears to share our doubts on the conclusions which can be reached from the CMI data.

5.4.8 Our conclusions on the subject of mortality assumptions are twofold. First, that the rates assumed should be scheme-dependent. In particular, they will depend on the relative proportions of staff or manual grades in the scheme. Secondly, mortality varies not only by social class, but also by geographical location throughout the country, and some schemes do have much heavier mortality than others. It is therefore difficult to generalise about what mortality rates should be used by particular schemes. What we would highlight, however, is the possibility that schemes are understating the rates of current mortality, and overstating the expected improvement in mortality in the future, both of which lead to unnecessary margins in the reserves held.

5.5 Withdrawal Rates

5.5.1 It is usual in actuarial calculations for large self-administered pension schemes to include scheme-specific assumptions regarding future rates of withdrawal from membership. In our experience withdrawal rates are not invariably included for smaller self-administered schemes and for insured schemes. We believe that this is an area where margins may unwittingly be included, leading to an overstatement of reserves and contribution rates, and also of future average working lifetime. (We acknowledge that some insurance companies combine an absence of withdrawal rates with a control period beyond which pay increases are not taken into account. Such a method does approximate, albeit imprecisely, to a proper withdrawal rate coupled with pay increases throughout—it is, however, an artificial approach.)

5.5.2 As with other scheme-specific assumptions, there may be some difficulty in deriving assumptions based on the scheme’s own experience. In a small scheme the volume of experience may be inadequate, whilst in a large scheme the period under review may not be typical. Many large schemes relate to industries which have been in steady decline since the 1970s and which have been subject to a succession of factory closures, reductions in the workforce, early retirement redundancy schemes and the like. In view of this actuaries have, quite properly, tended to assume that future rates of withdrawal will not necessarily be as high as those experienced hitherto. On the other hand, the frequency of job changes in mid career has tended to increase and the number of employments which would be regarded as a ‘job for life’ are fewer than they were; this suggests that withdrawal rates might well be higher than the underlying rates experienced in the past (whatever they might be).

5.5.3 The context in which withdrawal rates have to be set has changed considerably in recent years. In the 1960s and early 1970s, the withdrawal of a member from membership of a final salary scheme would have led to a substantial release of reserves. Furthermore, the funding strategy often adopted in this period was one which was intended to lead to the gradual emergence of surplus at successive valuations.
5.5.4 In contrast, in the 1990s the release of reserves on withdrawal is much smaller. At the same time funding strategies are much more orientated towards limiting the emergence of future surplus, and schemes are experiencing difficulty in managing existing surpluses. Where companies are taking contribution holidays there is a natural desire to be able to show a pension cost in the company accounts as close to nil as possible, and to achieve this it is helpful if the average future working lifetime used to take credit for the surplus under SSAP24 is shorter rather than longer.

5.5.5 The position has, therefore, shifted from one where there was seen to be some merit in understating the assumed withdrawal rates, to one where this is no longer desirable.

5.5.6 A typical approach to setting withdrawal rates for past service would be to examine the experience on a select basis and to adopt rates based on the ultimate experience after, perhaps, 5 years' duration. Rates of withdrawal are found to vary considerably with duration as well as by age, but it would be unusual for a valuation to be made using select rates. Any overstatement of reserves in respect of members at short durations is of little financial consequence.

5.5.7 In setting a projected unit contribution rate for continuing service similar considerations apply. However, in this case the weight of liabilities will differ, as the length of past membership does not enter the calculation. This might suggest using withdrawal rates somewhere between the ultimate rates used for past service and the aggregate rates.

5.5.8 In calculating the average future working lifetime, aggregate rates of withdrawal would seem more appropriate, although there is a general case for using the same withdrawal rates as for the past-service reserves. Furthermore it is an interesting question whether it is justified to use different rates for SSAP24 purposes compared with those used for funding, simply on the grounds that the rates are compatible (in the sense that aggregate rates for SSAP24 and ultimate rates for funding are both derived from the same experience).

5.5.9 For practical reasons actuaries are likely to continue to use a single set of withdrawal rates for all purposes, but the foregoing analysis does indicate that there are dangers in setting rates significantly lower than the ultimate rates experienced. It might be thought dangerous to assume that withdrawal rates will remain high in recessionary times, but this concern was not borne out in practice in the early 1980s, and there is no reason to suppose that it will be during the current recession. Figures produced in the past by the Department of Employment of the rate of turnover in the economy showed little difference in turnover between times of boom and bust.

5.6 Pension Increases

5.6.1 In a scheme where the pension increases granted to pensions in payment and/or preserved pensions prior to vesting are linked to increases in prices, as in the public sector, the assumption adopted should naturally be linked to the assumed rate of price inflation.
5.6.2 In other schemes the assumption to be adopted has to be regarded as more in the nature of a provision. There are three cases to consider:

Case A—where the pension increases are wholly discretionary,
Case B—where the pension increases are guaranteed up to a certain level and allowance is to be made for increases above this on a discretionary basis, and
Case C—where the pension increases are guaranteed up to a certain level and no allowance is to be made for increases above this level.

In cases B and C a distinction can be drawn between two typical forms of guarantee. Type 1 is where increases are guaranteed to match price inflation up to a ceiling of, say, 5% p.a. Type 2 is where increases are guaranteed at, say, 5% p.a. regardless. Type 1 is normally regarded as appropriate in self-administered schemes, whilst Type 2 is frequently encountered in insured schemes (more often at the 3% level), presumably for reasons to do with ease of administration. (In passing we may wonder whether actuaries have done enough to draw their clients' attention to the implications of a sustained period of low inflation or, indeed, deflation.)

5.6.3 None of these cause any great difficulty other than in Case C1, where it would be appropriate to use an assumption lower than both the guaranteed rate and the assumed rate of price inflation, on the grounds that the actual increase in any year will always be the lower of the two, and will never be made good in a later year. An analysis of this question using stochastic processes has been made by Wilkie, which indicates that the appropriate reduction for a guaranteed rate of 5% p.a. and a long-term assumed rate of price inflation of around 5% p.a. should be in the region of 1-1½% p.a.

5.6.4 We suspect that this feature is not often allowed for, and would argue that there are good grounds for not doing so. Wilkie's results will only be experienced over a long period, during which it is likely there will be periods of low inflation and other, shorter, periods of high inflation. It seems probable that pension increases will have to be provided over quite sustained periods which match inflation, and would then have to be rigorously restricted to the guaranteed rate in periods of high inflation to secure the reduction indicated. This is bound to mean additional fluctuation in costs. However, there will clearly be considerable pressure on trustees and employers to provide higher increases in such circumstances which they may not be able to resist. It therefore calls into question whether this approach is sustainable in practice. Because of the possibility of long periods of low inflation, it may be best to ignore the saving in future times of high inflation for the purpose of funding.

5.6.5 This does, however, raise the question of whether it will be realistic to ignore it in costing LPI increases for the purposes of the Social Security Act 1990 when the relevant legislation is brought into effect, and whether the actuarial guidance will allow due cognisance to be taken of these results.
5.7 Other Assumptions

5.7.1 Without going into full detail on each item, there are numerous other areas where actuaries take margins without always being conscious of it.

5.7.2 Compounding. One such is the frequent practice of adopting bases in which each parameter is stated in nominal terms, and the differences described at face value. For example, a basis incorporating a rate of investment return of 10% and a rate of price inflation of 5.5% would be presented as reflecting a real return of 4.5%, whereas the calculation will, allowing for compounding, be based on 4.27%. Over a 30-year period, say, the effect is to overstate liabilities by some 7% \((1.045 ÷ 1.0427)^{30} = 1.07\). For presentational purposes it is reasonable to put a gloss on this, but the actuary should be conscious of the point when setting the parameters to be used. Parameters do not have to be specified in whole numbers of per cent or halves, and there are examples of basis assumptions specified more precisely. (There is also another possible use for the margins—see Appendix 1, §§ A1.14 et seq.)

5.7.3 Family Statistics. Some fairly arbitrary assumptions are often adopted in respect of proportions married and loadings for children’s benefits. Because of the lack of scheme-specific experience data, such assumptions are often left unchanged from valuation to valuation. The common assumption that 90% of males are married at retirement is too high, with national statistics indicating a figure currently of 80–83% at relevant ages and a firmly downward trend. It is true that many schemes now provide dependants’ benefits on a similar basis, but the adjustment for this should properly vary from scheme to scheme. Furthermore, national statistics of unmarried couples co-habiting suggest that the adjustment should rarely be more than 5%.

5.7.4 Children’s benefits on death are most conveniently allowed for by applying a loading to the value of death in service widows’/widowers’ benefits. Loadings of 10–15% are sometimes seen and often derive from statistics produced in the 1960s, thus not taking account of the substantial fall in the birth rate, especially at older ages. Again the appropriate loading will depend on the rules of the particular scheme, but our experience of large schemes is that the actual costs are much smaller when the amount of children’s allowances in payment is considered relative to the amount of widows’/widowers’ benefits: a loading of 5% would be more than appropriate in most cases.

5.7.5 Finally, there is the point that rates of mortality vary with marital status. Married persons suffer much lighter mortality than single persons, with divorced and widowed suffering the highest mortality. The result is that the proportion married amongst the dying is much lower than amongst the living, which is the statistic usually used in valuations (not least because it has to apply to both death in service and death after retirement). For example, in the years of peak proportions married amongst males (50–60), the proportion amongst the living is about 83%, but the proportion amongst the dying is only 75%. Furthermore, the extra mortality suffered by widows (and widowers) is sufficient to suggest a rating of 1 or 2 years to the mortality table used for female pensions.
5.7.6 Overall, it would not surprise us to find that the value of widows’ and dependants’ benefits could occasionally be overstated by as much as 20%.

5.8 Conclusion

5.8.1 Our conclusion is that nearly all the parameters used in a typical actuarial valuation contain margins of varying importance. Overall, we can speculate that the average basis might include margins which, in aggregate, amount to an overestimate of the amount of benefits of about 10%, an overestimate of the rate of pay escalation of \( \frac{1}{2} \) % p.a. and an underestimate of the rate of investment returns of \( \frac{1}{2} - 1\frac{1}{2} \) % p.a. Does this matter? We think it does.

6. THE EFFECT OF MARGINS

6.1.1 The effect of margins on valuation results can readily be investigated by substituting revised assumptions and comparing the results. As will be apparent from the foregoing, our view is that unintentioned margins should be avoided, particularly as there is a danger of building layer upon layer of caution into bases, methods and funding strategy. We therefore intend to concentrate our investigations into the element where it may be appropriate consciously to adopt a margin, namely the investment return, for two reasons. First, it is where the effect can most readily be demonstrated and hence understood. Secondly, it is straightforward to make direct allowance for that caution in setting contribution rates designed to avoid unwanted surpluses arising.

6.1.2 Although the concept of a pension is simple, in practice a pension fund is a very complicated structure, and it is tempting to build up sophisticated models to examine some of the byways. This is not our intention in this paper, in which we discuss basic principles and concepts. In consequence, we have chosen a very simple model of a stationary fund to investigate the effect of a margin in the investment return assumption over time, a model which relies solely on compound interest. Because pension funds work by reference to monthly payments, continuous functions have been used throughout. Using compound interest has the merit that the figures quoted can be readily verified and replicated, and the answers adjusted where different opinions would lead to different emphases being placed on some or all of the parameters adopted. Appendix I sets out a detailed description of the model.

6.1.3 The calculations made in connection with the model demonstrate that the most important economic parameter in funding pensions is the rate of investment return which is achieved in excess of general pay increases, and we have designated this rate of interest by \( i \). The two other economic parameters required are the rate of investment return in excess of pension increases, and the rate of pay increases in excess of pension increases. The pension increases concerned are of two types: increases in deferment and increases in payment. In this paper, for simplicity, we have only considered the case when the two are the same, and equal to the increase in cost of living.
6.1.4 If the rate of investment return over pension increases is denoted by \( j \) and the rate of increases in pay over pensions by \( e \), then the relationship between the three economic parameters is:

\[
(1+j) = (1+i)(1+e).
\]

The rate of real increases in pay is regarded as a fairly stable parameter and it is not our intention to consider variations in it. Throughout this paper we have set \( e \) as 0.02, although, as noted in § 5.3.14, we might equally well have used 0.0175 or 0.015. As already stated, and as we will show, \( i \) is the basic function in pension fund work, and as our concentration will be on changes in \( i \) we have felt it natural to give examples which give integral values of \( i \). This means that the real investment return over prices will be non-integral. Thus, if \( i = 0.03, j = 0.0506 \). No doubt in this circumstance one might think of \( j \) as being 5%, but in our calculations we have rigorously used the true value.

6.1.5 The detailed calculations under the model are given in Appendix II. We have investigated the results of the calculations by reference to values of \( i \) between 0% and 4%; the answers are set out in Table A1 in Appendix I. The table indicates that taking \( i = 0.03 \) a margin of 1% in the assumed rate of investment return leads to overstating the past-service reserves needed by 14% and the contribution rate by 24%.

6.1.6 As a stationary fund, the conditions underlying the model fund are constant. In other words, the progress of the fund from one year to the next will simply depend on the rate of salary escalation suffered. The population of the scheme is stable and the characteristics of deferred pensioners and pensioners deriving from that membership remain static. Since all benefits are based on pay, it is not surprising that the answers are found to be constant multiples of payroll. The same will be true for different levels of pension increase, providing that the rate by which the pensions fail to keep pace with inflation (or rise faster than inflation) is constant.

6.1.7 Whilst the concept of a stationary fund can only be theoretical, in practice the results prove robust. The only exception is the need to allow for improvements in mortality, which is discussed in Appendix I.

6.1.8 If investment returns are constant, and each of the fund \( (F) \), the benefit outgo \( (B) \) and the contributions \( (C) \) is a constant multiple of payroll, which they will be in a stationary fund, then the following relationship must apply:

\[
B = C + F\delta
\]

where \( \delta \) is the force of interest earned in excess of pay increases.

This relationship has been derived before in the actuarial literature, and is fundamental to the understanding of pension scheme finance. At a very simple level it makes the obvious statement that benefits must derive either from contributions or from the investment return achieved on assets. At another level it illustrates that, if the population is stable and the economic conditions are stable so that \( B \) is constant, then there are an infinite number of different stable
contributions each with its own unique stable fund. However, it should be noted that this stability is only reached in practice at the expected values (i.e. standard contribution and standard fund, in pension fund terminology terms) if the value of $\delta$ is actually achieved in practice. If, instead, a return of $\delta'$ is achieved then a variation must arise equal to $F(\delta' - \delta)$. The relationship between $B$, $C$ and $F$ will, however, still hold on the valuation rate of interest and the variation will need to be dealt with. If it is not removed immediately, the fund will grow or diminish until a new stable level is eventually reached.

6.2 The Long-Term Effect of Margins

6.2.1 To investigate the consequences in the long term, consider a pension scheme which has reached a stable position, with stable benefit outgo, $B$, and a standard fund, $F$, with standard contribution, $C$, on a valuation basis which assumes a force of interest in excess of pay escalation of $\delta$. Suppose that instead a higher rate of return $\delta'$ is achieved; the fund will no longer be stable. Surplus will accrue, and will need to be removed over a period. Whilst that surplus is running off more interest will be earned and more surplus will arise.

6.2.2 Stability will only be resumed when two equations of value are obeyed. First, the equation between benefits, contributions and fund must work by reference to the rate of return actually achieved. That is:

$$B = C' + F' \delta'.$$

Secondly, the surplus in the fund ($F' - F$) when removed over the amortisation period (say with annuity value, $a$) must result in the reduction in contribution ($C' - C$) experienced.

We therefore have three identities:

$$B = C + F\delta,$$
$$B = C' + F'\delta',$$
$$C - C' = C(F' - F) / a.$$

From these formulae we can deduce that:

$$F' / F = (1 - a\delta) / (1 - a\delta')$$
$$C' = C - F(\delta' - \delta) / (1 - a\delta').$$

6.2.3 Tables 6.2.1 and 6.2.2 show the results of applying these parameters to two valuation bases, using $i$ (equivalent to $\delta$) of 0.03 and 0.02.

6.2.4 Tables 6.2.1 and 6.2.2 show a number of interesting features. If all surplus is removed instantaneously, the contribution rate is dependent on the valuation basis used, as well as on the actual rate of interest earned. If a rate of return at the top end of our expected range is obtained, members contribute 5% of pay, and the investment returned assumed in the valuation basis is only 2% above pay, then the ongoing contribution which will be required by the employers is very small or nil.
Table 6.2.1. Effect on Pension Funds of investment returns deviating from assumptions

<table>
<thead>
<tr>
<th>Method:</th>
<th>Projected Unit</th>
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<tbody>
<tr>
<td>Key parameters:</td>
<td></td>
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<tr>
<td></td>
<td>Investment return over pay $i = 0.03$</td>
</tr>
<tr>
<td></td>
<td>Standard Fund $F = 3.80$ times payroll</td>
</tr>
<tr>
<td></td>
<td>Standard Contribution $C = 11.98%$ of payroll</td>
</tr>
<tr>
<td>Investment return over pay actually achieved, $i'$</td>
<td>0.02 0.025 0.03 0.035 0.04 0.045</td>
</tr>
<tr>
<td>$F'$</td>
<td>3.80 3.80 3.80 3.80 3.80 3.80</td>
</tr>
<tr>
<td>$C'$</td>
<td>14.8 12.9 11.1 9.2 7.4 5.6</td>
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</tbody>
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Table 6.2.2. Effect on Pension Funds of investment returns deviating from assumptions

<table>
<thead>
<tr>
<th>Method:</th>
<th>Projected Unit</th>
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<tr>
<td>Key parameters:</td>
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<tr>
<td></td>
<td>Investment return over pay $i = 0.02$</td>
</tr>
<tr>
<td></td>
<td>Standard Fund $F = 4.33$ times payroll</td>
</tr>
<tr>
<td></td>
<td>Standard Contribution $C = 13.75%$ of payroll</td>
</tr>
<tr>
<td>Investment return over pay actually achieved, $i'$</td>
<td>0.02 0.025 0.03 0.035 0.04 0.045</td>
</tr>
<tr>
<td>$F'$</td>
<td>4.33 4.33 4.33 4.33 4.33 4.33</td>
</tr>
<tr>
<td>$C'$</td>
<td>13.75 13.75 13.75 13.75 13.75 13.75</td>
</tr>
</tbody>
</table>

6.2.5 If the amortisation period is greater than zero, then as the investment return achieved increases above the return assumed in the basis, so the eventual contribution required falls quickly. Once again, if the returns achieved were in the range of 3–4% above pay increases suggested in Section 5 for a best estimate, the use of an investment return of only 2% p.a. above pay in the valuation basis is likely to mean, if members contribute 5% of pay, that the employers will never need to contribute again. Indeed, with longer periods of amortisation, no contributions at all would be required from either members or employers, and
6.2.6 At this stage it is worth drawing attention to the work which was done by Dufresne in the mid 1980s. He showed that, if the investment returns averaged the funding assumption in the long term, then there was an optimum period of amortisation. If the amortisation period was too short, excessive instability in contribution rates would result. If the amortisation period was too long, then the effect of random fluctuations could cause a random walk which would result in a drift in contribution rates. He concluded that, using rates of return consistent with typical valuation bases, the optimum period of amortisation was in the range of 10–20 years. What the above analysis would show is that amortisation periods at the higher end of this range could be dangerous.

6.2.7 The results in Tables 6.2.1 and 6.2.2 show clearly the danger in setting too low a rate of investment return in the valuation basis, unless surpluses or deficits are amortised over a very short period.

6.2.8 Tables 6.2.1 and 6.2.2 also show that, where a low valuation rate of interest is used, the greater the value of the annuity value for amortisation, the greater the size of fund which would be built up. Even with relatively short amortisation periods, and relatively small margins between the valuation rate of interest and the rate of return actually achieved, substantial excess funds build up. Thus, with an annuity value of 10, a margin in the rate of interest of 1% leads to extra funds of the order of 60% of payroll. With average pensionable earnings probably now of the order of £13,000 p.a. this implies that excess funds will be built up of the order of £8,000 for every active member of a scheme. Multiplied by say 10 million members of pension schemes, this implies a total over-provision of £80bn nationally. This is more than the total of 1 year's profits by companies arising in the U.K. or about one-sixth of 1 year's GDP. The position is exacerbated if the valuation basis used is even more conservative. For example, suppose the investment return actually achieved was at the favourable end of our forecast, namely 4% p.a. in excess of pay, whilst only 2% was used for valuation purposes. In this circumstance, the extra funds built up with a 10-year amortisation period amount to 140% of payroll—coupled with the extra assets retained compared with a fund valued on a 3% basis (4.33 less 3.80), the extra funds built up are nearly 200% of payroll.

6.3 The ICTA 1988 Surplus Requirements

6.3.1 The discussion on the size of funds which will be built up leads directly to the question of what maximum would be imposed by the surplus requirements contained in the Income and Corporation Taxes Act 1988 on a fully taxed-approved basis. Under the model fund, assuming pension increases in line with the cost of living, but not guaranteed, the reserves under the surplus basis would be 4.96 x payroll. Adding the 5% margin gives a maximum fund of 5.21 x payroll before any allowance for reductions in contribution is taken into account. The contribution rate under the ICTA 1988 basis would be 16.76%, so that the value
of 5 years' contributions by the employer would be some 57% of payroll if the members contributed at the rate of 5%, or 81% of payroll if the scheme were non-contributory. In consequence, the maximum fund which could be held would be $6.02 \times \text{payroll}$ if the scheme were non-contributory, or $5.78 \times \text{payroll}$ if the employees contributed at the rate of 5% of pay. If pension increases were guaranteed to match increases in the cost of living the ICTA 1988 basis would permit a maximum fund that was even greater.

6.3.2 It will be seen from Tables 6.2.1 and 6.2.2 that, if a value of $a$ of more than 10 is used, there is a very real danger that the maximum fund allowed by the Inland Revenue will eventually be breached. Yet again, there seem to be good reasons for ensuring that the valuation basis does not contain too many margins, and that amortisation is over a reasonably short period.

6.3.3 Tables 6.2.1 and 6.2.2 also show that, if the funds do get to the multiple of 5½ to 6 times payroll, there becomes a substantial probability that no further contributions will ever be required and that the over-funding will increase. The circumstances for this to happen are easily described. If the scheme is non-contributory, one would simply require a force of return, $\delta'$, to be achieved, where $\delta' = B/F'$. With a non-contributory scheme, and a maximum fund of 6.02, the implication would be that it would only require a rate of investment return of 3.78% p.a. above pay to be earned for no contributions to be required.

6.3.4 If the scheme is contributory, say with members' contributions of 5%, the equation then becomes:

$$\delta' = \left(\frac{B - 0.05}{F'}\right).$$

With a maximum fund of 5.78, this implies that a rate of return of just 3.04% p.a. in excess of pay is required before no further contributions are needed. Even with a fund of 5.21, the rate of return required is just 3.38%.

6.3.5 These figures apply to a fully mature fund. Clearly, if the scheme is not yet mature the effect of taking a contribution holiday will be more helpful, and a higher rate of return will be required before this zero position is reached. However, many schemes are now super-mature, in the sense that the reduction in workforce during the 1980s has been so severe that the rate of pension in payment is currently running at far more than would be sustained by a mature scheme. In such schemes, the rate of return required before discovering that, once the fund has reached the maximum on the ICTA 1988 basis, no further contribution will ever be required, is much lower than given above. The position is even worse for schemes where pension increases to match the cost of living are guaranteed.

6.3.6 It may be thought that this would not matter unduly, on the grounds that a capital repayment to the employer could always be made from the scheme. However, the employer may need to share the surplus with the members of the scheme. Furthermore, if the scheme requires a Modification Order from the Occupational Pensions Board (OPB) before a repayment can be made, it seems very likely that the OPB would require some benefit improvements to be given to members before the Order was given. What our analysis is showing is that, once a
scheme gets to the position where a repayment does need to be made to the employer, whether through a Modification Order or not, in order for the surplus requirements not to be breached, it is quite likely that that position will persist and further repayments be required, even if the employer never makes a further contribution.

6.3.7 This highlights a particular problem at the present time. The basis which is applied by the Inland Revenue as the maximum for tax relief purposes is also being applied as the minimum funding level before money can be taken out of the pension scheme. We believe it is wrong that the same basis should be used to do both jobs. From the analyses we have done, we conclude that the ICTA 1988 basis is a reasonable one for the purpose of calculating the maximum fund which should be established for tax purposes. However, we believe that it is inappropriate for the purpose of determining the extent of a repayment out of a fund, especially for schemes where pension increases are guaranteed to match the cost of living. For that purpose, we believe that instead of an addition of 5% to the past service reserve, it would be more reasonable to have a deduction of 10% so that the fund can be reduced to a more manageable size. Otherwise, the Revenue is effectively in the position of forcing companies to retain excessive funds and ultimately provide unwarranted benefit improvements to beneficiaries.

6.4 The Effects of Prudence on SSAP24 Bases

6.4.1 Where the trustees, and perhaps the company, have chosen to fund for pensions on a prudent basis, there is a natural desire to adopt the same basis for SSAP24 purposes, on the grounds that the company will prefer the pension costs shown in its accounts not to differ from the payments actually made to the pension scheme. In consequence, there are likely to be many examples where an actuary has used a basis which he considers is perhaps \( \frac{1}{2} \) or even 1% p.a. on the prudent side in the investment return assumed, and this basis is then used for SSAP24 purposes. What are the consequences of this in the long term?

6.4.2 In this circumstance, no provision or prepayment will be built up in the company balance sheet. However, as shown in \( \S \) 6.2.8, the effect will be to create permanent surpluses in the pension fund of the order of 30% or 60% of payroll if the margin were \( \frac{1}{2} \) or 1% respectively, and a permanent reduction in contribution below the standard contribution rate of the order of 3% or 6% of payroll respectively.

6.4.3 An alternative might be to continue to use a prudent level of funding, but to extract surplus immediately even though the funding basis was regarded as satisfactory for SSAP24 purposes. In that circumstance, no surplus would arise in the fund, but if the contribution paid were regarded as initially less than that required under SSAP24, a provision would accumulate in the company accounts. In a similar manner to \( \S \) 6.2.2, it can be shown that that provision would eventually be the same amount as the surplus which would have accrued in the fund if the amortisation had been in accordance with SSAP24, whilst the SSAP24 cost would reduce accordingly—i.e. to the amounts shown in Tables 6.2.1 and 6.2.2. The SSAP24 cost would thus ultimately be below the funding contribution.
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6.4.4 A further alternative would be to keep the prudent basis for funding purposes, but to adopt a best estimate basis for SSAP24 purposes, amortising over the SSAP24 period on both the prudent funding basis and the SSAP24 basis. In this circumstance, the contribution rate paid would initially exceed the SSAP24 cost, and a prepayment would be incurred in the company accounts. Again, it can be shown mathematically that the amount of that prepayment will eventually become the sum of the surplus in the pension fund on the valuation basis plus the excess of the standard fund on the valuation basis over the standard fund on the SSAP24 basis.

6.4.5 The important conclusion which we reach from this analysis is that it is very difficult to prevent either large provisions or large prepayments being built up in company accounts, unless some means is found of reconciling both the needs and desires for a stronger fund than a 50–50 chance of solvency by trustees and company with the best estimate requirements of SSAP24.

6.5 Reconciling Funding Strength with SSAP24 Requirements

6.5.1 It might be thought that our conclusion from the above analysis is that it must be right in all circumstances to fund for best estimate. However, this is not the case. What we have been trying to show is that funding conservatively does involve the risk of over-funding, even against the levels desired, and that ways need to be found to avoid this happening. This is especially true for schemes which are already over-funded. It is highly desirable to seek methods which will give the company full credit for the amount of money in the fund, whilst at the same time meeting the natural desires of the trustees that, once a strong position has been built up, it should not be lightly taken away. Furthermore, there are a number of occasions when funding on a best estimate basis for past service could lead to insufficient margins on discontinuance if that should occur after 1 or 2 years of poor investment performance. In consequence, we remain attracted to the idea of retaining a margin for caution in setting funding targets of ½–1% p.a. on the investment returns. Indeed, because the range within which the best estimate might fall is so large, one can never be certain in advance that the best estimate has been correctly identified.

6.5.2 Our proposed method of reconciling these conflicting desires, which has been used in practice by a few actuaries, is to use a variation of the projected unit method whereby the standard fund is calculated by reference to the prudent funding basis, but the contribution rate set takes into account the additional interest which it is expected will be earned on the fund, using a best estimate basis. The intended result of this method is that surpluses should not build up, that a best estimate rate of interest is used for setting the contribution rate as required for SSAP24 purposes, whilst a strong fund is preserved which will satisfy trustees and members. The regular contribution under this approach would be the regular contribution rate by reference to the basis used for funding, less the additional interest which is expected to be earned by reference to best estimate assumptions on the standard fund held on the funding basis.

6.5.3 The approach becomes clear if a new scheme just setting up is
considered. At the end of the first year the reserves which will be required will be the reserves by reference to the basis used for past service. The contribution rate will, therefore, need to be set by reference to that basis. There would be no offsetting interest to be earned. In subsequent years, the contribution rate so set should be offset by the interest which is expected to be earned on the funds held. In practice, this would mean setting a contribution rate which one knew would fall gently over the years. For example, if the investment rate of return above pay was 2% for the purposes of funding past service, but 3% for the purposes of setting the contribution rate, the contribution rate in a new scheme with no past service benefits will initially be 13.75%. At the first valuation after 3 years, the fund built up would only be of the order of 40% of payroll, so the reduction in contribution at that time would be from 13.75% of pay to about 13.35% of pay. Eventually, over a large number of years, the contribution would fall to 9.42%. We would not regard such a pattern as being inconsistent with SSAP24 or the disclosure requirements, especially if the expected reduction was mentioned in the valuation report.

6.5.4 This method seems to us to have the merit of reconciling the natural desires of trustees, sponsors and auditors, without building up unnecessary provisions, prepayments or surpluses. It also allows all the detailed calculations to be made on just one basis, but it does lead us to ask whether some clarification is needed to SSAP24 to make it clear that this funding approach is acceptable.

6.5.5 As the method involves using two different rates of interest, we would propose calling the method the 'Dual Interest Projected Unit Method'. The Disclosure Regulations would then identify separately the interest rate used for setting past service reserves and the interest rate used for adjusting the projected unit rate for accruing service.

6.6 Other Margins

6.6.1 The analysis which we have made above regarding the problems which arise when the rate of interest earned on the fund is more than that assumed on the valuation basis, would also extend to other margins in the funding basis. However, other margins are more difficult to remove by an easy formula such as that given above. This is perhaps the main reason for our view that it is highly desirable to remove margins of caution from all the other elements of the basis, and to restrict any margins for caution which might be desired to the rate of investment return used in the valuation process.

7. LESSONS FROM THE PAST

7.1 It is reasonable to ask the question as to how well the methods and assumptions which have been used by actuaries have worked in practice. It is sometimes suggested that the embarrassingly large surpluses in some funds at the present time are attributable to actuaries having been overcautious in the 1970s. Is this fair?

7.2 Unfortunately space prevents us from exploring this question within the
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confinces of the present paper. We have, however, written a separate note on this which will appear in J.I.A. 120, 1. The principal conclusions reached in this note are as follows:

(1) Variations in investment returns, whether measured by market values or assessed values have been very large and are likely to have swamped variations caused by other variables. In passing we note that the deviations from the mean figures are much smaller for assessed value returns than for market value returns, which gives powerful support to the use of assessed values in valuations as providing more stability. Furthermore we explain why the assessed value should be used in conjunction with yields which are close to the expected long-term average running yield in the market, which in turn requires a view to be taken which is not overly influenced by current market conditions, and has a bearing on the assumptions for valuing liabilities.

(2) The British pension industry has benefited fortuitously from the way in which the pattern of investment returns over the past 20 years have interacted with the growing maturity of schemes. This was not something which could be fully predicted by actuaries in the early 1970s, or even in the early 1980s. It is quite clear that the embarrassingly large surpluses found in some schemes at the present time have resulted from the conditions prevailing in the late 1980s.

(3) The speed with which surpluses and deficits can build up would suggest that there should ideally be a margin of at least 20% between the discontinuance position and the target ongoing funding position. This, together with the possibility of generous discontinuance benefits, may provide a reason for needing to fund on a more conservative basis than best estimate.

(4) The popular myth that pension schemes must have been in grave difficulties in the mid 1970s and that large sums of money were injected into schemes to repair the ravages of inflation is not supported by the statistics. For the vast majority of large pension schemes, special payments to maintain solvency were the exception during the 1970s.

(5) The returns achieved in the 1970s and 1980s can be readily reconciled with those suggested in this paper.

(6) The construction and use of a simplified 'surplus index' is likely to be highly misleading, because of the large number of different parameters involved and the variations caused by them.

8. FUNDING METHODS

8.1.1 The starting point for a review of funding assumptions is a report on 'Terminology of Pension Funding Methods' produced by a joint Institute/Faculty Working Party under the chairmanship of M. J. Turner in 1984. This set out a definition of each of what were regarded as distinct funding methods at the
time and led to the note on Pension Fund Terminology which is included in the professional guidance. This has subsequently been the subject of much detailed consideration within the Joint Pensions Committee of the Institute and Faculty, on the narrow issue of whether the particular approach described in the paper by McLeish & Stewart is a variation on one of the basic methods or a distinct method in its own right.

8.1.2 The original purpose of the note was to aid the development of SSAP24, by providing definitions so that the funding method used in a particular case could be uniquely defined for the purposes of compliance with SSAP24, and referred to in the disclosure note. These definitions are also used for the Actuarial Statement required under the Disclosure Regulations. The note has also been extended to include a definition of the Projected Accrued method as used for the purposes of the Surplus Regulations under the ICTA 1988 to define the Prescribed Basis for the valuation calculations required.

8.1.3 The various methods are the following:

- Current Unit,
- Projected Unit (and Projected Accrued),
- Attained Age,
- Entry Age, and
- Aggregate.

Of these, the aggregate method is not really a distinct method: it is simply a variant of the entry age method under which all surpluses and deficits are removed over the future working lifetime of the active members. Its inclusion in the final report was simply to enable all forms of method commonly in use to be mentioned. To use the aggregate method in its pure form, i.e. without separately identifying the past service liabilities, would be distinctly unhelpful in current circumstances.

8.1.4 As recently as the early 1980s the funding methods in use would often have tended to be the entry age or attained age methods. The projected unit method would have been less commonly encountered, although it might have been a more likely choice for a newly-established scheme. Insured schemes were frequently funded using a discontinuance funding approach, sometimes with only a short projection period. Since then there has been an increasing move towards the use of the projected unit method. This is no doubt partly because it is seen as meeting the needs of SSAP24 more directly than other methods, but more fundamentally it is because other methods have been seen as leading to an excessive build up of assets in relation to past-service liabilities. This has been reinforced by the adoption of the projected accrued method for the purpose of the Surplus Regulations. The current unit, or discontinuance, funding approach has virtually disappeared.

8.2 The Projected Unit Method

8.2.1 The authors’ view is that, for a variety of reasons, the projected unit method is now the natural method to use other than when there are special
circumstances. This view is best explained by considering the attributes of the projected unit method itself and then examining what grounds there might be for using any of the other methods for particular circumstances.

8.2.2 Conceptually, the projected unit method has many attractive features:

(a) The distinction between the level of funding for benefits in respect of pensionable service accrued to date and the ongoing level of contribution required for future accruing benefits is made clear,
(b) the funding requirements are fully consistent with the underlying premise that the pension scheme is an ongoing entity, and
(c) the funding requirements are clearly based on the estimated future cost of the benefit promises made.

It has also proved to be a successful method throughout large variations in prevailing economic and investment conditions and dramatic changes in employment conditions such as the reductions in the workforces in manufacturing industries in the 1980s.

8.2.3 At a practical level, use of the method has enabled the organisations sponsoring pension schemes to plan funding strategy effectively, including decisions on the rate at which surplus is reduced through contribution reductions or holidays, or repayment to the employer, and the scale of benefit improvements granted. In practice the effect on the projected unit contribution rate of changes over time in the age and sex distribution of schemes has been comparatively minor and entirely manageable. If there is a significant reduction in the number of employees this is most likely to be achieved through a mixture of factory closures covering the whole age spectrum and of early retirements: the average age has a tendency to fall, not rise, in these circumstances. Such effects have been, and are likely to continue to be, swamped by the effect of fluctuations in the real rate of return achieved on the investments.

8.2.4 For small schemes, the use of projected unit method can lead to unwelcome fluctuations in contributions as the age pattern of the membership varies. In this circumstance the use of a control period does help to smooth contribution rates, although there is the danger that the additional funds received in order to keep the contribution rates at a reasonable level might be regarded as surplus, and used for other purposes. Nevertheless, as practised by many insurance companies who necessarily deal with large numbers of small clients, it is undoubtedly an efficient tool.

8.3 Attained Age Method

8.3.1 In the authors’ experience it was the realisation that the additional stability supposedly offered by some of the other methods was largely illusory which led to the widespread move to the projected unit method during the 1980s. The use of the attained age method had hitherto been common. Under this method the past service reserves would be determined in the same way as under the projected unit method, but the ongoing contribution rate would be calculated taking into account the whole of the projected future period of the members’
A Realistic Approach to Pension Funding

pensionable service; the rising cost by age of each year's accrual of benefit normally found then resulted in the attained age rate reflecting an average future rate in some sense, which was higher than the projected unit rate. The routine use of this method at successive valuations still resulted in changes in the rate as the age and sex distribution varied.

8.3.2 In theory the rate should be able to withstand closure of the scheme to future entrants. In practice this occurs comparatively rarely, and when it does it is almost invariably in the context of a new scheme for future entrants, so that any trend for contribution rates in the closed scheme to increase is offset by a reduction in overall contribution costs which the employer enjoys as, over time, the proportion in the closed scheme diminishes and the proportion in the open scheme increases. Furthermore, when a scheme is closed, for the benefit of stability to be enjoyed, it would be necessary at future valuations to determine the rate as at date of closure, i.e. departing from what would then be the attained age rate, and to retain as future service reserves the expected surplus arising from contributions in excess of the cost of benefits accruing in the early years. It might be worth giving this the name of the 'Closed Age' method.

8.3.3 In the more common situation of a continuing scheme, the effect of using the attained age method in current conditions would be to charge higher contributions than needed to cover the cost of accruing benefits, leading to further surplus emerging. With the current level of surpluses in most schemes this would now be unwelcome, in contrast to the position in the 1970s when this was a helpful contribution towards reducing deficiencies. What is more, the surpluses which have arisen have resulted in wholesale benefit improvements, to such an extent that for many large companies the scope for further improvements is very limited.

8.3.4 The extent to which the attained age method will lead to excessive funds being accumulated clearly depends on the period of amortisation. With a period equal to the average working lifetime, the extra fund built up will be the same as the future service reserve under the entry age method, and therefore the contribution would tend to fall to that under the entry age method. In other words, with this particular amortisation period the attained age method would simply be a variation of the entry age method. However, whereas the entry age method would not be producing surpluses as such, the attained age method would, and it would be by no means certain that in practice all the surplus would be used to reduce contributions.

8.3.5 If the method is unsound when a scheme is closed, and unsound when a scheme is open to new entrants (because of the spurious surpluses which emerge), it has to be questioned whether it is of any practical use, and whether it should not now be abandoned.

8.4 Current Unit Method

8.4.1 The current unit method has ceased to be a suitable method to use in the U.K. Its original use was as a method which ignored the implications of future inflation, leaving these to be dealt with as they emerged. Modifications were used
involving control periods to take some account of inflation. The modern-day equivalent would be a method which took account of the revaluation and post-retirement increase requirements and would normally go under the name of the 'discontinuance' method.

8.4.2 Nowadays the minimum level of solvency which an employer would wish to cover would allow for revaluation of any Guaranteed Minimum Pensions up to State Pension Age (at 7\(\frac{1}{2}\)\% p.a. currently, in line with national average earnings increases under Section 21 orders, or limited to 5\% p.a. on payment of a Limited Revaluation Premium), and revaluation of the excess over GMP to match price inflation, or 5\% p.a. if lower, over the period to vesting. Any shortfall below this level on the winding up of a scheme is expected soon to become a debt on the employer. Furthermore, the minimum solvency level would have to allow for post-retirement increases at least on the post 1 April 1988 element of GMP to match price increases up to 3\% p.a., and beyond this for any increases guaranteed under scheme rules. The majority of larger schemes already guarantee increases at the LPI level (to match price inflation up to 5\% p.a.), and other schemes are expected soon to be obliged to follow suit under the Social Security Act 1990. It follows that the differences in practice for a U.K. scheme between discontinuance funding and projected unit funding now broadly relates only to the excess of the assumed rate of pay inflation over the assumed rate of price inflation or 5\% if less, and to any discretionary post-retirement increases beyond the LPI level; furthermore, the effect of this difference is diminished by the effect of the withdrawal rates included in the assumptions for a projected unit valuation.

8.4.3 The discontinuance method is clearly incompatible with the requirements of SSAP24. Whilst it is, therefore, now inappropriate as a general funding method, consideration does need to be given to the discontinuance position. Some schemes which do already give very generous benefits and have large surpluses have sought to use some of that surplus to guarantee that members would be granted full pension on early retirement due to redundancy, without actuarial reduction. Often, an enhancement in benefit to allow for the lack of state benefits before state pension age is also given. In such circumstances, the benefits on discontinuance of the scheme due to insolvency of the company would be greater than the liabilities on an ongoing basis. Where this happens, it might seem prudent to reserve for such an eventuality, although the Inland Revenue Practice Notes now forbid funding in advance for the cost of redundancy programmes. Whilst the solution may well be to fund on a conservative basis in this particular instance, it will probably be worth calculating the discontinuance position on a best estimate basis, to ensure the cost of insolvency is being properly covered and will not fall on the sponsor when he can least afford it.

8.5 Entry Age Method

8.5.1 This leaves the entry age method. Under this method the reserves to meet benefits based on future projected pensionable service will equate to the value of
future contributions at the point of entry, and as time goes on will exceed the value of future contributions for a member in mid-career. A fund is thus built up which is greater than needed to meet the liabilities in respect of past pensionable service, which could then be unnecessary in the event of a reduction in the membership or closure of the scheme.

8.5.2 Although reserves are built up which are greater than those needed for past service, the method is technically sound in the sense that, if the assumptions are borne out, unwarranted surpluses or deficits will not arise. In consequence, along with the projected unit method, it must be regarded as professionally acceptable. Furthermore, there are two circumstances in which its use would be fully justified.

8.5.3 First, in circumstances described in § 8.4.3 where discontinuance benefits are unusually generous, the average reserve built up using the entry age method may be a highly desirable way of ensuring a reasonable margin on discontinuance solvency (although the surplus requirements of ICTA 88 would still apply).

8.5.4 The second occasion is where a scheme has changed the scale of benefits (perhaps as a way of reversing the tendency for past-service surpluses to lead to increased benefits through industrial relations pressure) by introducing a new section for all future entrants which gives lower benefits. The use of the projected unit method in this circumstance will lead to a gradually reducing regular cost. If the scheme is in surplus, the sponsor may well prefer to produce a regular cost which is that appropriate to new entrants, thus capitalising the additional cost of benefits for existing employees. This would enable a proper charge to be made in respect of employees of any new acquisitions who might all belong to the new section, and for whom a requirement to pay the full projected unit contribution including allowance for some earlier scale of benefits would be inappropriate.

8.6 Other Methods

8.6.1 Under the approach described by McLeish & Stewart, the projected liabilities reflect the position arising on the wind-up of the scheme at some future date, leading to a lower level of assets to meet past-service liabilities than under the projected unit method. If a sufficient margin were added, this could be regarded as providing the necessary degree of security for accrued benefits. However, for normal purposes, including recognising the cost of pensions in company accounts, it seems to us necessary to treat the pension scheme as an ongoing entity, on which basis it seems odd to adopt a method which does not fully reflect the cost of the promised benefits projected on a basis which assumes the scheme will continue indefinitely.

8.6.2 A second weakness is that this approach exposes the sponsoring organisation to an unacceptable level of risk in relation to the need for additional finance on winding-up if the assumptions used are realistic ones. If a realistic basis is not adopted, unwanted surpluses may be expected to arise. However, if the funding is on target and the assumptions are best estimates, there will be a 50% probability of inadequate funding in the event of winding up, which exposes
A Realistic Approach to Pension Funding

the beneficiaries to an unacceptable risk of not receiving the winding-up benefits if the sponsoring organisation is in difficulty. This then indicates the need to add back precautionary margins.

8.6.3 A further problem with this approach arises in takeover situations. The acquiring company is highly unlikely to agree to providing benefits which match the previous expectations of the members concerned without receiving the funds needed to meet the cost of these on an ongoing basis, namely in accordance with the projected unit method. Given the attitude displayed by the courts in recent cases, an acquiring company exposes itself to considerable risk of legal action in acceding to anything which fails to match previous benefit expectations, and granting reduced benefits to match a reduced funding level in the transfer payment is unlikely to be an option which commends itself.

8.6.4 A fuller analysis of the problems with this method is given in the reports of the discussions on the paper.

8.7 A Funding Problem

8.7.1 A curious problem has recently arisen in connection with the various funds in the Local Government Scheme. Until 1989, pension increases awarded under Pensions Increase (Review) Orders were not benefits of the scheme, and were not funded for, but met on a pay-as-you-go basis. In 1990, pension increases became a benefit of the scheme. However, to avoid what was seen as a likely increase in cost, the regulations of the scheme were changed so that the instructions to the actuary on how to set a contribution rate now read that it should be such as "should in the actuary's opinion be paid to the fund so as to ensure that the fund is able to meet 75% of its existing and prospective liabilities having regard to the desirability of maintaining as nearly constant a rate as possible". For 'admitted bodies', provision is made for 100% funding instead of 75%.

8.7.2 Two funding methods have been devised to meet this requirement. The first is to recognise that the requirements are consistent with supposing that there are two different parts of the scheme: one for three-quarters of the benefits, funded using a projected unit method; the remaining quarter being pay-as-you-go. The contribution rate is then found as the sum of:

(a) the projected unit rate for 75% of all benefits, plus
(b) amortisation of surplus/deficit of assets compared with 75% of past-service liabilities, plus
(c) 25% of the current rate of benefit outgo.

8.7.3 The alternative approach which has been adopted is to ignore (c) and to let the additional cost emerge through the experience of the fund. We believe that such an approach is technically unsound, and can see little except expediency to justify its use. The defect can be seen by consideration of what would happen to the funding level in due course.

8.7.4 If item (c) of §8.7.2 is ignored, then stability in the funding position,
using the notation of Section 6.2, is only reached when each of the following three equations holds:

\[ B = C' + F'\delta \]
\[ B = C + F\delta \]
\[ C' - 0.75C = (0.75F - F')/a. \]

Solving for \( F' \) in these equations in terms of \( F, \delta \) and \( a \) gives:

\[ F' = 0.75F - 0.25ab/(1 - a\delta). \]

If \( \delta' \) is earned instead of \( \delta \), the formula becomes:

\[ F' = (0.75F (1 - a\delta) - 0.25ab)/(1 - a\delta'). \]

8.7.5 Since the regulations require certificates to be fixed for 3-year periods, starting 1 year after each valuation date, it is difficult to see how a value of \( a \) of less than 2 can be taken. Indeed, given the requirement to avoid undue fluctuations, it is reasonable to suggest (having regard to § 6.2.6) that a value of \( a \) of much less than 10 is contrary to the regulations, but any value of \( a \) greater than zero leads eventually to the fund being less than 75% of expected liabilities, and substantially below for large values of \( a \), other than where \( \delta' \) substantially exceeds \( \delta \).

8.7.6 It might thus be thought that this problem could be addressed by using much more conservative funding bases. Certainly, reducing the rate of investment return assumed would increase the proportion of past liabilities ultimately achieved as measured on a more realistic basis. However, the extent of the reduction in investment return would have to vary between funds because of differences in maturity; and also over time for the same reason. Secondly, the effect would be to overcharge those employers required to fund for 100% of liabilities. In consequence, we find it very difficult to see how the method can give acceptable results.

8.8 Risk Benefits

8.8.1 Finally on funding methods, the authors note that sometimes benefits on death in service are reinsured under insurance contracts. However, it does not follow that the past-service accrual of dependent's death-in-service benefit should be excluded from the assessment of past-service liabilities, not least because of the danger that discontinuance benefits will not be covered. Disagreements sometimes arise on this point in bulk transfer situations, and we believe it should be more clearly recognised that exclusion of this element of past-service liabilities is inconsistent with the projected unit method, as was indicated in the Terminology Report.

8.9 Conclusion

8.9.1 We see no strong reasons to use any other method than the projected unit method for funding large schemes expected to have a continuing flow of new
entrants. The evidence of a survey carried out by Jeffrey Weeder, which was discussed at the 1991 Harrogate Convention, is that the majority of actuaries are now using the projected unit method, and the authors' concerns about unintended margins of caution in the actuarial assumptions used at the present time do not therefore carry over into funding methods. Indeed, the authors' concerns in this area relate to the dangers highlighted of using methods which do not fund the liabilities fully.

9. VALUATION OF ASSETS

9.1 As will be apparent from other parts of this paper, the authors regard it as essential to bring the assets into account in funding calculations by reference to the value of the future income stream. For completeness we record our reasons for this view, namely:

(a) it ensures that the liabilities and assets are assessed on a wholly consistent basis,
(b) it places proper emphasis on the significance of future growth in the income stream as the major factor influencing the emergence of surplus in schemes, and
(c) it enables funding calculations to be made by reference to long-term assumptions which are comparatively stable over time.

As noted earlier, one by-product is that the run of investment results is smoothed, and this tends to be reassuring to clients at times when market sentiment causes sudden swings in share prices.

9.2 A consequence of assessing the value of assets by reference to the value of future income is that at times the assessed value may exceed the market value of a scheme's investment portfolio, and at other times be lower. We believe there is a danger that where assets are brought into account at some other value, either market value or an average of recent market values or some arbitrary proportion of market value, there will always be a reluctance to take credit for a figure greater than market value. Unless in such circumstances the valuation of the liabilities is carried out on a basis which adequately reflects expected future returns on the asset value actually adopted, we believe the scope for unintended margins is very considerable, and in general we regard such approaches as best avoided.

9.3 There is one exception to this. This is where the assets are taken into account at their market value and the assumptions used to value the liabilities are based on current market conditions. This approach proceeds by analysing the investment portfolio into its constituent asset classes and determining the expected future investment returns on each class by reference to current market levels. An overall rate of return on the portfolio as a whole is then derived which is used to value the liabilities. If the fund has substantial inward cash flow, the setting of the contribution rate still has to have regard to the average terms on
which new money can expect to be invested if large fluctuations in contribution rates are to be avoided.

9.4 The use of such an approach should lead to similar results to those we have set out using the assessed value approach. Although more complicated, it introduces the discipline of requiring the actuary to reconcile his valuation assumptions with the returns implied by market prices at each valuation. A lack of rigour can be masked by the actuarial mystique of using assessed values, but would be unmasked using the market value approach described.

9.5 This is also the most appropriate method to adopt for a closed scheme in an advanced state of maturity. If the investment portfolio matches the liability profile and the scheme is neither in surplus nor deficiency, then in theory no investment or disinvestment arises and there is no reason to depart from market value. Furthermore, if such a scheme is in surplus or deficiency it is normally appropriate to assume that future cash flows will be invested or disinvested on current market terms.

9.6 Another approach sometimes adopted is to carry out all the calculations in terms of actuarial values and then re-express them in market value terms, simply adjusting by the ratio of market to actuarial value of the assets. This introduces no new concepts, but it may be helpful to some clients to see the valuation results presented in terms of the amount (by market value) of assets needed to meet the liabilities at the valuation date.

9.7 Finally, there is the question whether or not to use investment models rather than to value the assets directly. For the purposes of this paper we have used a model portfolio invested wholly in U.K. equities, but have then made allowance for other asset categories in the conclusions we have drawn. Our own preference is to use a model which explicitly recognises the asset allocation strategy. This is particularly important where an asset/liability study has been carried out and a specific long-term asset allocation strategy agreed. Within each category we would normally adopt a model portfolio approach unless there are strong reasons to do otherwise.

9.8 In the authors' view there are a number of different justifiable approaches to assessed values, each of which has its merits according to the particular circumstances, and we would not regard any one approach as invariably the most appropriate. We do not regard any of the approaches as necessarily leading to hidden margins.

10. PRUDENCE

10.1 In §4.1 we promised to return to the question of what is meant by 'realistic', 'prudent', 'cautious', 'conservative' and similar terms. Other adjectives sometimes encountered to describe bases which are on the conservative side include 'strong', 'stringent' or 'pessimistic'. To describe bases considered less conservative we come across the words 'weak', 'aggressive' or 'optimistic'. The authors have also encountered the word 'robust' being used to describe a best estimate basis (which they found confusing!).
10.2 The words ‘optimistic’ and ‘pessimistic’ should strictly only be used to describe an attitude of mind. Assumptions in themselves cannot be optimistic or pessimistic, although they can reflect an optimistic or pessimistic view. In general the words are used in the sense that it is optimistic to anticipate high real rates of investment return and pessimistic to anticipate low ones. This can lead to misunderstanding however as, for example, the use of a low real rate of return on future investment in the valuation of past service liabilities and assets may well lead to a more favourable result being indicated (as the mean term of the liabilities is usually shorter than the mean term of the assets).

10.3 The words ‘weak’ and ‘strong’ are well understood in terms of the results. Thus a ‘strong’ basis would be one which understated the level of past-service solvency and overstated the contribution requirement for future benefits compared with a best estimate basis. It could be misleading, however, to describe the basis itself as strong or weak. It is even less helpful to use the terms in respect of an individual assumption.

10.4 The word ‘stringent’ tends to be used in the same sense as ‘strong’. Stringent is not, however, synonymous with strong and dictionary definitions give ‘strict’, ‘precise’, ‘requiring exact performance’ and ‘leaving no discretion’. Clearly the word stringent could correctly be applied to a best estimate basis, but certainly not to a more conservative one!

10.5 The word ‘aggressive’ is a word which achieved some currency on the back of a desire to please clients who like to think of themselves as having an aggressive management style. It has been used to describe bases which are at the less conservative end of the range. The word is quite inappropriate as a description of bases.

10.6 As indicated by the definition at the start of this paper, the word ‘realistic’ should be used in its proper sense of ‘true to nature’ or ‘free from prejudice or convention’. It should thus be used to describe a basis which is objective and appropriate for its purpose. According to the circumstances, it might be appropriate as a description of a basis which is conservative (e.g. for determining the solvency level for past-service liabilities) or the opposite (e.g. when it is important not to overstate liabilities in planning for the removal of unwanted surplus).

10.7 ‘Prudent’ is a word with a clear meaning. It connotes a basis which is on the conservative side of a best estimate basis, such as would typically be used for pension funding purposes.

10.8 ‘Cautious’ goes one stage further.

10.9 ‘Conservative’ is described in the dictionaries as ‘moderate’ or ‘cautious’. We have used it as covering the generality of bases on the prudent or cautious side of best estimate. Historically it would have been used in relation to the use of low rates of investment return, i.e. something was being held back as a hidden reserve, namely the capitalised value of future investment returns in excess of those taken credit for. Given the greater complexity of actuarial bases and methods now in use compared with earlier times, we consider it a less useful word than ‘prudent’ or ‘cautious’.
10.10 Would it be feasible to attach probabilities to these words to quantify them to any extent? Whilst we would not pretend to any great rigour, we suggest the following:

<table>
<thead>
<tr>
<th>probability of events proving more/less favourable in the long term</th>
<th>real rate of return (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>best estimate 50/50</td>
<td>$x$</td>
</tr>
<tr>
<td>prudent 60/40</td>
<td>$x - \frac{1}{2}$</td>
</tr>
<tr>
<td>cautious 70/30</td>
<td>$x$</td>
</tr>
</tbody>
</table>

10.11 This leads on to the question of the extent to which it may be appropriate to include deliberate margins for caution in funding bases. We have already touched on this in earlier sections. In § 6.1.5 we showed that if a ‘cautious’ basis is adopted, as defined above, the past service reserves will be overstated by 14% and the contribution rate for accruing benefits by 24%. In Section 7 we suggested that in order to ensure adequate cover for discontinuance benefits, a minimum 20% margin between the discontinuance position and the ongoing funding position would be desirable, and this might indicate a need to fund on a more conservative basis than best estimate. In § 8.5.3 we suggested that use of the entry age method might be another way of ensuring a reasonable margin on discontinuance solvency. Elsewhere in the paper we have alluded to the idea of a prudent basis being used for funding, with adjustment to the contributions required to take credit for best estimate investment returns.

10.12 In our experience the views of clients differ significantly on the extent to which funding should be on a conservative basis. Many clients are sceptical and assume that actuaries always adopt cautious assumptions, even when they claim not to. As this paper shows, there would seem to be fair grounds for such scepticism!

10.13 Some clients would wish to fund on best estimate bases; this is typically in cases where finance is difficult, where pension costs have to be minimised in the company accounts to achieve respectable company results, or where cash is short. In such cases the views of the sponsoring company are highly influenced by their financial circumstances, and it is in just such circumstances that trustees might well prefer to see more conservative bases. We believe that our suggestion of funding on a prudent basis, whilst taking credit for best estimate investment returns in the contributions charged, and reflecting costs on a best estimate basis in the company accounts, would be of considerable assistance in such cases.

10.14 In other cases the sponsoring company itself may be concerned to maintain a strong fund. This might be because the future prospects for the company or its industry may be uncertain, and the risk of having to support an underfunded scheme in later more difficult times is to be avoided.

10.15 Our view is that scheme trustees should always be concerned about the security of the past-service benefits and should normally expect the sponsoring company to fund these on at least a prudent basis (as defined above). In particular
circumstances they might expect the company to fund on a cautious basis (as defined above). As will be apparent from the discussion in Section 5.2, this still implies that bases typically in current use are often unduly cautious, to the extent of at least $\frac{1}{2}\%$ p.a. and occasionally more than 1% p.a. in the real rate of return.

11. CONCLUSIONS

11.1 We believe that typical funding bases in use at the present time often contain hidden and undesirable margins.

11.2 We indicate an objective approach to deriving best estimates.

11.3 Our view is that where margins are taken deliberately this should be in the investment return, so that the effect is understood and can be taken into account.

11.4 We consider that the most appropriate funding method in normal circumstances is the projected unit method used in conjunction with a discounted income approach to the valuation of assets.

11.5 We think that the emergence of large surpluses and deficiencies does not indicate a failure of actuarial methods and assumptions, although the techniques we describe might make them more manageable.

11.6 We suggest that SSAP24 should be clarified to facilitate the use of prudent bases for funding purposes in conjunction with contribution rates adjusted for best estimate investment returns for the purpose of the pension costs in company accounts, which we term the Dual Interest Projected Unit Method.

11.7 We warn that the use of the ICTA 1988 basis for the purpose of determining the extent of a repayment of surplus will give rise to problems.

12. ACKNOWLEDGEMENTS

12.1 We are grateful to our colleagues David Donneky and Andrew Reid for their assistance in checking our formulae and calculations.

REFERENCES


OPCS (Annual), General Household Survey.
APPENDIX I

THE MODEL FUND

A.1.1 The basic benefit of the model fund we have chosen is a pension payable from age 60 of one-sixtieth of final pay for each year of service. Age 60 has been chosen as representative of the average age at retirement, inclusive of early retirement at the request of the employer. It has been assumed that part of that pension would be commuted on the terms available under the 1989 Revenue code, that is to produce a lump sum of 2.25 per unit of pension before commutation at a rate of 12 for 1. (Allowance for commutation is essential if the size of fund which might be built up is to be studied.)

A.1.2 It has been assumed that the pension, once it comes into payment, will be paid for 22 years certain. This period has been chosen to equate (broadly) the value of the annuity certain to the value of a pension payable from age 60 to an individual, for 5 years certain and thereafter for life, with a reversionary pension of one-half (before commutation) to a surviving spouse. Using PA(90) mortality rated down 2 years, 5% interest, and proportions married of 0.835 (men), and 0.6 (women), the values of the pension benefits are approximated by annuity certans of duration 21.5 (men) and 23.1 (women). Each deduction of a year in rating from the mortality table would increase the period of the annuity certain by 0.7, whilst each addition of 1% to the rate of interest would reduce the period of annuity certain to give equivalence by 0.4 years. The effect of changing the annuity certain by 1 year would be to change the figures quoted by about 3%, and would not invalidate the conclusions.

A.1.3 No allowance has been made for mortality before retirement, and withdrawals have been allowed for in a stylised way. It has been assumed that members join at age 20 and leave at age 25, to be replaced by other members at age 25. In turn, those leave at age 30 and are replaced at the same age. Those members leave at age 40 and are replaced by other members of age 40, who survive to age 60. There are two basic reasons for choosing this pattern: first, it represents the career of a ‘typical’ employee; secondly, introducing other forms of exit will not change significantly the past-service fund; the effect is mainly limited to the contribution rate.

A.1.4 Confirmation that this pattern of employment is typical is drawn from two sources. First, various surveys which have been made in the past on the pattern of employment, including the General Household Survey. It has been assumed that each period of employment has been of sufficient duration to produce pension benefits. It is therefore appropriate to the position since 1988, when the vesting period was reduced to 2 years, and many companies introduced immediate entry to pension arrangements unless the joiner specifically requested otherwise. The fact that, before 1980 when the preservation requirements introduced by the Social Security Act 1973 first had full effect (or 1978 for
contracted-out schemes), there was relatively little preservation, will mean that the model overstates the number of deferred pensions and amounts of deferred pension currently in existence, but it does give an indication of future trends.

A.1.5 The idea that employees change jobs for the last time in their late thirties or early forties is borne out in practice. We have studied the past membership durations of members of a number of large pension schemes, and find that the past duration at age 55 is typically in the range of 15 to 20 years. Between age 55 and age 60 average past duration sometimes increases, but not as fast as a year for each year of age, and indeed sometimes decreases. The main reason for this would seem to be that early retirement, especially on redundancy, is weighted quite heavily towards those with long service, who will therefore not suffer such a large drop in income on retirement as others. This tendency is reinforced by the practice in some schemes for service-related supplementary credits to be given to encourage early retirement.

A.1.6 The pattern of withdrawals before age 40 is less crucial, providing that the periods in each job are sufficient to give rise to a deferred pension. The overall rate of benefit commencing at age 60 of 53·3% (= 32/60) calculated under the model implies that the 20 years service before age 40 is equivalent to 12 years service in the final employment after allowing for the difference between pension increases and pay increases. If instead, the pattern assumed was for changes in job every 2 years until age 40, the overall rate of benefit commencing at age 60 would reduce to 52·2% (= 31/60), but such a rapid turnover in staff is not supported by the evidence. Overall, it seems unlikely that different patterns of withdrawals would change the level of benefits (and therefore funds and costs) by more than ±10%.

A.1.7 Because the withdrawals are stylised, the reserves at each age will not be typical of a real pension fund, but the overall levels of, and relationships between, active members, deferred pensioners and pensioners should be. Thus, for a total active population of 40 (i.e. one for each age between 20 and 59 inclusive) the model gives the number of deferred pensioners (assuming no-one transfers) as 85, and the number of pensioners as 88 (four at each age, emanating from those who left at ages 25, 30, 40 and 60). Thus, at this rate of turnover the number of pensioners and deferred pensioners is each more than twice the number of active members. Clearly, these ratios depend crucially on the pattern of withdrawals, and it is therefore difficult to gauge the maturity of a scheme from relative numbers: a much better guide is the level of benefit outgo as a multiple of payroll.

A.1.8 To keep matters simple, we have assumed in the model that the number of members is such that we can assume a density of 1 per age. To introduce a number of members, say $N$ per age, would simply be to introduce a further parameter in the calculations which would cancel out at all stages.

A.1.9 The absence of deaths and ill-health retirements from the model will only cause distortions to the extent that the reserves on death or ill-health retirement differ from the reserves held under the model. In practice, the value of past-service benefits payable on ill-health retirement is generally found to be
slightly more than the reserve before retirement, whilst the value of spouse's benefits on death in respect of past service will not be very different from the reserve held at the ages at which deaths occur. In consequence, the inaccuracies in the size of the reserves by ignoring these exits will be small: their main importance lies in the effect on contribution rates of providing the risk benefits of lump sums on death and notional years of service on ill-health retirement and death. These costs have been ignored in the results below, which therefore understate the total cost of providing benefits, possibly by 1–2% of pay.

A.1.10 Another advantage of the model is the investigation of the comparability of money purchase benefits with final salary benefits. Money purchase benefits are usually accumulated on the assumption that the member concerned will survive to retirement, leaving the provision of enhancement of benefits on death in service and ill-health retirement to be separately funded. It therefore makes sense to equate money purchase and final salary benefits on this footing.

A.1.11 Finally, no salary scale has been assumed. As is shown in Section 5.3, the error which is involved by ignoring the salary scale is relatively small, and mainly affects only those members joining and leaving by age 30. Indeed, since pay, when expressed as a multiple of the national average, tends to decline with age after about age 45, the effect of assuming no salary scale is to overstate the past-service liabilities for active members somewhat, but to understate the value of deferred pensions. Overall, the effect is small enough to be ignored here.

A.1.12 The results of the calculations at various rates of interest are summarised in Table A1.

A.1.13 It will be found that the figures in the table satisfy the identity \(B = C + F\delta\). No doubt this could also be demonstrated by manipulation of the formulae in Appendix II.

### Table A1. Valuation characteristics of stationary funds and how they vary with investment return

<table>
<thead>
<tr>
<th>Percentage rate of return in excess of pay increases</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past service liabilities as multiple of payroll</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pensioners</td>
<td>1.971</td>
<td>1.839</td>
<td>1.722</td>
<td>1.617</td>
<td>1.523</td>
</tr>
<tr>
<td>Deferred pensioners</td>
<td>2.127</td>
<td>1.713</td>
<td>1.399</td>
<td>1.157</td>
<td>0.968</td>
</tr>
<tr>
<td>Actives (past service)</td>
<td>1.721</td>
<td>1.431</td>
<td>1.205</td>
<td>1.028</td>
<td>0.887</td>
</tr>
<tr>
<td>Total past service</td>
<td>5.819</td>
<td>4.983</td>
<td>4.326</td>
<td>3.802</td>
<td>3.378</td>
</tr>
</tbody>
</table>

#### Standard contribution rates (% of payroll)

<table>
<thead>
<tr>
<th>Entry Age</th>
<th>22.31</th>
<th>17.12</th>
<th>13.25</th>
<th>10.34</th>
<th>8.13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projected Unit</td>
<td>22.31</td>
<td>17.36</td>
<td>13.75</td>
<td>11.08</td>
<td>9.07</td>
</tr>
<tr>
<td>Attained Age</td>
<td>25.04</td>
<td>20.70</td>
<td>17.28</td>
<td>14.56</td>
<td>12.38</td>
</tr>
</tbody>
</table>

#### Future service reserve under Entry Age Method

(a) as multiple of payroll

<table>
<thead>
<tr>
<th></th>
<th>0.187</th>
<th>0.233</th>
<th>0.249</th>
<th>0.248</th>
<th>0.238</th>
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(b) as percentage of active past service

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<th></th>
<th>11</th>
<th>16</th>
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<th>24</th>
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A.1.14 We believe that the concept of a stable fund is robust, with one exception: allowance for improvement in mortality. In practice $B$ is the product of past mortality, and will tend to increase in time with the improvement in mortality. As a first approximation, we might expect $B$ and $C$ to increase at approximately the same rate, say $k\%$ p.a. For the actual contribution to only grow as fast as benefit outgo, the fund, $F$, must then also increase at the same rate. As this growth must come from investment return, it suggests that the first $k\%$ of investment return should be earmarked for the increase in the fund required by improving mortality, and therefore that $\delta$ in the equation should be reduced by this amount.

A.1.15 It is therefore important to estimate $k$. As the derivation of both $B$ and $C$ incorporate annuity values at retirement (at rates $e$ and $j$ respectively), these would seem appropriate estimators. The various projections of mortality suggest that the rate of improvement is close to a change of 1 year of rating every 10 years. At the relevant interest rates, a year of rating equates to a change in annuity value of about $2\frac{1}{2}\%$. Thus, $k = 0.25$. In other words, reducing the rate of interest in the calculations by $\frac{1}{4}\%$ represents, in itself, an effective allowance for improvements in mortality, and avoids the problems of using mortality rates which vary with age. No other specific allowance would then be required in the valuation basis.
APPENDIX II

CALCULATIONS UNDER THE MODEL FUND

A.2.1 The fund contains an equal number of employees at all ages from age 20, each earning the same salary S. For ease of calculation, numbers have been ignored in the calculations, by simply taking one member per age, and thus a payroll of 40S, as described in Appendix I.

The benefit is a pension of 1/60 of final pay for each year of service. Employees join at age 20, but leave at age 25, to be replaced by other employees also age 25. A similar process happens at age 30 and 40, and entrants at age 40 retire at age 60. Deferred pensioners also retire at 60, and all pensioners live to age 82. Pension increases are given in line with cost of living both in deferment and in possession.

A.2.2 The calculations then proceed as follows:

Let \( i \) be rate of interest in excess of pay inflation;

\( j \) be rate of interest in excess of pension increases;

\( e \) be rate of pay increases in excess of pension increases;

so that \( (1 + j) = (1 + i)(1 + e) \).

To help in the development, specimen results are given at various stages on the following set of assumptions: \( i = 0.03 \); \( e = 0.02 \), so that \( j = 0.0506 \).

It is convenient first to calculate the value at retirement of the benefits arising per unit of pay per year of service, as this will be a constant which applies to all benefits accruing to actives and deferreds. Commutation has been allowed for by assuming that a cash sum of 2.25 per annual unit of pension is taken at a rate of commutation of 12 for 1.

Hence: unit value of benefits at retirement, \( L \), is given by:

\[
L = \frac{2.25 + 0.8125}{60}.
\]

On the assumptions used, \( L = 0.219226 \).

A.2.3 Value of Past Service of Active Members (A)

Consider those entering at age \( x \), and leaving at age \( (x + n) \). Those age \( (x + t) \) will have \( t \) years service (where \( 0 \leq t \leq n \)), will receive pay increases for \( (n - t) \) years, and then pension increases for a further \( (60 - x - n) \) years.

Hence, past-service value is:

\[
SL \int_{0}^{n} t(1 + i)^{- (n-t)}(1 + j)^{- (60 - x - n)} dt = SL (Da)^n (1 + j)^{- (60 - x - n)}.
\]
Hence, total reserve for past service of active members, $A$, is given by:

$$A = SL \left[ (\bar{D}a)_i^\|$ ((1 + j)^{\ -35} + (1 + j)^{\ -30}) + (\bar{D}a)_i^\|$ (1 + j)^{\ -20} + (\bar{D}a)_i^\|$ \right].$$

On the assumptions used, $A = 1.02781$ times payroll.

### A.2.4 Projected Unit Contribution Rate for Accruing Service (C)

Consider those aged between $x$ and $(x + n)$ as above. Those now aged $(x + t)$ will receive pay increases on unit service for $(n - t)$ years, and then pension increases for $(60 - x - n)$ years.

Hence, cost is:

$$S \lim_{t \to 0} (1 + i)^{-(n-t)}(1 + j)^{-60-x-n} dt$$

$$= SL \bar{a}^i_m (1 + j)^{-60-x-n}.$$

Hence total contribution, $C$, is given by:

$$C = SL [\bar{a}^i_p ((1 + j)^{-35} + (1 + j)^{-30}) + \bar{a}^i_m (1 + j)^{-20} + \bar{a}^i_{200}].$$

On the assumptions used, $C = 11.0756%$ of payroll.

### A.2.5 Value of Deferred Pensions (D)

Consider the value for those who left service at age $x$, with $n$ years service. The benefits of those now aged $(x + t)$ will be based on pay $t$ years ago, and have received $t$ years pension increases. The current benefit is therefore:

$$nS(1 + e)^{-t/60}$$

and the value is:

$$S \lim_{t \to 0} (1 + e)^{-t} (1 + j)^{-60-x-t} dt$$

$$= S \lim_{(60-x)} (1 + j)^{-60-x}$$

$$= S \lim_{(60-x)} (1 + e)^{-60-x}.$$

Hence, total reserve for deferred pensioners, $D$, is given by:

$$D = SL [5\bar{a}^i_{35}(1 + e)^{-35} + 5\bar{a}^i_{30}(1 + e)^{-30} + 10\bar{a}^i_{200}(1 + e)^{-20}].$$

On the assumptions used, $D = 1.15669$ times payroll.

### A.2.6 Annual Amount of Pension (Before Commutation) Coming into Payment at Age 60 (KS)

The pension arising from those who left at age 25 for example would be based
on pay 35 years ago, and have had pension increases in the meantime. Hence, the
total pension coming into payment at age 60 each year, $KS$, is given by:

$$KS = S \left[ 5(1 + e)^{-35} + 5(1 + e)^{-30} + 10(1 + e)^{-20} + 20 \right]/60.$$  

On the assumptions used, $K = 0.53317$.

This means that the benefit for an individual who has followed the typical career
would be about 32 years based on final pay in his final job.

**A.2.7 Total Outgo on Benefits ($B$)**

The benefits of those aged $(60 + t)$ will be based on a value of $K$ and salary $t$
years previously, but will have had pension increases since. Hence, their pension
will be $0.8125KS (1 + e)^{-t}$. Hence, total benefit outgo, $B$, is given by:

$$B = 2.25 \cdot KS + 0.8125 \cdot KS \int_0^{22} (1 + e)^{-t} dt$$

$$= KS \left[ 2.25 + 0.8125 \cdot \bar{a}_{22} \right].$$

On the assumptions used, $B = 22.313\%$ of payroll.

**A.2.8 Total Value of Pension Payroll ($P$)**

Hence value of pension payroll, $P$, is given by:

$$P = 0.8125 \cdot KS \int_0^{22} (1 + e)^{-t} \cdot \bar{a}_{22}^{(1 + e)^{-t}} dt$$

$$= 0.8125 \cdot KS \cdot \delta_j^{-1} \int_0^{22} (1 + e)^{-t} (1 - (1 + j)^{-22 - t}) dt$$

$$= 0.8125 \cdot KS \cdot \delta_j^{-1} [\bar{a}_{22} - (1 + e)^{-22} \bar{a}_{22}^{(1 + e)}].$$

On the assumptions used, $P = 1.61734$ times payroll.

**A.2.9 Check on Results**

Fund $= (A + D + P) = 3.80184 \times$ payroll.

Check: $F \delta_i + C = 3.80184 \times \delta_i + 0.110756 = 0.22313 = B$

i.e. $F \delta_i + C = B$.

**A.2.10 Effect of Members Leaving Service taking Cash Equivalents**

If members leaving service take cash equivalents instead of deferred pensions,
those aged 25 will receive the present value of 5 years benefits based on salary, $S$,
at exit, and so on. Then total cash equivalent paid per annum is:

$$T = SL[5(1 + j)^{-35} + 5(1 + j)^{-30} + 10(1 + j)^{-20}]$$

which is $3.1524\%$ of payroll on assumptions used.
A revised value of $KS$ needs to be calculated, based on just those who join at age 40 and retire at age 60. It is therefore $20S/60 \ (= 0.33333S)$ not $0.53317S$.

Whence \[ B' = B \times 0.33333 \div 0.53317 + 0.031524 = 17.102\% \text{ of payroll} \]

\[ P' = P \times 0.33333 \div 0.53317 = 1.01114 \text{ times payroll}. \]

Fund: $F'$ is $(A + P') = 2.03895 \times \text{payroll}$.

Check: \[ 2.03895 \times \delta_i + 0.110756 = 0.17102 \]

i.e. \[ F'\delta_i + C = B'. \]

A.2.11 Future Service Reserve (FS)

For attained age and new entrant funding methods, we need the value of future service benefits. For a member aged $(x + t)$ who entered at age $x$ and who will leave at age $(x + n)$, this is for $(n - t)$ years service, discounted for $(n - t)$ years at rate $i$, and thereafter at rate $j$.

Hence, reserve:

\[ SL(1 + j)^{-(60 - x - n)} \int_0^n (n - t)(1 + i)^{-(n - t)} dt \]

\[ = SL \ (\overline{a_t})_{x+n} (1 + j)^{-(60 - x - n)}. \]

Hence, Future Service Reserve, $FS$, is given by:

\[ FS = SL [(\overline{a_t})_{x+n}((1 + j)^{-35} + (1 + j)^{-30}) + (1 + j)^{-20}(\overline{a_t})_{x+n} + (\overline{a_t})_{x+n}]. \]

On the assumptions used, $FS = 0.85570$ times payroll.

A.2.12 Attained Age Contribution Rate

The value of future contributions of 1% of payroll from members who entered at age $x$, and will exit at age $(x + n)$ is:

\[ 0.01 \ S \int_0^n \overline{a_t}_{x+n} dt = 0.01 \ S \int_0^n \overline{a_t} dt \]

\[ = 0.01 \ S \int_0^n \frac{1 - (1 + i)^t}{\delta^i} dt \]

\[ = 0.01 \ S(DA)_{x+n}. \]

Hence, total value of future contributions of 1% of payroll:

\[ FC = 0.1 \ S[2(\overline{D}a)_{x+n} + (\overline{D}a)_{x+n} + (\overline{D}a)_{x+n}]. \]

On assumptions used, $FC = 0.058754$ times payroll.
Hence, the standard contribution under the Attained Age method is given by:

\[ FS \div FC = 14.56\% . \]

**A2.13 Entry Age Contribution Rate**

The Entry Age contribution is found by first calculating the benefits for the new entrants each year, and then dividing by their expected contributions.

Hence, for members entering at age \( x \) and leaving at age \( (x + n) \):

Value of benefits = \( SL \left[ n(1 + i)^{-n}(1 + j)^{-(60-x-n)} \right] \).

Value of 1% contributions = \( 0.01S \bar{a}_{x|} \).

Hence, total value of contributions for all new entrants each year

\[
= SL \left[ 5(1 + i)^{-5}(1 + j)^{-35} + (1 + j)^{-30} \right] + 10(1 + i)^{-10}(1 + j)^{-20} + 20(1 + i)^{-20} 
\]

on the assumptions used,

\[ = 3.418497S . \]

Value of 1% contributions for all new entrants each year

\[
= 0.01S \left[ 2\bar{a}_{5|}^i + \bar{a}_{10|}^i + \bar{a}_{20|}^i \right] 
\]

\[ = 0.33053S \]

Hence, Entry Age contribution rate is 10.34%. 
ABSTRACT OF THE DISCUSSION

Mr P. N. Thornton (introducing the paper): It might be thought that this paper has been much influenced by the bull market returns of the 1980s and pays too little heed to the poorer prospects for the 1990s. Nothing could be further from the case. If anything, our concern is that current more modest levels of investment returns should not be allowed to obscure the longer-term trends which can be discerned. We will do a disservice to our clients if, by using over-cautious assumptions, we encourage them to divert cash away from business investments and underestimate the true level of their profitability.

We have no argument with those who would point out that the degree of uncertainty which attaches to equity returns is such that it is wrong to place reliance on future returns projected from historical trends. We think it is desirable for the funds set aside to cover past-service liabilities to be determined on at least a prudent and sometimes a cautious basis. What we do argue for is that the true extent of possible margins should be appreciated and the long-term implications understood. The paper is concerned with an approach to setting bases which would have been valid 20 years ago and we hope will be valid in 20 years' time. If our approach had been followed in the mid 1970s, bases would not have been strengthened to the extent that they were, and with the benefit of hindsight this would have been correct. Likewise, to flinch now from using more realistic bases because the trend of investment returns is perhaps in the opposite direction, is to ignore the lessons of the past. It is all too easy to be pessimistic in the depths of a recession.

In current conditions, the best estimate valuation basis which would emerge from the analysis we describe in our paper would, perhaps, involve a real rate of return on future investment of 5% p.a., and real growth of equity dividends of ½% p.a. This basis might be used for the purpose of accounting for pension costs in company accounts. For funding purposes, a prudent basis might then involve a future real rate of return of 4½% p.a. and equity dividends growth in line with inflation. A cautious basis would involve a future real return of 4% p.a. and equity dividend growth of ½% p.a. below inflation. These bases are not uncommon, and we are conscious of the fact that, for some actuaries, we are not breaking new ground. On the other hand, we encounter from time to time other actuaries using much more cautious bases for normal funding purposes, sometimes following the basis prescribed for the surplus regulations, and occasionally even stronger than this. We think this should be a cause of some concern. However, there is nothing immutable about these assumptions. There could be a sea-change in the rates of return which investors require which would necessitate a reappraisal of prospective returns. The main point which we would want readers to take away from our paper, which should be a timeless one, is to be much clearer about the extent of the margins for caution which are taken in funding assumptions, and about the implications of taking margins for the funds which will be built up longer term.

The paper was written before the Maxwell affair became public. We might have made the point that the paper is concerned with the security of funding, not with the security of the assets, Where we might perhaps have placed more emphasis is on the importance of investigating the discontinuance position, where the level of solvency may these days be much closer to solvency on an ongoing basis than formerly. The need to ensure that discontinuance solvency is covered with a suitable contingency margin is likely to assume increasing importance in future. Again, we hope that our paper will help in assessing this on a more objective basis.

In the current circumstances of many pension schemes, particularly large over-mature ones, the funds accumulated after the bull markets of the 1980s may be such that, on any reasonable set of assumptions, company contributions will be unnecessary for many years. Undoubtedly, the preference of trustees and companies in many such cases will be to assess the position on cautious assumptions. Should benefit improvements be granted, it may be felt important that these are costed on cautious bases. On the other hand, the desired course of action in some cases may be to repay surplus back to the company. In this case it may be felt important to use a basis without an excessive margin of caution, if the funding position is to be stabilised for the future. The potential exists for conflicts of interest between the trustees and the company in such situations, and we hope that a more
objective approach to the setting of assumptions will enable the actuary to help his clients understand more clearly their respective positions.

Mr R. B. Colbran (opening the discussion): The authors have given us a detailed examination of many aspects of pension funding which are commonly taken for granted. In the paper itself and in the supplementary historical note they have exposed the foundations on which our valuations are built, both their strengths and their weaknesses.

The main message of the paper, although possibly slightly modified by Mr Thornton in his introduction, is that we are being over-cautious and that we encourage scheme sponsors to set aside too much money. The paper confirms that the most important economic parameter in funding final salary pension schemes is the excess of the investment return over the rate of pay increase. The authors suggest that we should assume a real return of 5–6% over prices, which corresponds to 3–4% over salary increases. The evidence presented in the paper to support this assumption seems to be impressive, but on closer examination possibly less so. The case is largely based on the historical pattern of dividend growth compared to prices and wages, as shown in Figure 5.2.3. However, when you look at the base line and see the length of the period of the two main trends in each direction, their conclusions are questionable.

The dividend index used by the authors is derived from the All-Share Index. Since the latter is primarily an asset measure, I am not quite sure how they obtained the one from the other. In their historical note the authors use the more usual approach of illustrating overall fund returns by reference to both market value and assessed value. They have chosen the period 1969–90. Over that period, using market values, the excess yield over earnings is only 0.6% p.a. They quote figures on assessed values primarily to show the smoothing effect, but that increases the yield to just over 2%. That does not seem to me particularly to help their case for 3–4%. It is interesting when you look at the historical note to see that, although the assessed value approach definitely smoothes out some of the wilder fluctuations, the yields from year-to-year are still very volatile. Even ignoring the exceptional years 1974 and 1975, they still range from −7% to +10%.

Other evidence of past real returns appear in the annual surveys by Phillips & Drew and BZW. One of the BZW charts now shows historical real returns over all combinations of starting and ending years from 1918 to 1990. The range of results is enormous. The chart shows many periods which support the authors' contention, but there are many others which do not. It depends on the period you choose as the norm.

Assuming that we can establish just what the past tells us, we still have to decide how much we can take as relevant for the future. We are in the middle of a recession; we do not know how we will come out of it. The authors say that past recessions have had little long-term effect on dividend growth, but this one is longer and deeper than any other since the War. Also, portfolios are widely diversified on a global basis with holdings in Europe, and other economies, which would have been unheard of a few years ago. How competitive will the emerging economies become? Will other countries allow us to take the returns which the invested equity really earns, or will they keep it back, by withholding taxes, and other means?

Actuaries can be as vulnerable as anyone else to projecting latest trends and then looking for facts to justify their stance, and I believe that some of the relaxations in funding assumptions which have been seen of late may come from such feelings. We need to be sure what we are doing if we weaken accepted bases.

Turning to asset valuation, the authors take it for granted that an assessed value approach will be used, with the usual argument, among others, that this ensures consistency with the value of the liabilities. When the foundations for projecting future income streams are so unstable, one might wonder at a claim to be able to value them mathematically. At least the authors have developed the ideas of assessed values more fully than usual. Indeed, in the historical note they include a discussion of the way in which new money is treated on the assessed value approach. On the other hand, they are rather vague about overseas holdings, although they do say they want to use the actual portfolio rather than the notional portfolio. How they value the income stream from Japanese equities escapes me.
A Realistic Approach to Pension Funding

However, the authors say they prefer the assessed values to be related to a United Kingdom market yield of 4.75% p.a., and are evidently keen not to be too far from market values. They seem to be saying that, if the market moves any great distance from a 4.75% p.a. yield, it has usually overdone the optimism or overdone the pessimism, and one is entitled to make a correction. It would be more honest to say so and avoid any impression of a falsely scientific method.

My main concern about the assessed value system is some of the more extreme approaches used in practice. I have recently seen valuations where the assets were valued as though the All-Share yield was about 4.1% p.a. or 4.2% p.a., and this was during the current recession which was then well underway. One of these cases was for the distribution of a fund being wound up, with no allowance for a possible discontinuity in dividend growth. Disclosing a large surplus on the basis of highly written up assets can only be misleading to the client, and the actuaries concerned are simply setting a lower funding target. The assessed value approach is accepted only in the U.K. and in Ireland; it is not applied on the other side of the Atlantic. It is an area of our practice which deserves re-examination.

I was particularly interested in Table 5.3.1 showing the decline in salaries at higher ages. This pattern has appeared in some of the surveys by Remuneration Economics of salaries of our own profession, showing lower average salaries after age 50 than before.

One other idea in the paper which I thought was valuable was that of using a strong basis for the funding target, but a best estimate basis for the contribution rate between valuations. I have used this myself when introducing a withdrawal assumption into a valuation without wishing to reduce the funding standards. The funding target is maintained, but with less chance of further surplus at the next valuation. Unfortunately, it seems that such an approach is unlikely to be acceptable for surplus testing for the purposes of the Social Security Act 1990.

I produced my own paper (J.I.A. 109, 359) 10 years ago. This seems a convenient time to look back to see how much of what has happened in that period could possibly have been foreseen. I think that Mr McLeish, who is mentioned in the paper, would accept that he has not succeeded in converting the rest of the profession to his method. On the other hand, what he said about over-funding by the aggregate method has now almost universally been accepted. On the world scale totally inconceivable changes have been seen. Looking at pension funds, who would have imagined the investment returns which have been achieved and the surpluses which have emerged? In 1982 we were only just coming out of a period when it seemed that labour could dictate the share of GNP which it could take. To me the message of the paper is that all we can give is a very broad estimate of what, in our judgement, a prudent employer should have set aside for pension provision. There is no reason to think that we can forecast the next 10 or 20 years any better than the past. If the 'Realistic' in the title of the paper is interpreted as meaning that we should be modest in our claims, the authors' work will have served a useful purpose.

Mr P. M. Greenwood: I agree with much of the paper, particularly most of the comments about actuarial assumptions and valuation of assets. I disagree, to a degree, on its actuarial assumptions in that I would be less dogmatic about where I placed any prudence in the economic assumptions or decrements, particularly for a small to medium-sized scheme.

There are two items in the paper with which I strongly disagree. These are the authors' comments about the future relevance of discontinuance funding, although Mr Thornton has qualified the paper slightly in his opening comments, and some of the comments about the interrelationship between funding and SSAP24.

If you use the actuarial assumptions proposed to decide the target fund after allowing for early leaver revaluation for all service, with the likely removal of the death discretionary elements in funding bases and with the prospective introduction of LPI, and if you make a proper solvency valuation—by which I mean trying to model non-profit deferred annuity rates with probably an initial yield and an investment yield report approach—you will find that the target fund produced by the projected unit credit method based on the authors' actuarial assumptions and dividend growth allowance, for a small to medium scheme with not many pensioners, is probably around or below discontinuance non-profit annuity rate liabilities. For a substantial proportion of the time the shortfall can be as much as 10 or 20%. Therefore the paper's rejection of discontinuance funding is
untimely. Many actuaries will be looking at the higher of a discontinuance funding liability with some margin for variation and expenses and a projected unit credit reserve. Possibly some of the treatment in the paper is due to the fact that the authors are looking too much at large funds and large surpluses, but surveys of SSAP24 disclosures show that there are some wide variations on projected unit credit funding levels at the moment. Survey results show funding levels vary from 60% to over 200%. The bottom end of that range is where the discontinuance funding approach starts to come in. I admit that you will have smaller problems with a larger scheme with a large proportion of pensioners, where the insurance companies may be less conservative on the reinvestment yield if all benefits are bought out at the same time.

Turning to SSAP24 covered in Sections 6.4 and 6.5, the comments show a misunderstanding or a rejection of what a standard on pension cost accounting is meant to be about. To produce a new actuarial method to attempt to ensure that funding and allowance for expenses can be the same just because companies, trustees or some advisers do not like the implications of properly reporting on the differences, seems an attitude which can only bring both the actuarial profession and accountants into disrepute.

The authors suggest a dual interest projected unit credit method as a proposed solution for SSAP24. I am not convinced from the details provided in the paper that the method has a regular cost, which is expected to be, and remain, a steady percentage of pensionable payroll, and therefore satisfy SSAP24. This is certainly true if it is intended that the regular cost is that defined in the paper as the regular contribution. However, I cannot be precise on this point until we see a fuller definition of the actuarial method proposed with the standard contribution rate defined. When the authors or others actually adopted this method, what did they put in the pension fund cost disclosure? To say it was projected unit credit would be wrong. GN17 requires a description on a non-standard actuarial method.

Mr R. E. Brimblecombe: Much of the detailed information in the paper will be very valuable background for actuaries working in the pension scheme field. However, I am concerned that a superficial look at the authors' cryptic conclusions set out in Section 11 will not necessarily give the right message, particularly to the lay reader. These conclusions may give the unfortunate impression that pension schemes as a whole are substantially overfunded. I would suggest that a rigorous analysis of the authors' build up to their conclusions does not necessarily justify such a sweeping statement. Pension schemes facing uncertainties on 'Barber', debt on wind up, LPI, etc., as well as the economic, demographic and political uncertainties of the next few years might not agree with that conclusion, or even worse, could be lulled into a false sense of security.

As the opener said, the authors are really concerned with potential areas of unduly conservative margins in the actuarial parameters governing the valuation of liabilities. On funding methods, the more common use of the projected unit method, with other methods being acceptable in special circumstances, and the wide use, I would like to think, of the discounted income method for the valuation of assets are, it is to be hoped, common ground.

Reference is made in Section 8.6 to the defined accrued benefit method. If any funding method is to be criticised, it should be solely on the grounds that, for the sake of security of members, it must be acceptable to have any funding method which does not aim for accrued benefits based on full earnings projection.

When it comes to the actuarial parameters in respect of the valuation of liabilities set out in Section 5, the authors have considered every possible variance from those traditionally assumed by many actuaries, and have effectively assumed that they all work out to be unduly conservative. I suggest that most actuaries would take some margin in many of the factors, and in any event conservatism in some assumptions would turn out in practice to be counterbalanced by under-estimates in others.

Mr Thornton considers we should use past experience to estimate the future, but I ask, will the experience of the last 10, 20 and 30 years necessarily be repeated in the next 10 years and into the next century? Have we already seen a sea change in relation to investment returns? Are changes in employment practices, in effect, affecting future reasonable assumptions on salary increases and salary scales? Are not employers perhaps now more interested in the volatility of their pension costs over a much shorter time scale than hitherto?
A Realistic Approach to Pension Funding

The question of professional judgement has already been commented on, but the authors in § 4.6 rather dismiss the concept as a possible misleading alternative to choosing assumptions as a statistical exercise on the grounds of over-subjectivity. In fact, professional judgement is the essence of what our profession is all about, making complicated judgements on demographic and economic factors over many years in the future, albeit using past experience as one, but only one, factor in making that judgement.

Equally fundamental is the question of what our clients expect. Much play is made of 'best estimate' being a 50:50 chance of being right. I suggest that most lay people would interpret 'best estimate' as being when the calculations turn out to be right more often than not—whether that be 60:40, 65:35, or whatever. The authors accept this in §§ 6.5.1 and 10.13, but have suggested that any margin should only appear in the interest rate assumptions. Margins could appear elsewhere in the assumptions.

The authors have written their paper from the point of view of large schemes. It is even more important for smaller schemes, with perhaps a few higher paid employees, to have margins to allow for the greater likelihood of volatility in their experience.

We need to look at the comments made in § 5.6.5. and at the authors' conclusions when we develop our Guidance Note on LPI. In the light of the authors' conclusion in Section 5.6, the DSS might feel it more appropriate to make LPI cumulative rather than on a year-to-year basis.

Concerning the surplus regulations, in § 6.3.7 the authors seem to justify a less stringent testing before pension scheme monies can be refunded on the grounds that otherwise 'unwarranted benefit improvements to beneficiaries' might be granted. Whilst some may agree with the technical analysis in §§ 6.3.5 and 6.3.6, it could give an unfortunate impression that, particularly in the current climate, the actuarial profession is recommending an option which might stop the improvement to the benefits of pension scheme members.

Mr J. J. Kenna: Realism should not be all one way. The value which the market, or the actuary, puts on the assets of a pension scheme reflects what has happened in the past. Why was the past like it was? The paper tells us that:

1. Average dividends have been about 5% of average share prices.
2. Average dividends have increased by something in excess of price inflation.
3. Dividends have been well covered by earnings. However dividend cover now appears to be in free fall.

(1) and (2) taken together, show that share prices have increased by something in excess of price inflation. Perhaps we should ask ourselves why this has happened.

In 1977 Redington, in A Ramble through the Actuarial Countryside, 379, pointed out that, for the 11-year period 1965-75, net new money flowing into the institutions for investment was £24 billion. Net new U.K. share issues have added £1½ billion. Some of the £24 billion will have been invested in property, fixed interest, etc., but most went into U.K. shares. The pattern has not changed since 1977. For 26 years at least there has been too much money chasing too few U.K. shares. Like anything else in relatively short supply, U.K. share prices have risen more than inflation. When share prices are high, investors expect correspondingly high dividends, namely 5% or so, increasing at something more than price inflation. For real distributable profits to increase steadily, production has to increase at an accelerating rate and real costs have to decelerate. The proof is in my letter in The Actuary (November 1990, 34–5). Accelerated production gains from computerisation look unlikely; real cost deceleration from relocation has its limits; dividend cover appears to be in free fall. Company boards are, therefore, having long hard looks at savings from rationalisations, staff reductions, pay freezes and
cuts. Thus, I consider that actuaries should be very careful about what value they put on assets expressed in U.K. equities.

However, a manufacturing firm introducing quality management throughout the whole organisation should save up to 15% of its sales revenue and a service firm from 30 to 40% of its revenue budget. Quality management is about far more than quality—avoiding errors, satisfying the customer, etc. It is also about cost reduction, though this aspect is less emphasised for obvious reasons. Quality will not pay off immediately in the sense that a pay freeze, for example, will do. A firm which is not taking steps to introduce quality management now is the sort of sluggish company which, in a year or two, will be unable to meet investors' present expectations.

Actuaries, as well as investors, need to have a much closer look at the companies whose shares they are valuing.

Mr G. N. C. Ward (a visitor): Paragraph 1.6 makes reference to no distinction being drawn between the actuary to the scheme and the actuary to the sponsor. Present cases underline the very real differences of interest between the trust and the sponsor, and further thought should be given to this issue.

I was delighted to see in § 2.1.5 that SSAP24 has done some good. This standard is now being reviewed by the Accounting Standards Board, with the full involvement of individual members of your profession.

It is good to see weight being given to realism in a learned professional paper, but I wonder just how realistic the paper is being in relation to SSAP24. The general principle of accounts, as summarised here in § 4.7, that there can be no unique best estimate, is certainly true, but nevertheless, it does behove us to try our very best in this regard. With the help of the courts and lawyers for the plaintiffs we are trying harder and harder every year.

Section 6.4, succinctly summarised in § 11.6, seems to indicate that the authors are looking to achieve systematic initial overfunding without recognising that fact in the published accounts, albeit that it all washes out in the long term. As an individual who is concerned very much with truth and fairness, and a representative here of a profession, one of whose major raisons d'être is the promotion of truth and fairness, this proposed systematic dishonesty is of the very greatest concern to me. I would need a great deal of convincing to accept it, if indeed I could be persuaded to accept it at all.

Mr P. A. Randall: I should like to have seen more emphasis in this paper in the notion that what we are doing is providing financial models of complex and indeterminate financial institutions for our clients. There is a danger here that we, if we are not careful, give a little too much weight to the extent to which the world is going to fit our model instead of to the extent to which our model is going to fit the world. We must not claim more for our models than they can deliver, nor allow others to believe that they are anymore than approximate tools for financial control.

I am also concerned about the necessity to balance at the same time two very conflicting objectives: to fund a pension scheme on an ongoing basis; and to provide fully for the security of the scheme's benefits on its discontinuance. It has become increasingly difficult in recent years to reconcile these objectives and to maintain them both at the same time. It is a hard problem, but it is one that we must address.

Mr A. Neill: The authors' approach seems vaguely similar to the old question of net premium and bonus reserve valuations in a life office. What we want is a best expectation picture, but also with some feel for variations which may come from general experience or model funds.

On the question of different methods, I am pleased that we seem to be settling on one. I find it difficult to explain to the general public why there are different methods. Also, semi-public controversy on methods does our image no good, although I accept that there must be the opportunity for professional people to express their views.

Bases were influenced some 14 years ago when the Government Actuary published his views on the original contracting out rebate, which had interest and earnings increases rather higher than most people were then using, and this had quite an effect on the assumptions subsequently made.
Considering contracting out, I wonder to what extent one should take account of the buy-back terms in assessing funding rates. For example, the terms at present try to get back profit that is assumed to have been made in an extraordinarily broad brush way, and are completely irrelevant for a new scheme which could not have made such profits. In the case of a scheme insured with an insurance company, are the terms on which deferred annuities will be purchased or the the terms of surrender to buy accrued rights premiums important? Is the cost of deferred annuities relevant for all schemes?

On mortality, is there selection against life offices with staff schemes in more salubrious parts of the country more likely to insure pensions? Offices now take account of such for death-in-service rates so maybe they should also be doing it for pensions.

The comments on terminology are interesting, because one of my campaigns is that we should use the same words in all aspects of our activities. Thus I draw attention to the fact that, while the authors think that we have best estimate, then prudent, then cautious, in order, one of our guidance notes (GN12) calls the same things adequate, prudent and cautious (which it thinks are the same) and then sufficient.

Mr D. J. D. McLeish, F.F.A.: Speaking on behalf of Colin Stewart and myself, I was interested to read in Section 6.5 about the authors' dual interest approach. We use a similar approach in my own firm, but we have two reasons for the difference between the rate of investment return used to calculate the standard fund (which I shall call the settlement rate) and the rate used when valuing assets and calculating future contributions (which I shall call the projection rate). The projection rate is meant to represent the yield which will be obtained on the asset portfolio held by the ongoing fund, whereas the lower settlement rate is meant to represent the yield which would be obtained on a portfolio of assets closely matched to accrued liabilities. There would be a difference between these rates, even if both were best estimates of the return from the two different portfolios. Additionally, we incorporate a margin in the settlement rate to reduce to an acceptably low level the probability of inadequate funding, which otherwise might be 50% in the event of winding up. This may help reassure the authors on what otherwise they perceive, in §8.6.2, to be a weakness in our approach. It may also explain why I believe the authors reached a very odd conclusion in §2.1.8, where they suggest that the focus of the Social Security Act 1990, on the adequacy of scheme assets to meet wind-up benefits, will render unattractive a funding method which explicitly sets out to achieve just that objective. Concerns about the risk of a debt falling on the employer should be addressed by appropriate margins, and not by rejecting the only funding method which is tailor made to address the problem.

On the subject of methods, I am encouraged that the gap between the approach I advocate and the methods used by those who favour more traditional approaches has narrowed significantly over the years. I agree with the authors that the aggregate method is distinctly unhelpful, and that the attained age method is unsound and should be abandoned.

The authors recommend the use of only the projected unit and entry age methods. The casual reader of their paper might gain the impression that the philosophy which leads them to choose these methods is significantly different from the philosophy which underlies what I call the defined accrued benefit method, or DABM for short. A closer examination of what they say does, I believe, reveal that the difference in philosophy is much less than the difference in our methods might otherwise suggest.

In §8.6.1 the authors make the statement that use of the DABM will lead to a lower level of assets to meet past service liabilities than under the projected unit method. This may be true in some circumstances, but in many others the reverse will be true. Although both the projected unit method and the DABM will use withdrawal rates in the calculation of future contributions, it will be contrary to the rationale of the DABM to use withdrawal rates in the calculation of the standard fund. The total past service liability using the projected unit method and the authors' model, incorporating their withdrawal rates, is only 3% higher than the corresponding liability using the DABM, with wind-up benefits for active members at the minimum level equal to statutory leaving service benefits. Isolating the difference to the liabilities for active members increases it to around 11.5%. The difference in the future contribution rate is of the order of 0.25% of payroll. I cannot believe an auditor would consider these to be material differences. The differences would be even smaller and could become
negative if allowance were made for what the authors describe as a realistic salary scale or for the effect of guaranteed minimum pensions in a contracted-out scheme.

If the scheme in question incorporates flexible retirement, giving the member the right to retire at any age between, say, 60 and 65, the past service liability under the projected unit method will assume a representative spread of future retirement ages. In contrast, the corresponding liability under the DABM will assume that all wind-up benefits are available from age 60. Thus, even if wind-up benefits are only at the minimum level of statutory leaving service benefits, the standard fund could easily be greater under the DABM than under the projected unit method. Furthermore, I know of many schemes where the wind-up benefit is defined at a more generous level than the leaving service benefit. Thus, there are many circumstances where there is a very real danger that use of the projected unit method could well result in inadequate funding in the event of winding up.

The authors, in §8.4.3, indicate some awareness of this danger and suggest that in such circumstances it might be prudent to reserve for such an eventuality. I would suggest it is essential to do so. They describe their approach as a natural one, but what could be more natural than using the DABM with the defined accrued benefit equal to whatever the wind-up benefit happens to be? Also if, in dealing with what the authors identify in Section 8.7 as the curious funding problem with local government schemes, they had used the DABM with the prescribed 75% target instead of a mixture of the projected unit method and pay-as-you-go, the perceived problem would have ceased to exist.

As an alternative solution to the problem when wind-up benefits are generous, the authors recommend the entry age method, because it results in a larger standard fund than the projected unit method, which is certainly true. I would prefer not to use such an approximate approach when the more sophisticated DABM is at my disposal.

In Section 7 the authors recommend a funding objective 20% above discontinuance liabilities. I think that the place for margins is in the assumptions, but if they wish to pursue such a funding objective, why not simply use the DABM with the defined accrued benefit equal to 120% of the wind-up benefit?

I suggest, similarly, that the DABM is ideally suited to addressing the issue as the profession considers to the subject dealt with in Exposure Draft 8, and referred to in §2.1.7. Leaving aside opinions on the appropriateness of the retrospective nature of the legislation, surely we would all agree that the yardstick for measuring whether or not a scheme has available surplus should not be lower than the liability for wind-up benefits. I can see no reason why it should be higher, either. The use of any uniform yardstick would run the risk, where wind-up benefits were generous, of releasing assets as surplus to be applied to benefit improvements when these assets were really needed to meet the existing liabilities of the scheme. Alternatively, if the yardstick is higher than the discontinuance liabilities, its use could frustrate what I understand to be the Government's intention by retaining surplus which otherwise could be made available for other purposes.

I have a deep disagreement with the authors when the discontinuance liability falls below the standard fund on the projected unit method, but here I seek to focus on the areas where I believe we really should be in agreement. I therefore hope the authors may tell us what is wrong with the DABM in the circumstances they themselves have identified, where they appear to agree that discontinuance liabilities are the driving factor, and why, in this increasingly common circumstance, do we apparently still have a disagreement?

Mr B. H. Davies: What is meant in §1.3 where it refers to schemes which give adequate increases in pension? The only pension increases that I would regard as adequate are those in line with inflation, if not average earnings. The context, however, suggests that the authors have something else in mind, and it would be useful for them to make it clear.

Section 7 summarises a separate note by the authors in which they reach six principal conclusions. I agree with conclusions (1) to (5), and particularly with conclusion (4), where the authors refute the myth that in the 1970s large sums of money had to be injected into schemes to repair the ravages of inflation. However, I do not agree with conclusion (6), which says that the use of a simplified ‘surplus index’ is likely to be highly misleading. What I cannot understand is the leap in the authors' logic which enables them to reach that conclusion from their other arguments in the two papers. Indeed,
most of what they say in their papers adds support to the idea of an index rather than invalidating it. Setting out the three main areas of agreement between us, the authors say that the most important economic parameter is "the rate of investment return which is achieved in excess of general pay increases". Next they concentrate their analysis on the situation of mature schemes, for which new money will not be significant in terms of emerging surplus. Then they reach the conclusion that the real return achieved on assessed values is independent of the yield used to obtain the assessed value. In §4.2 of the note, they set out the algebra which demonstrates that this is so. So, when we consider their objections to a surplus index, which is set out in §6.1 of the note, we find that their objections there are contradicted by their arguments elsewhere in the two papers.

The final objection they raise to an index is that the investment return for an individual fund would deviate from the median return. I regard the surplus index as a sort of economic barometer, which assesses the economic climate within which pension schemes currently have to operate. Thus, the fact that the index shows that for the past 20 months real investment returns on equities, using assessed values, have been only marginally in excess of the rates commonly assumed for valuation purposes, should be a matter of great significance to all actuaries.

The strength of this paper is also its weakness. It represents, on the one hand, the apogee of the traditional approach to modelling the finances of a pension scheme, whilst on the other, it does not adequately consider whether any alternative model would be preferable.

My suggestion of where we should be heading is what I would describe as a macro-economic model of how pension schemes operate. Pension schemes now make up a substantial proportion of financial flows within our economy. Their future can be better assessed by considering how the significant factors, whether investment returns, increases in earnings, labour turnover rates, and so on, can and might move in relation to each other in the longer term within that economy. The authors begin to move in this direction when they consider how dividends have grown over the last decade, but they have failed to pursue the idea far enough.

Mr J. M. MacLeod: I had hoped to see the subject of tax included among the list of keywords. Needless to say, I was disappointed, though not exactly surprised. Pension schemes are, after all, currently free of tax on their investments. Nevertheless, many pension schemes overseas are, or have been, free of tax; and there has been both action and discussion about the topic in those countries where the question has been raised as to whether such special treatment is justified. Unfortunately, in those countries where there has been action there had been little or no prior discussion; and in those countries where there has been, and is, discussion, there has been, as yet, no action.

However, the recent experience of at least one overseas country in changing the basis of pension fund taxation, and then finding that they had hurriedly to change it back again, should act as a warning to us in the U.K. not to be reluctant to consider this topic. If the future tax regime of pension schemes were to change, the funding rates and methods described in this paper would need to be reconsidered.

The key to any consideration of pension funds being taxed is to realise that, other things being equal, there is no difference as far as either contributors or beneficiaries are concerned in waiving tax on contributions and applying tax on the benefits, which is the principle of our present pension tax system, and, on the other hand, levying tax on contributions as they come in and waiving all tax on benefits.

There is in every pension fund at the moment a fund within the fund—a subfund—which is built up from the tax waived on past contributions, and which is, in effect, used to fund that part of a member's benefit that he will be required to pay in tax. However, this subfund provides no nourishment to its host—there is no question of the fund as a whole 'benefitting from interest on deferred tax'. We are conditioned to think that whenever tax is deferred that must be a benefit, but in pension funds, where tax is levied as a proportion and not as a fixed sum, it matters not at all at what point that proportionate levy is made; 25%, or whatever, is 25%, whenever it is applied. These subfunds, built up from tax waived from past contributions, are therefore no more than holdings by the government in pension funds, which are managed for nothing by the scheme administrators, and which, by a switch from taxing benefits to taxing contributions, could in time be reduced or even eliminated. This
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would lead to the government not having in future to lay down sums which currently amount to some £50 billion. It would transform pension schemes into slimmer versions of their former selves, more like personal equity plans. Future pension costs and members' benefits and expectations would not be affected.

Other things must remain equal when any switch from taxing benefits to taxing contributions is made. The key is to leave the investment rate of return unaltered, that is, to allow pension funds' investments to remain untaxed. Gross roll up of funds is the one citadel that must be defended if pension schemes costs and benefits are to continue at their present levels. It would not, as some maintain, be double taxation were tax to be levied on funds' investments. That would merely have the effect of reducing pension savings to the level of ordinary investment, thus removing any incentive to put money by irrevocably until retirement age. So I agree with § 7.2(1), which states that the rate of investment return is the dominant parameter in pension fund financing, but I wonder if even the authors realise what dramatic changes could be made to pension funds while keeping this parameter intact.

The time has come for us to take a more proactive stance to the taxation of pension schemes, and not to leave it to others to propose possible alternatives, which could be made too late to allow discussion of what might best be done for scheme members, employers and taxpayers alike, whose respective interests, as I have endeavoured to show, do not necessarily have to be conflicting.

Mr D. O. Cule: Cost is not a function of the actuarial basis, it is a function of benefit design. The actuarial basis affects cost in two expectations. The first one is the build up of 'surplus', which leads people to think, "I can give a benefit improvement", and that is an extra cost. The second one is in a sale where you are paying money out. As I mainly act for a seller, I am all for a realistic approach.

SSAP24 is the accounting cost side. I am a cash-based actuary and accountant and I am all for going back to the cash basis with disclosure. Disclosure, these days, seems to mean very little indeed from some of the reports we see. Full disclosure would help the analyst, and an experienced actuary would tell you what was happening. A cash basis would do away with the complications on the balance sheet. These include the complications of an asset building up on the balance sheet from a fund which can never be touched because of the structure of the trust deed involved. I find that disturbing.

We must remember security and look at it from the member's view. If you tell him that he has a pension built up with enough fund to provide a projected benefit, he does not think it is 50:50 odds, or even 70:30 odds. He thinks it is a lot more powerful than that. Perhaps the paper should not be realistic funding, but realistic costing for accounting purposes.

Mr. T. M. Ross F.F.A.: Since time immemorial, professional people have debated whether their profession is best represented as an art or as a science. Our profession is no exception. The paper is overwhelmingly a scientific one, particularly in the way it treats its main theme, the consideration of assumptions and the margins inherent in assumptions in current use.

The graphs in Section 5 give compelling evidence to support the authors' choice of best estimates, although I would, like other speakers, question the impression given that actuaries are taking margins in all the assumptions at the same time. Things are not quite that bad.

Looking to the future, however, I believe that we must temper the view derived from scientific analysis with a liberal dose of art, in the form of professional judgement.

None of us is immune from the natural human tendency to put greater weight on the predictive power of relatively recent events than on things that happened a longer time ago. Thus I am pleased that the authors have acknowledged that the 1980s—and for that matter the early 1990s and the 1970s—were very unusual periods in their different ways. Yet they are bound to figure prominently in any analysis of past experience. To me the key question for the artist as opposed to the scientist is "are there forces afoot which may call into question the past as a reliable guide to the future?" We commonly ask this question so far as mortality is concerned, but what about the other assumptions—the economic ones—which have such a major bearing on pension scheme funding?

A number of general influences at the present time make me nervous. First and foremost is the
impact on economic activity, and on the sharing of the economic cake, of our ageing workforce, which has gone through a massive rationalisation and training process over the last 15 or 20 years. Their future bargaining power could be much stronger, not weaker. Will pay increases continue to outstrip price increases by a mere 1·75% or 2% p.a.? Will we continue to see the well known phenomenon described in Section 5.3, of age-related salary scales which dip downwards after middle age? The impact of the funding of many large pension schemes of salary scales which continue to rise, or at any rate do not tail off, would be quite dramatic.

A hypothesis that employees will take a larger share of the future economic cake has major implications for corporate earnings and dividends. One can readily see a double edged sword coming into play, of higher pay increases and lower asset returns. This could make us wonder, in 10 years' time, why we were so worried about over-funding in the early 1990s, just as nobody was worrying about the possibility of over-funding 10 years ago. Of course, the adverse effects of an ageing workforce may, in the long run, be offset by increases in retirement ages. Such changes are slow in coming, and if history tells us anything, it is that we have to suffer considerable financial pain before the political will emerges to effect necessary changes.

Further, how might our new togetherness with Europe affect pension scheme finances? It may well mean lower inflation, in which case there may be little difference between LPI and RPI. Schemes may be glad of the odd margin in their funding to pay for this. It may also lead to higher real interest rates, which would not necessarily augur well for equity investment. At the very least, I would hazard a guess that the outperformance of equities over other asset classes will be less over the next 20 years than it has been over the last 20.

The effect of the increasing maturity of home ownership is worth more examination. How many people are anticipating, relatively soon, the proceeds of the sale of the home of a parent or other relative? What effect will this new phenomenon have on the investment markets favoured by pension funds?

I sense that we may be embarking on an era of economic change on a scale which has not been seen for many years. Consequently, while the scientific part of me appreciates the cogent discussion in this paper, the artistic part, if I may call it that, is sounding some loud warning bells.

Mr P. D. Jones: I will limit my comments to Secton 5.2, since I have spent some 30 years looking at equities.

A point on dividends which the authors' appear not to know about refers to privatisation. Privatisations have biased upwards the dividend series on the index. This is because virtually all of them, if not all, have been introduced to the market at yields higher than that prevailing on the All-Share Index at the time. The effect of chain linking the prices of the index impart an upward bias to the dividend series. The effect of putting British Telecom in the index, for example, in November 1984 was something like 3%. If you add together all the privatisation issues, you will find an increase approaching 10%.

I take issue with the idea that equity returns lie between 5·5% and 7%, because I think the range is too high. What the authors have done is to add together the dividend yield and the real increase in the dividend. What they need to demonstrate is that the two series they have used are consistent. What they have done is add together two averages, which is dangerous. This is so in particular if you look at the 1980s, where it is obvious that the equity market underestimated the degree of actual dividend increases by some 2% p.a. So, in other words, to be consistent, you have to discount some part of the dividend increase or assume that the market was correctly priced on a lower yield.

We have available on the All-Share Index 'Roll-up' indices. These are a roll up of income and capital combined. From the start of the roll-up series in 1965, that is 28 years, you only get a return of 6%, and that includes a period from 1984/90 when real dividends increased by 10% p.a., which I have described elsewhere as positively halycon. I really do think you have to make some adjustments.

Mr J. M. Hill: I agree with most of the authors' conclusions reached about best estimates. My comments mainly concern the practical application of those conclusions and in particular the security of pension benefits.
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I agree that we need to be clear what margins we believe our funding bases contain. However, recent changes point to a greater need for margins than hitherto. With early leavers now entitled to substantial revaluation on the whole of their deferred pensions and limited price indexation of pensions in payment imminent, many, and possibly most, defined benefit pension schemes will soon be essentially 'non-profit'. The substantial buffer against adverse experience which discretionary pension increases provided will be lost, particularly in periods of low inflation. As a number of speakers have indicated, many schemes which have fully funded their projected accrued liabilities on realistic dividend and pay increase assumptions will be insolvent in a discontinuance if the benefits are to be bought from a life office.

One particular circumstance in which substantial margins may be needed is if a scheme is extremely mature, with disproportionately large liabilities for pensions in payment and deferred pensions. If such a scheme is substantially invested in equities, their performance on a market value basis will be critical. I would not be surprised if real U.K. dividends fall significantly over the next 10 years. Whether you believe such a fall in real dividends is likely or not is almost irrelevant, the point is that the possibility cannot be ignored. The potential, therefore, for a very mature scheme to be unable to meet its liabilities will be significant, unless either substantial margins are contained in the funding basis or substantial surplus is carried forward or the liabilities are largely matched by index-linked and fixed gilts. However, the ability to invest in gilts, and hence to forgo the superior returns expected from equity type investments, itself depends on an adequate supply of index-linked gilts.

Over the last 20 years, U.K. legislation and industry practice has succeeded in providing pension scheme members with a very high level of vesting of their entitlement to benefit and of preservation of the purchasing power of that benefit. Almost certainly, attention must now focus on ensuring that members actually get their promised benefits. The proper level of security and how to achieve it is not just a technical question, it is a matter of public concern. Actuaries must participate in that broader debate. To place the onus of determining and providing an adequate level of security of pension benefits from an actuarial viewpoint on individual employers, boards of trustees and their actuaries is, in my view, impractical, and may cause the decline of defined benefit pension provision, thus denying to employees the security of living standards in retirement which we are seeking to provide.

Mr D. G. Ballantine, F.F.A.: The main conclusion reached by the authors, as given in Section 5.8, is that actuaries have been adopting too conservative assumptions for pension fund valuations. This conclusion seems to me to be inconsistent with the assertion in §7.2(2) that "the embarrassingly large surpluses found in some schemes at the present time have resulted from the conditions prevailing in the late 1980s". Now, large surpluses were emerging in some funds in the early 1980s and the mid 1980s so that it could not have simply been the conditions prevailing in the late 1980s which gave rise to the surplus. While I certainly recognise that the very high investment returns experienced throughout the 1980s were a major factor giving rise to surpluses, there are other factors that need to be considered.

I first draw attention to the supporting evidence which the authors have adduced, and in particular the graphs shown in Figures 5.2.3 and 5.2.4, which reflect the index of share dividends in relation to wage inflation and the accumulated real returns from equities. They show figures for the whole period 1940–90, but if they were to be truncated in the early 1970s their shapes would be very similar to the ones shown in the paper. Accordingly, it would seem reasonable that the conclusions to be drawn from such an analysis ought to have been very much the same 20 years ago as now, and Mr Thornton, in his introductory remarks, seemed to recognise this point. Accordingly, this seems to cast doubt on the validity of the assumptions that some actuaries were making in the 1970s and early 1980s.

The second factor is the change, in some cases the significant change, in actuarial assumptions adopted for valuation purposes. This factor does not seem to be discussed in the paper, but there have been cases of very large surpluses, some in excess of £1 billion, where almost one-half of the surplus has arisen because of a change in actuarial assumptions. While some may argue that such large surpluses are of no consequence in a balance of cost scheme, I agree with the authors that it does matter, particularly, for example, in a shared cost defined benefit scheme, or in cases where there has been a change in ownership. Where the change in actuarial assumptions occurred shortly after a
change in ownership of the organisation, it is likely that considerable inequity could have been suffered, and similarly, in a shared cost scheme an actuarial basis that is too conservative can cause inequity to some generations of contributors. I believe actuaries have to accept some share of responsibility for contributing to such elements of inequity in pension scheme assessments.

In the paper there appears to be inadequate attention to the purpose of funding. It is not until Section 10 that there is an implicit assumption that the purpose of funding is to provide security for pension benefits promised to employees. That is not the purpose of funding for Local Government Schemes, which are discussed in Section 8.7, and the failure to appreciate the different purposes of funding may explain why incorrect conclusions have been drawn in that section.

Mr T. S. Shucksmith (in a written contribution which was read to the meeting): The cost of defined pension benefits is unknown and uncertain. The cost can be represented by a probability distribution, probably of a skewed or log normal nature. The authors pay a great deal of attention to assessing the mean of the distribution, but none to the assessment of its dispersion. In order to obtain a realistic picture the range of costs needs continually to be borne in mind, and attention should be focused on ascertaining what the range or variance is. I would be most interested to know what the opinions of other pensions actuaries are as to the range of possible costs.

To be objective about what margins are appropriate in the funding of pension benefits, it is essential to formulate, as best one can, a view as to the probability distribution of the cost of the benefits. It is also necessary to remember that we do not know where the mean or best estimate is, or for that matter the true standard deviation. It is highly relevant whether the benefits are totally defined or whether a significant element of the benefits is discretionary. The authors scarcely touch on these aspects.

There is a danger that, by disclosing half the truth, the truth on best estimates only, the matter of uncertainty will be forgotten, and as happened in many others areas in the 1980s, commercial pressures are likely to lead to inadequate allowance for risk and to the cutting of margins to levels much less than appropriate. It is for this reason that I consider this paper could be dangerous in the wrong hands.

One of the conclusions that I draw from the steady state analysis in the paper is that adjustments in the contribution rate are an inadequate regulator in themselves to keep a pension scheme with fully defined benefits in financial balance. This arises because a normal contribution rate is such a small fraction of the total fund built up over a large number of years, and because the assessed fund required to meet the benefits attributable to completed service is subject to a margin of error which completely dwarfs any normal contribution rate.

While the authors' dual interest projected unit method solution is theoretically appealing to the mathematical mind, I doubt whether it is adequate on its own. In my view it is important to be able to adjust the benefits. The authors may not feel the questions of scheme design are within their brief, but they are very important and interrelated to the funding question. One obvious way of regulating the benefits is by adjusting the rate of pension increases on a discretionary basis, and it is regrettable that so many scheme have opted to guarantee LPI increases.

Proper margins represent enormous sums of money, both in relation to shareholdes' equity in the employing companies and also as multiples of employees' salaries. More than 10 years ago I was concerned in the devising of a scheme structure which would liberate these margins for the benefit of members and for the credit of the employer, while continuing to control and limit the employer's risk. Our first scheme on this basis, which might be described as a with-profits final salary scheme, has now been running for about 10 years, and I still believe it is an effective and realistic way of mitigating the effects of future uncertainty.

Mr D. J. Parsons: I think it is a shame that the authors have tried to perpetuate the myth that the most important gap in assumptions is between interest and salary growth. They must be aware that in a mature pension scheme this gap is actually third in importance, coming after the gaps between interest and pension increases, including deferred pension increases, and between interest and the dividend growth.
The authors also fail to address properly the question of valuing assets. In a number of actuarial valuations I have recently seen the liabilities have been valued on an unduly cautious basis. In the same valuations, however, the assets have been put in at an unduly optimistic level; in other words, rather on the high side. The net effect can be that the past-service valuation in total is a best estimate of the funding level, but the future service contribution rate is rather on the cautious side. Is this in the best interest of clients? Might it not be slightly more appropriate to be cautious on a past-service valuation, but to use a best estimate for future service?

Mr P. R. Watson: For far too long in the U.K. there has been a lack of realism in the funding of pension schemes, and this has partly, although not mainly, been responsible for the surpluses that have emerged during the 1980s.

On assumptions, it is surprising to see that the authors rejected the use of the latest mortality tables. One of the reasons given for this is that they fail to allow adequately for early retirements, whereas this is also true of the PA(90) tables which they appear to prefer. The authors also conclude that mortality rates should be scheme dependent. While I have some sympathy with this view, there are practical problems, particularly with regard to cash equivalents. I would not find it easy to explain to a staff member that his cash equivalent has just been reduced because some works members have been admitted to the scheme.

I liked Section 6 because:

1. In § 6.1.8, the authors make the point that stability of the contribution rate is not dependent on the amount of the target fund. Indeed, any level of target fund will result in a stable on-going rate.

2. The authors advocate a dual interest approach as a means of reconciling the concepts of prudence and best estimate. My own firm also uses this approach, and I believe it has much to commend it.

Considering funding methods, the authors have been critical of the defined accrued benefit method by making a number of statements which are questionable. In § 8.6.1 they state that this method results in a lower level of assets than under the projected unit method. This is not always true. My own firm has many clients where the opposite is the case. In § 8.6.2 the authors refer to a 50% probability of inadequate funding if the assumptions are best estimates. That is an argument in favour of the dual interest approach, it is not an argument against the defined accrued benefit method. Also they refer to an unacceptable level of risk for additional finance from the employer on winding-up. The important point here is that, while it is for the actuary to assess the degree of risk, it is for the sponsoring employer to decide whether that risk is acceptable.

In § 8.6.3 the authors refer to problems in take-over situations. The use of the defined accrued benefit method does not cause problems, either in theory or in practice. In theory, the price paid for the company being acquired should be struck in the light of the transfer payment available and the level of future contributions. In practice, things happen the other way round, and the negotiations take place in the field of actuarial assumptions after the price for the company has been struck.

Mr P. G. Meins: Concerning the purpose of funding, our sophisticated assessments are all very well if a scheme carries on as a single entity and as a going concern, but that does not always happen. Maybe it does not happen in the majority of cases. Schemes are split up and schemes are wound up.

There are many pension schemes, governed by Trust Documents with ambiguous, inconsistent clauses dealing with these eventualities, which can lead to much dispute. They may give substantial discretion to the parties involved, which can be used for the wrong purposes—for commercial purposes. This is against the background that, as has been maintained previously, actuarial judgement can be very much an art rather than a science. There is much room for subjectivity and for differences of view.

I make a strong plea for the profession to use its influence to try and get the context of our advice into a more appropriate vehicle; in other words, a standardisation of the terms of pension funds, for example those dealing with apportionments and winding-up (but also including many other matters), which can have a very big effect in practice on the rights and interests of individual members. This is put forward on the basis that there should be a continued right for the employer to determine benefit.
levels and have a veto on improvements which involve cost increases. These clauses were often drafted many years ago. No one envisaged the circumstances in which they might now be used, and it can result in something of a lottery for the unfortunate member.

As pension funds are granted a substantial amount of tax relief, it would seem to be in the public interest to demand that they conduct themselves in an appropriate fashion and there is put in place a standard framework within which funding can take place, otherwise our profession cannot satisfactorily carry out its role.

Mr D. H. Loades: My references are extracted from my paper submitted to the 1988 Helsinki Congress (Transactions of the 23rd International Congress of Actuaries, 5) and material I submitted to the 1987 Harrogate Convention (Proceedings of the 2nd Actuarial Convention, 'The Actuary in Pensions in a Time of Change').

I applied the Wilkie model to try to assess the security level of pension scheme valuation assumptions. In the Helsinki paper there are many tables of the distributions of liabilities and interest rates. I now summarise the conclusions from that paper.

In a simulation, if you discount the dividends generated by the model at the rates of return produced by the model you get back to the market values of the assets. Thus simulation produces a relationship between market values and the value of the liabilities. The value of the liabilities can be picked from those generated by the simulations according to the security level or percentile you decide to use. I postulated that an adequate funding standard would be the lower quartile or, in the notation of §10.10, a 75/25 standard. I have compared the figures given in §10.10 with my own figures, and have come to the conclusion that on the Wilkie model the figures relate to something like 50 years down the track, which I consider to be too long. If a shorter period, say 20 years, is used, the figures at the margins are: 60/40 would be –0.8; 70/30 would be –1.7; and 75/25, my standard, –1.9.

Annualised rates of return over a period are means, and the greater the number of terms averaged to get a mean, the greater the reduction in the variance. At the extreme end of the period I simulated, that is 100 years, which is much too long for pension funds, but indicates the minimum margins: for 60/40 the margin is –0.3; for 70/30 it is –0.6; and for 75/25 it is –0.8.

I considered how to apply simulation in a deterministic manner, but could not find a way of deriving a single valuation rate which would produce the required security level for the liabilities. I looked at various starting positions by putting through the Wilkie model 15 years of observed real rates of returns. However, I did discover that the median or central forecast is dependent on the starting conditions. Beginning with a neutral position, the median rates of interest at all durations are equal. Beginning with the 1980 position, the Wilkie model correctly forecast the massive increase in real rates of return before the regressive nature of the model pulled them back to the long-term forecast. However, after 5 years into the future, the distribution of the simulated annualised rates of return around the median are independent of the starting position and dependent only on term. This provides a method of estimating the results of simulation using a deterministic approach.

Pension schemes are different from insurance companies. Various papers have suggested that insurance companies should reserve using a risk of ruin of 1 in 100 or 1 in 1000, which I consider far too strong for pension schemes. A 99/1 standard would produce for a 20-year, 50-year or 100-year projection, interest margins of –6.3, –3.5, and –2.8, which I think are far too high. Any attempt to impose insurance company solvency standards onto pension schemes should be resisted by the profession.

Mr G. R. Farren (closing the discussion): One analogy often used in the past was that a pension fund is like a boat, and that the actuarial valuation is a check by the navigator that it is still on course and that all that is required is a touch on the tiller. In this case:

1. In the 1990s we find that many boats have grown to such a size that the rudder is ineffective.
2. Generally boats are not heading to a final port, but are continuing to ferry passengers who join and leave from time to time. Thus, what is just as important as keeping strictly on course to a port, is making sure that there are sufficient lifejackets for all the passengers and some spare if the boat hits the rocks. By this last I mean discontinuance.
A number of contributors to the discussion have drawn attention to the increasing maturity of pension schemes, which is leading to greater importance being attached to their discontinuance liabilities relative to their ongoing liabilities. Not only will the discontinuance benefits themselves be increased after the introduction of LPI increases, but the costs of buying out the liabilities with insurance companies have risen such that the discontinuance liabilities could well exceed the ongoing liabilities on a realistic basis of the type discussed in the paper. We need, as Mr Randall pointed out, a prudent on-going basis for funding our client schemes that is reconciled with, and results in, a sufficient margin relative to the discontinuance liabilities. Insurance companies seem to be concerned to write deferred annuity business, not on a best estimate basis, but on a prudent basis that provides a substantial profit for the shareholders and with-profits policyholders. The costs of buying out discontinuance liabilities may be avoided, if the trust deed permits, by the continuation of the scheme after the winding up would otherwise have taken place. This is often a difficult decision for trustees, and many would prefer the certainty of winding-up today to the uncertainty of winding-up tomorrow. One would also welcome some flexibility in law to be able to amend the trust deed and rules of a pension scheme after the winding-up should have commenced. However, even then problems are not avoided, as some of the larger pension schemes that I think the authors had in mind when they wrote the paper might not be able to buy sufficient gilts and indexed-linked gilts of the right terms to be able to match their liabilities.

Returning to the assessment of the on-going financial position of a pension scheme, the authors, in Section 5, have identified and discussed at length the margins contained in a typical valuation basis. I and a number of speakers found the discussion regarding investment return particularly interesting, but somewhat worrying, as insufficient consideration seemed to have been given to the current lower level of dividend cover. I look forward to the authors’ next paper in which they advance their ideas by paying greater emphasis to the stage reached in the economic and corporate cycle, perhaps by normalising dividend cover to a baseline before projecting future dividend growth. Similar techniques embodying select rates where the immediate future merges into the longer term could also be introduced into the assumptions to give an even greater degree of realism.

More generally though, and as Mr Brimblecombe pointed out, it is by no means clear that, in the brave new world of lower inflation following ERM membership, ‘Experience will foretell’ and the past will be a reliable guide to the future. Mr Ross, in this connection, particularly referred to the effects of changing demography.

Although the authors have not said so, we suspect that they are somewhat nervous of using a realistic or best estimate basis in which all the margins have been eliminated. Various reasons could be advanced for this such as:

(1) Trustees actually want to be in the same prudent funding position as other similar trustees.

(2) Mr Brimblecombe commented on the meaning of best estimate. This implies equal chances of success and failure of the outcomes, but failure would be disastrous and success merely fortuitous. Perhaps the probabilities in §10.10 should be skewed with these outcomes in mind.

To the paper’s credit, it should encourage us all to discuss with our clients, whether they are trustees or employers, their objectives and the degree of caution that they require. What surplus do they want to emerge at successive valuations? Do they understand the consequences of the use of cautious assumptions, or do they merely want surplus to be retained or even concealed within the scheme so as to enhance the security of the benefits without it actually being used to provide increased benefits? How can the employer and the trustees achieve this? The analysis of the consequences of using the example of a stationary fund, in Section 6.2, in conjunction with higher rates of return and long amortisation periods, must have brought home to many of us the potential instability being faced by some mature and super-mature pension schemes, and the possibility of recurring refunds of surplus. However, the problems now being faced by many pension schemes are a consequence of the unusual experience of the recent past.

The authors' dual interest projected unit method would have reduced the size of some of the surpluses that we have seen and are now seeing by distributing part of them in advance, though it would not have avoided some of the surpluses altogether. None of the speakers went so far as to
comment that that method should be extended to its logical conclusion—that is, the negative contribution rate, but even then it would give rise to significant variations in pension costs of the type many of us have seen in FASB calculations. This would necessitate a relaxation of the Finance Act 1986 basis of the type suggested by the authors and by some speakers. One wonders whether the American accountants got it right all along! On the other hand, the opener and others felt that the dual interest projected method allowed the trustees to be prudent as far as past service is concerned, but to accept imprudent contributions 'one year at a time'. I think Mr Ward went so far as to refer to this as systematic dishonesty. Other contributors to the discussion said that the method might not be acceptable for either the purposes of the Social Security Act 1990 or SSAP24.

The authors accepted, in §10.15, that it was reasonable for a pension scheme to be funded on a 'prudent' basis as opposed to a 'best estimate' basis. However, they proposed that the only margin should be in the investment return, and that this should be only 3% p.a. According to Section 6.1, this will result in overstating the past-service reserves by only 7% and the future-service contribution rate by about 12%. Mr Parsons effectively drew attention to this when he doubted whether these percentages were the right way round.

In the future it will be interesting to see what becomes of the proposals in the paper, and to what extent pension scheme valuation assumptions do become more optimistic, and more like best estimates. Although assumptions have changed a lot in absolute terms over the last 25 years, the real returns relative to prices and pay increases may have fluctuated, having become narrower at one time and then widened, but have changed little. In this uncertain world, is now the time to be changing the assumptions? Hindsight is a wonderful gift, and many of us would have gladly adopted less cautious bases in the early 1980s, but few of us may now be sufficiently confident to become less cautious now than we would have been if the paper had been discussed at the end of 1974. Cannot the realistic assumptions be made more dynamic and responsive in some way to changing financial conditions?

Would we willingly accept the best estimate assumptions as part of a minimum statutory funding basis in a post-Maxwell era, in which trustees had to maintain assets not less than the liabilities with an independent custodian? Perhaps this was what Mr Kenna referred to when he mentioned total quality management. Mr Davies, for his part, also endorsed the idea of a surplus index which might have a similar effect. Some might well, on the other hand, argue that this would lead to a false sense of security and possibly encourage tax reliefs to be restricted to this level.

Mr Neill drew our attention to the financial basis of contracting out and the buy back terms in particular. He stopped short of asking whether many of the pension schemes that we advise will be content to contract out if the financial assumptions for determining the rebate are brought onto a realistic basis, so that there was only a 50/50 chance of being able to meet the GMP liabilities by the investment of the rebate.

The President (Mr H. H. Scurfield): This discussion has demonstrated how important it is for us regularly to bring forward papers on our core subjects.

We should not take it for granted that there is nothing more to be said on a subject on which so many of us are working regularly. I hope that the Programme Committee will take heed of the interest that there has been in this paper—including some disagreement—and see that our other core subjects are similarly exposed for discussion. We need to be pushing forward across new boundaries, but we must also see that our house is in order on our daily routine subjects.

The authors have done well—indeed in exemplary fashion in my view—in being very practical, thorough, and at the same time have been prepared to challenge some existing thinking. This is good for the profession and we are indebted to them. I congratulate them too for the emphasis which they have given to the need to bring out their realistic expectations, and then to add explicit margins. This surely is the proper professional actuarial approach for all our work.

Sometimes we arrogantly presume to reach the right answer for our clients, be they trustees or directors, without leading them through the reasoning, and without enabling them to understand and own the thinking which leads up to that answer. They need to know what the margins are and what the cumulative impact is of them all. Also, what are the consequences of having insufficient assets at some time in the future?
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Sometimes we are afraid to be too explicit in case the client does not agree with the logic or does not understand it. That is his prerogative; ours is to advise and put the case, forcefully if necessary, so that the client can appreciate the degree of caution which has been built in and why. That may require us to demonstrate with models; that in itself will add to the client's understanding, and perhaps to our own as well.

The final point which the paper made me recall was the uncertainty which we often have in projecting forward. How much weight shall we give to current events, and how much to long-term history? Just now I believe that we may be going through an economic discontinuity. Certainly when we look back, we see very different phases over the last 45 years. The authors are surely right to encourage us to look back over a long period and not to weight the immediate past too heavily, while also allowing appropriately for the starting point.

Thank you Paul Thornton and Andrew Wilson. It is a very good paper and we have had an excellent and useful discussion.

Mr A. F. Wilson (replying): The question of discontinuance is important. I recently looked closely at the discontinuance position of a poorly funded scheme for the first time in a number of years, only to find that the terms to be obtained from insurance companies had worsened considerably. There are now a number of occasions where discontinuance benefits are likely to mean a higher amount of money required than on a best estimate basis. This situation reinforces the need for some structure like the dual interest approach in Section 6. I have no quarrel with the idea of prudent funding or of cautious funding, providing one is aware of what one is doing, and providing one does not automatically use the same basis to set the contribution rates that one charges for future service, especially where the scheme is mature.

We are entering an era where we may find that it is not so easy to dispose of surpluses just by reducing contribution rates. There have already been considerable improvements within large schemes. Many of them do not want to give further improvements in benefits, and that has got to be recognised.

WRITTEN CONTRIBUTIONS

Mr D. G. Ballantine, F.F.A.: In the local government context, the purpose of funding is simply to provide a means of determining employers' contributions—other mechanisms could be selected, and the funding itself has nothing to do with the security of members' benefits, which are backed by Statute. The failure of the authors to distinguish between these different purposes of funding may explain the incorrect conclusion which has been drawn in Section 8.7. While the result may be unacceptable to the pedantic actuary, it may still be acceptable to those for whom the calculations are being made.

Another aspect of the purpose of funding, on which others have already commented, is that employees will have most need of the pension funds when the scheme is being discontinued. The authors recognise that a bare minimum of assets on discontinuance may lead to a shortfall of promised benefits in too high a proportion of cases. Prudent assumptions and a higher funding target are ways of providing additional security. However, I feel that regard must also be had to the cost of securing the promised benefits from an external party, which in the last resort would be an insurance company. Whilst I would certainly not suggest that insurance company premium rates should be the sole determinant of an actuarial funding basis in a continuing pension scheme, the actuary needs to be aware of the cost of securing discontinuance benefits, and to take that cost into account in determining the basis and particularly in giving actuarial certificates under the Disclosure of Information Regulations. In present circumstances, this might incline the actuary to adopt rather more conservative assumptions than those indicated by the authors in their analysis.

Finally, we at GAD have noted the plea from the President of the Faculty of Actuaries for publication of the mortality experience of pensioners in self-administered schemes. As actuaries for around 40% of occupational scheme pensioners, we shall seek to develop ways in which the experience of these pensioners might be made available to a wider audience.
Mr R. E. Brimblecombe: The whole question of expressions such as 'best estimate', 'conservative', etc., is one where we have the greatest difficulty in communication with accountants, not only in respect of pensions, but also of life assurance and general insurance. Whilst not necessarily agreeing with the authors' detailed analysis in Section 10 and their definitions in §10.10, I feel we should consider undertaking a research project with a view to preparing a glossary of what actuaries mean by various expressions.

I am pleased that in §4.7 the authors have emphasised that the starting point for SSAP24 costs in many cases is the underlying funding rate. Perhaps we need to place more emphasis on this in any revision of GN17.

On insured schemes, I do not agree with the authors' comments in §8.1.3 about short control periods. In my experience most insured schemes generally used control periods of at least 20 years as a norm.

In relation to insured death benefits, I do agree with the authors in §8.8.1, that actuaries should value such benefits in full. Perhaps this is a point which should be emphasised, and a place for this might be either in a revision of GN9 or in our proposed revision of 'Pension Fund Terminology'.

Mr P. M. Greenwood: I disagree with those who say that there should be only one actuarial method. The actuarial methods are the tools of our trade, and I doubt whether, say, the medical profession would restrict themselves to one treatment or one drug for all illnesses or even a particular illness.

The paper proposes an alteration to the Finance Act 1986 surplus requirements. I agree with the aim. However, if executed in its present form the proposal would allow a company to fund whilst above the limit for a refund, and then later to take the money having obtained a few years gross roll up. This negates the purpose of the legislation, and should not be acceptable to the Revenue. I would, therefore, suggest that the proposal should be amended with a rule which did not allow tax relief on employer contributions if, under the Finance Act 1986 basis, the statutory valuation of assets was above 90% of past liabilities.

Mr C. N. Hedderwick: I take issue with the conclusion in §11.4 which states that the most appropriate method of valuation of assets is the discounted income approach. If we look in more detail at some of the arguments presented on asset valuation the following problems can be identified:

—It is stated in §9.1(a) that the discounted income approach ensures that the liabilities and assets are assessed on a wholly consistent basis. This is not true. The contribution for future service under the projected unit method is taken as the value of the liabilities accruing in the next year, allowing for future salary increases and other assumptions. If this amount is actually paid in cash, it is the expectation under the valuation method that assets and liabilities will be equal at the end of the year, unless the actuarial assumptions are not met. The discounted income approach to asset valuation means that assets and liabilities will not be equal, even if the actuarial assumptions are met in practice.

—It is stated in §9.2 that there will be a reluctance to take credit for a figure greater than market value if some method of averaging market value is used. Where is the evidence for this statement? It is certainly not true in the United States of America. Even if it were true, it would be a criticism of the application of the method, not the method itself.

—If assets are valued using a discounted income approach together with a model portfolio, it is possible for a fall in the market value of assets to be accompanied by a rise in the assessed value. This will happen when the actual fall in the market value of the assets is less than the fall in the notional portfolio. Such a characteristic is unlikely to reassure clients at times when market values fluctuate over short periods, as stated in §9.1.

—If assets are valued using a discounted income approach, but valuing the actual portfolio's income, the client or his investment manager is able to adjust his investment strategy to maximise the assessed value of assets for the actuarial valuation. An asset valuation method which can influence investment strategy is clearly undesirable.

—There is a logical inconsistency if assets are valued using a discounted income approach together with a model portfolio. The justification for this combination has to be that the discounted income
value of the actual assets is the same as the discounted income value of the model portfolio. If, for example, the actual portfolio includes some gilt-edged investments and the model portfolio is 100% equities, this justification leads to the conclusion that the discounted income value of the actual gilts is the same as the discounted income value of the same amount (by market value) of notional equities. However, we know what the discounted income value of the actual gilts is, since the income is fixed. In practice, the discounted income value of the notional equities will be different.

It should be noted that the discounted income approach to asset valuation is unknown outside the British Isles. In the U.S.A. some form of smoothed asset value is invariably used. British actuaries need to be prepared to show some humility when considering actuarial practice in other parts of the world. After all, it is hardly more than 10 years since British actuaries widely used the aggregate or attained age valuation methods, whereas American actuaries were commonly using the projected unit method. We can see the degree of change from this position from §8.3.5. The preferred British valuation methods of 10 years ago are now considered unsound under all circumstances.

Mr P. D. Jones: Looking at real returns on equities over 50 years, whilst ignoring those on gilt-edged, strikes me as an omission. Real returns on gilts have been below 2% or actually negative for much of the period—until the early 1980s—ideal for equities. The 1940s were a time of excess liquidity and little gearing. The 1990s are just about the opposite. Is there not a cyclical phenomenon here worthy of comment and investigation? It would at least lead me to be cautious about stating a rate of return figure on equities for the future.

What worries me most about the authors' series of assertions is that there is no time series analysis. The returns clearly demonstrate strong positive serial correlation with discontinuities. Thus, their figure of 6%, if right, is likely to be made up of long periods above this figure (i.e. the 1980s) and long periods below; perhaps the 1990s? Is now really the time to adopt this degree of optimism, sometimes to justify contribution holidays, especially when the financial robustness of many employers is declining? As a pension trustee, worried about the security of pensions, I venture to suggest that it is not. From the standpoint of members, valuations at say 4% real, allowing such surplus as exists to emerge over time, seem infinitely preferable.

Mr P. J. Lee: Using best estimate assumptions as advocated by the authors, asset liability modelling (ALM) can be used to provide the necessary rigour in order to ascertain, in §10.10, what is a prudent basis and what is a cautious basis, with the attendant probabilities of 60/40 and 70/30. By also taking into account factors such as the gearing effect on the contribution rate of, for example, a high proportion of non-active liabilities, ALM shows that the concepts of prudence and caution and appropriate probability levels can vary from scheme to scheme, sometimes quite significantly.

ALM has also been used to demonstrate the lower variability of assessed value equity returns as compared with market value returns. Both historical and theoretical analysis (using the Wilkie stochastic investment model) show that the annual standard deviation of U.K. equity returns using assessed values is about half, at around 10% p.a., that of market value returns. This level of standard deviation is perfectly consistent with the range of −7% to +10% quoted by the opener. My feeling is that market values probably overstate equity risk (because of overreaction by investors), whereas assessed values probably underestimate equity risk (because the variability of abnormal short-term dividend growth prospects is ignored), with the truth somewhere in between. The fact that asset models used in valuations, assuming 80–100% in U.K. equities, are applied to market values of portfolios containing only 55–60% U.K. equities, introduces an element of inconsistency which may well increase the variability of portfolio assessed value returns back towards the variability by market value of a balanced portfolio (around 14%). The actuary may thus end up, totally unintentionally, exactly where he started!

Partly because of the mitigating effect on equity risk of assessed values, but mainly because of the stochastic dominance of equities over bonds over the long term, ALM studies typically show that long-term investment policies with a high equity content (over 60%) are appropriate for most schemes, except where factors such as a high degree of maturity, negative cash flow or low current funding levels are present. As the authors point out in §2.2.1, whether assets are taken at assessed or
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market value, the investment strategy to be adopted by the pension fund (whether determined intuitively or via an ALM study), is a very important factor to be taken into account in the asset model, to avoid unintentional side effects as shown above.

I would compare the approach advocated by the authors to the process known as zeroing in marksmanship. A marksman first calibrates his rifle by carrying out a practice shoot and adjusting the rifle sights to compensate for any bias due to incorrect positioning of the sights, slight curvature of the barrel, parallax, wind conditions, etc. For example, the results of the practice may show that all shots fell in a group slightly to the left and below the bull's eye. It seems to me that to carry out pension fund valuations without some idea of the extent to which one's assumptions deviate from best estimates is akin to carrying on shooting whilst neglecting to adjust the sights!

Mr P. H. Main: In Section 5.4 the authors make five main points concerning mortality in retirement:

1. The mortality of pensioners 'with insured contracts' is not representative of occupational pension schemes generally (§ 5.4.1).
2. Standard tables of mortality for pension schemes should not be based on retirements at or after normal retirement date only (§§ 5.4.2 and 5.4.3).
3. Mortality varies by social class (§§ 5.4.4 and 5.4.5).
4. Population mortality would be suitable for use in pension scheme work (§ 5.4.6 and 5.4.7).
5. Mortality assumptions should be scheme-dependent, in that they vary not only with social class, but also by geographical location (§ 5.4.8).

The authors return to the subject of mortality in §§ 5.7.5 and 5.7.6, where they refer to mortality rates varying by marital status. Finally, they mention mortality again in §§ A.1.14 and A.1.15.

The question as to whether pension scheme valuations should be based on mortality by reference to lives or amounts has been set in the examinations. The stock answer is that it is preferable to use rates weighted by amounts in financial calculations. It is surprising, therefore, to see the authors failing to address this question directly. Population statistics are by definition weighted by lives. Although the amount of pension is likely to be correlated to social class, there is considerable heterogeneity within most schemes, so this is not the same issue. There are technical difficulties in interpreting the results of investigations by social class.

With colleagues, I have estimated the effect of incorporating into the new tables the early retirement experience summarised in CMIR 8. In our investigations, we found that the question of lives or amounts was at least as significant as the question of whether early retirement experience should be included.

Despite the authors' statement that most of the male population are economically active, I suspect that we consider that there is a significant degree of selection attaching to the employed sub-group of the population and to members of occupational schemes. (They also refer to the spread of pension schemes—ignoring personal pensions, which may limit any further expansion in the coverage of occupational schemes.) Indeed, I question whether a lives table including unemployables would not be too heavy.

In rejecting the new tables because of the exclusion of early retirement experience, the authors are leaving the reader to assume that PA(90) could still be used. Of course, early retirement experience was also excluded when this table was compiled. Still worse, a(55), which they say is also still in use, was compiled from immediate annuitant experience, which may be expected to be quite different from pensioners. Their only real justification for staying with PA(90) is that it is heavier than the new tables, and they suspect the new tables are too light.

The small weight of pensions at high ages is mentioned, but, apart from this being a possible reason for the results being statistically unreliable, one would expect the rates by amounts to be lighter in occupational pension schemes generally than in insured arrangements if the average pensions in the insured arrangements are lower. This would make the newly published mortality rates too high at the high ages, contrary to their main argument. There is not much difference between the new tables and PA(90) at the oldest ages anyway.

It is true that the 1979–82 experience has more of its total exposed-to-risk in the early retirement
category than the 1967-70 data had. Following our investigations on the effect, we concluded that adjusting to allow for early retirement mortality was possible, and would not make a significant difference to results. We accepted the authors' point that all-member mortality was more stable than normal retirement mortality when the proportion of members retiring early changed. Our adjustments to the standard tables attempted to allow for all-pensioner mortality, but we realised that all-member mortality was likely to be more stable. In other words, if we are assuming that more members retire early, or that the normal retirement date itself is brought forward, we would be switching members from active service into retirement, and not merely amplifying the numbers retiring early with the same mortality experience. As the data are predominantly early retirements before state pension age and predominantly normal or late retirements thereafter, using all-pensioner mortality would over-correct for the early retirement experience.

The authors appear to be swimming against the tide in persisting in distinguishing between staff employees and manual grades. While there is heterogeneity within the experience, the tendency to have separate staff and works schemes has all but died out. Hence, the CMI have been unable to track works schemes, and I question whether the distinction between staff and works is as clear-cut as the authors suggest. This is not to say that I disagree with the general conclusion that mortality does vary between schemes depending on the occupation of the members and the geographical location(s). However, there are no data generally available to enable conclusions to be drawn on this. Only the largest consultancies might be able to draw conclusions from their own schemes' experience.

The new tables do include tables for widows, but this is ignored in § 5.7.5. The authors also imply that substantial reserves for death-in-service are required—apparently higher than members' own contributions plus GMP. It would be worthwhile to discuss what should be reserved for under the projected unit method, and whether the benefits on death after withdrawal are relevant.

The suggestion, in Appendix 1, that the interest rate should be adjusted to allow for improving mortality seems a rather eccentric one, although one can see how it would work. It seems odd to reject the new tables because they contain a margin and then decide that it is necessary to insert a margin in this way.

I can see no convincing argument in the paper that population mortality is more appropriate for use in pension fund work than the mortality of pensioners from insured pension schemes. I agree that early retirement experience should be incorporated, but the authors appear to be dismissig the new tables without investigating this, as we have done. They have glossed over the lives versus amounts question, which is more significant than the early retirement question, and negates their argument for population mortality. I therefore believe that the new tables (i.e. an appropriate selection from the range published) should be implemented, although we should be flexible and adjust our assumptions to reflect the occupations and geographical location of the members. Statistics which might enable us to develop a rule of thumb on this would be welcome. It would be regrettable if this paper's condemnation of the new tables succeeded in supressing their adoption.

The discussions concerning the adequacy of the fund on discontinuance highlights an interesting question concerning mortality. While the authors are not specific about what they expect to happen on a scheme discontinuance, securing benefits by non-profit deferred annuities seems the obvious route. Then the question about mortality (as with interest) becomes one, not of the best estimate of future experience in an on-going scheme, but the best estimate of the underwriting actuary's basis. This is likely to err on the side of prudence and points us towards the new tables.

Mr D. J. Parsons: There are two areas which the authors have not fully addressed. It is important to restate these now, because, from my observations, there are a number of people who put so much emphasis on certain other fundamental relationships that these two areas get partially overlooked. This can lead to the use of a set of actuarial assumptions which are internally inconsistent. Such inconsistency can cause difficulties in the future.

Realistic Valuation of Assets

In order to obtain a 'realistic' actuarial value of pension scheme assets, one normally defines the objectives so as to smooth out market value fluctuations and to achieve a situation whereby 50% of the time the actuarial value exceeds market value (and vice versa).
This can very simply be achieved, in the case of equity investments, by the use of a formula:

\[ \text{Market Value} \times \text{Dividend Yield} \times 1/d \]

where \( d \) (subject to any short-term adjustments which may be made) is a constant.

It is both convenient and traditional that \( d \) should be justified as the gap (however calculated) between investment return and the dividend growth appropriate to the relevant market. It is vital, therefore, if a realistic value is to be placed on the assets, that this gap is maintained, even if it results in an apparently unreasonable relationship between, for example, dividend growth and the price inflation assumptions. It is important to remember that, unless one is using 'realistic' assumptions for the whole valuation, a dividend growth assumption used for valuing assets is merely a device for obtaining the appropriate result; it will not be a realistic assumption in its own right. If one does not maintain an appropriate gap (i.e., \( d \)), one starts dealing in 'funny numbers', and this can only harm the credibility of the actuarial profession. Because of the skew distribution of dividend yields in most equity markets, I advocate the use of medians rather than means when determining an appropriate value for \( d \). The values of \( d \) which I would currently expect to use, before any adjustment for time lags or select dividend growth, would be close to the following:

<table>
<thead>
<tr>
<th></th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.K. Equities</td>
<td>5.0</td>
</tr>
<tr>
<td>Overseas Equities (excluding U.K.)</td>
<td>2.2</td>
</tr>
<tr>
<td>Property Rentals</td>
<td>6.0</td>
</tr>
</tbody>
</table>

I accept, of course, that this is an area for individual judgement but the above figures could be illuminating.

**The Importance of Gaps**

In my opinion, far too much attention is paid to the gap between investment return and pay increase. It may be that this is as a consequence of people forgetting, or not appreciating, that the other gaps are equally able to be manipulated. It is a matter of simple arithmetic to identify how important the gap \( d \) is to the valuation of assets. For example, a change of \( d \) from 5.0 to 4.5 instantly increases the assessed value of assets by about 11%. This can have a dramatic effect on both the disclosed funding level and the net contribution rate. This is particularly true in a mature scheme, where the active liability is a relatively low proportion of the total liability in respect of past service.

As we are all aware, the valuation of pension scheme liabilities depends on the use of net interest rates defined by the relevant gaps. These can be summarised as follows:

**Active members**
- Before leaving service: Investment return – pay increases
- After leaving service: Investment return – deferred pension increases
- After retirement: Investment return – pension increases

**Deferred Pensioners**
- Before retirement: Investment return – deferred pension increases
- After retirement: Investment return – pension increases

**Pensioners**
- After retirement: Investment return – pension increases

From these, it is quite clear that in a mature pension scheme liabilities are most affected by the gap between investment return and pension increases. As a rule of thumb, a change in this gap by 0.5% in isolation might change the total value of liabilities in respect of past and future service by 5%. By contrast, a change in the gap between investment return and pay increases by 0.5% in isolation may only have an impact of less than 7.5% of the active members' liability. The past-service element of this change in a mature scheme will be smaller than that caused by changing some of the other gaps.
A Realistic Approach to Pension Funding

(particularly \(d\) and investment return minus pension increases) by 0.5% in isolation. Admittedly, the change in the future service liability may be larger, but, if you are looking at net contribution rates, I suspect you will find that the adjustment in respect of past service outweighs this change and the gap between investment return and pay increases still comes third.

I am aware that I am speaking against conventional wisdom, but, in these days of more mature pension schemes and possible reductions in the perception of long-term investment returns, I believe that it is vital to ensure that we all understand the relative importance of the various gaps which we use in our actuarial assumptions. One common misconception is that everyone understands the impact of an adjustment to the investment return assumption. If this is made in isolation, it affects all of the gaps and can only confuse issues. In my opinion, any adjustments to realistic valuation assumptions to obtain a more prudent position should be made by changing only one gap at a time. In this way it really can be possible to understand the impact of a change in the basis.

The authors subsequently wrote: We are pleased that our paper has produced such a wide ranging discussion. We could, in reply, comment in depth on most of the points made by the speakers and written contributors, but that would lead to a response which was at least as lengthy as the original paper. We hope that some of the more controversial issues will stimulate the production of further papers. In this reply we wish to concentrate on what we see as the main themes.

The opener and Mr Hedderwick urged the use of market values. We accept that there are alternative views on this subject, but we believe the figures speak for themselves. Many changes in market value are capricious and of no lasting consequence. As our paper backing Section 7 shows, use of the assessed value approach in the past has substantially reduced the volatility of valuation results. If market values are used, the value placed on liabilities should reflect any changes in the rates of return anticipated by the market. That in itself introduces subjectivism.

The biggest problem with the use of assessed values, as the opener mentioned, is undoubtedly the question of how to value minority classes of assets, including the various overseas markets, especially Japan. At times as much as 15% of a fund's assets might be invested in Japan. Perhaps pension fund actuaries have too readily resorted to the expedient of converting holdings of Japanese equities into a U.K. model equity portfolio, on the grounds that the expected return is similar. In our view this argument is over-played, and the major consideration underlying investment overseas is the diversification of investment returns achieved. This point has been addressed by those involved in asset/liability modelling exercises, where to ignore the differing characteristics of overseas equity portfolios would be to ignore a vital part of the data for the exercise and could producing misleading results. This is an area where there should be some feedback from a new area of actuarial development into the traditional area of valuations.

Mr Jones raised some interesting points on Section 5.2. We readily acknowledge that that section could have been extended. What was contained in the paper just scratched the surface of a considerable amount of research and investigation. His comments on the effect of privatisation on dividend yields are well taken, but if those are taken into account, so should be the effect of such issues as Eurotunnel, and the effect of changes in tax rate, both of which have depressed yields. Overall, these are second order effects and we doubt whether there has been a substantial change over time.

The use of roll-up series, as he suggests, should indicate whether there are cumulative errors in our methods. Our firm has calculated a roll-up index since January 1970. That index shows a return which differs by less than 0.1% p.a. from that derived using the methods contained in Section 5.2 after allowing for the yields at the beginning and end of the period. This is within the margin of error arising from the approximations inherent in roll-up indices, and suggests that there has been little cumulative error in our method. We can also reconcile the figure of 6% quoted by Mr Jones as appropriate to the period since 1965. From Figure 5.2.2, it is clear that the beginning of 1965 represented a peak in the dividend index in real terms, as the end of 1991 is likely to be. The returns between successive peaks are likely to be similar to long-term average returns, so we feel his evidence supports our conclusion.

Mr Watson and Mr Main questioned our assumptions on mortality. Since the paper was finished, further research has been completed by our firm into the substantial experience of large schemes,
which should please Mr Neill. Comparison with CMI data relating to all pensioners confirms that the shape of the mortality tables produced by those data is more appropriate to pensioner mortality than the previous PA(90) tables. The research further shows that the recent tables based on normal and late retirements only are less appropriate. We understand that the CMI will be producing tables based on all pensioners, and we strongly support the production and use of those tables. However, for almost all the large schemes we advise, a positive age rating does need to be applied to the new tables if the base date is the same. For staff schemes, that rating is typically $\frac{1}{4}$ to 1 year, whilst for works schemes it is between 2 and 3 years. We acknowledge that the number of schemes which are specifically staff or works are reducing, but amalgamation of a staff scheme and a works scheme does not suddenly make the mortality of the whole population better. Mr Main also suggested that we should continue to ignore population mortality, on the grounds that the economically active is only a sub-group, but we consider that the differences in the rates are such that the implications for the remainder of the population are not plausible (and not supported by evidence).

A number of speakers pointed out that the 1990s will not be the same as the 1980s. We agree; we would not expect them to be. Whilst there does seem to be a long-term trend in the rate of dividend increases, there is also a strong case for suggesting there is a cyclical effect, and that we are currently just past the peak of the cycle. If this analysis is correct, it may well be right to take account of the possible reduction in dividend increases over the next few years—but this is very different from saying that such a temporary effect is permanent, and in our paper we were mainly concerned with long-term conclusions. Mr Hill eloquently pointed out the short and medium-term problems facing schemes, especially mature schemes, and we agree with his comments. Similarly, we accept and agree with much of what other speakers, particularly Mr Ross, said in similar vein. In particular, we agree with Mr Ross that professional judgement does need to be applied carefully to steer pension funds through what are likely to be turbulent conditions in the short and medium term, but professional judgement must be based on a proper scientific approach. It is the blend of the two which gives rise to the true art of our profession.

Professional judgement will be needed in no less measure in attempting to reconcile those opposites of security and stability of cost. Mr Greenwood and others highlighted the fact that, for a small to medium-sized scheme, the assets needed to cover discontinuance liabilities on a buy-out basis might well be greater than those required on an ongoing basis using the projected unit method and the types of assumption suggested in our paper. We fully agree that this might well be an aspect which would influence funding policy in such a scheme. As regards the larger well-funded schemes to which the paper mainly relates, this raises a serious question if the suggestion is that a higher level of assets should be maintained on a long-term basis than is realistically expected to be required to meet the benefit promises on an ongoing basis. In our paper we have approached this issue less directly, by exploring the long-term implications of retaining margins of caution in the funding assumptions on an ongoing basis. If a more pragmatic approach is adopted of applying a minimum funding standard of the estimated position on buy-out, this is likely to have a similar long-term effect, although it will be less easy to understand what is going on in the funding of the scheme.

Mr McLeish spoke in similar vein. Whilst we would accept that the results obtained in current conditions from the use of his funding approach may be less dissimilar from those using more conventional techniques than has been the case in the past, this should not be allowed to obscure the differences in underlying philosophy. The distinction remains between the realistic cost of the benefit promises on the assumption that a scheme continues indefinitely, and the cost of those benefit promises in the circumstances of the scheme winding up. In current circumstances it is clearly important for the actuary to understand the position of both approaches.

Mr Brimblecombe suggested that in a typical basis the margins in the various funding assumptions might balance out. This is not our experience. He also seemed to assume that improvements to benefits of pension scheme members were always to be desired, however generous schemes had become. We question that. We acknowledge that there are many schemes which could still do much to improve the benefits for members. However, more employees are probably in large schemes for whom the benefits are probably already too generous. Many of the current generation of pensioners are saying that they are better off in retirement than they ever were before. Can that position be fully
justified in a modern economy? The suggestion does seem contrary to the widespread concern over how to provide for an ageing population.

It is all too easy, especially in the wake of the Maxwell affair, to concentrate solely on security, and lose sight of the implications for cost and surpluses. We attempted to reconcile these problems in Section 6, and, despite a mixed reception, we still regard our dual interest approach as a worthwhile refinement. We were interested to hear that a number of speakers were already using such an approach, including Mr McLeish.

It may be that the move to protect members' interests in funds by converting discretionary increases into benefit promises has already gone further than desirable. There is a serious danger that, if benefit promises have to be funded from unduly stringent bases, which in turn would lead to cautious investment policies designed to sacrifice return for stability of expected return, the ultimate effect will be damaging to employers' costs, the level of members' benefits, or investment by pension funds in the economy, or a combination of all three.

Mr Shucksmith referred to the regulation of benefits, and we share his concerns. If benefits are totally defined, then only the contribution rate is left to smooth fluctuations, and, as many speakers mentioned, the contribution rate is a poor control over surplus in a mature pension fund. May it not be better to have some element of the benefits which also fluctuates with the investment returns? The most logical element is the rate of pension increase, and Mr Parsons gives a clue to the answer when he effectively points out that, in a mature pension scheme, the relationship between pension increase and dividend increase is very important.

In essence, we have shown that, if pension increases are granted at the rate of say 1% less than the rate of the dividend increase actually achieved, the likely effect in the long run is to give pension increases which broadly match inflation. Yet, in the shorter term, greater stability would be achieved, as the pensioners thus share in the investment success or otherwise of the scheme. Furthermore, that investment success or otherwise may well be a reflection of the fortunes of the whole economy. In consequence, we believe that a direct link between dividend increases and pension increases has much to commend it. Certainly it seems to us that more work needs to be done to develop this theme, and it would be better if the work were done before all flexibility was removed by the introduction of a rigid form of LPI. It could also require a relaxation by the Inland Revenue of the maximum rate of increase permitted on pensions in payment (and in deferment).

Mr Davies took us to task for dismissing the merits of a simplified surplus index. Our concern is that, unlike some of the analogies Mr Davies drew, there is a far more serious risk of the uninformed being dangerously misled by reference to a general surplus index which may appear to predict financial circumstances for a particular scheme which are well wide of the mark. It is not the use of a surplus index by actuaries which concerns us, it is the faith which would be put in such an index by non-actuaries.

We were glad to hear from Mr Ward that SSAP24 was being reviewed. However, we were saddened by his apparent misunderstanding of the dual interest method. In our view, systematic dishonesty lies in parading a strong basis as a best estimate without considering the consequences. We hope we showed in Section 6 the dangers of doing this. We believe that, if our method were adopted, and of course fully described and documented in the appropriate literature, or if necessary in the disclosure to the company's accounts, it would be quite clear to all concerned what the relationship was between the trustees' funding policy and the true costs of the fund such as should properly be taken into account in the company's accounts.

Unlike Mr Greenwood, we believe it is important to bridge the gap between funding policy on the one hand and pension cost accounting on the other. These are not unrelated matters—they are simply different faces of the same coin, and we believe it is entirely appropriate for actuaries to try to develop a methodology which demonstrates clearly the proper link between the two.