

PENSION FUND VALUATIONS IN MODERN CONDITIONS

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‘The wind of change is blowing. . .’ (HAROLD MACMILLAN)

INTRODUCTION

ALTHOUGH pensions have been discussed at the Institute on many occasions in recent years, the papers submitted have generally been limited to some particular aspect of the subject, such as the preservation of pension rights, the position of pension funds in the national economy, or the influence of State pensions, whereas the subject of the valuation process has been to some extent neglected.

2. The published history of the problem of pension fund valuations begins in the first decade of the twentieth century with the classic papers by G. King⁽¹⁾ and H. W. Manly⁽²⁾, in which the fundamental principles and formulae for determining the liabilities of a pension fund were first set out, but these papers are silent on the question of the determination of the rate of interest and the treatment of assets. Among a series of papers dealing almost entirely with refinements in valuing the liabilities, there appeared in 1921 a paper by G. S. W. (later Sir George) Epps⁽³⁾, in which there is a reference, albeit a limited one, to both the rate of interest and the treatment of assets. It was not until 1949 that Puckridge⁽⁴⁾ gave his paper which for the first time dealt almost entirely with the question of the rate of interest and the value to be placed upon the assets in a valuation. More recently, in 1957, D. F. Gilley & D. Funnell⁽⁵⁾ gave a paper to the Students’ Society, in which they considered primarily the valuation of assets and to a lesser extent the determination of the rate of interest. A similar change of emphasis towards the valuation of assets seems to be occurring in the life office field, as indicated in a paper by C. M. O’Brien⁽⁶⁾ to the Students’ Society.

3. The great majority of the earlier papers on pensions, therefore, considered in the greatest detail the methods and actuarial techniques of valuing liabilities and the derivation of actuarial formulae for calculation of contribution rates once the underlying bases have been decided

upon. There was, however, little or no reference to such matters as the determination of the rate of interest to be used in calculating the contribution rates in the first place, and the rate of interest and value to be placed upon the assets in subsequent valuations of the fund. There seems to have been a tendency to regard the liabilities and assets as quite separate matters to be kept in watertight compartments with only the former as worthy of study.

4. In so far as there has been a trend in recent years it seems to be that increasing attention has been devoted to the rate of interest and the value to be placed on assets of the fund. This may be a reflection of the changing economic background and investment thought. In modern conditions the importance of the rate of interest and the treatment of assets has become so great that a fresh examination is required of the purpose of a pension fund valuation viewed as a complete process, with particular attention to these factors and with the inevitable corollary of the means by which the purpose may be best achieved.

5. Moreover, since the beginning of the First World War, and more particularly during and since the end of the Second World War, there has been a trend of rising levels of remuneration due mainly to inflation and to a lesser extent to expansion in the economy. This feature can have such important repercussions on the finances of some pension funds that it is desirable to consider whether, and if so how, it should be treated in an actuarial valuation. It is thought that at the present time most valuations ignore inflation or at best treat it in a somewhat arbitrary way.

6. There is, therefore, a need to reconsider fundamentals, and a paper to the Institute on the subject of valuations in modern conditions, in which the purpose and meaning of a valuation is considered and in which the question of valuing liabilities and assets is looked upon as a coherent whole, may not be untimely. In seeking to examine this problem, the subject falls into the following clearly defined sections, which we now consider in turn:

(a) The concept of an actuarial valuation as the determination or the review of a funding plan.

(b) The determination of the rate of interest to be used in the calculations.

(c) The treatment of the assets and the value to be placed upon them, consistent with the principles decided under (a) and (b).

(d) The treatment of possible future inflation.

7. The paper then concludes with a practical example and some reflections on the role of the consulting actuary in the present-day field of pensions.

THE CONCEPT OF AN ACTUARIAL VALUATION AS THE
DETERMINATION OR THE REVIEW OF A FUNDING PLAN

8. In the past, actuaries confronted with the problem of making pension fund valuations have been influenced, possibly subconsciously, to a very great extent by the valuation procedure in life offices and friendly societies. Actuaries had become accustomed to dealing with the valuation of life funds against the framework of the requirements of the Board of Trade returns, or with the valuation of friendly societies as conditioned by the layout of forms C. 28 and F. 40. It was, therefore, natural to regard an actuarial valuation of a pension fund as a process in which the first stage was to arrive at the difference between the present value of the liabilities on the one hand and the present value of the future premiums or contributions on the other, thus producing the net liability. A valuation balance sheet was then drawn up to show how the accumulated fund (usually taken at book value or market value, whichever might be the less) compared with the net liability, the difference between the two figures being designated as surplus or deficiency. Many pension fund valuations still follow this pattern.

9. In carrying out a valuation on these lines there is an underlying idea that the value of the benefits of a pension fund can be precisely quantified as also can the value of the contributions and the consequent net liability. It is true that if the six basic assumptions, namely, mortality after retirement and in service, the rate of withdrawal, the rate of ill-health retirement, the salary scale and the rate of interest, are all given and if the precise assumptions as regards ages and durations are postulated, then the net liability on these assumptions can be arrived at as a piece of arithmetical calculation and is precisely determinable. In a pension fund valuation, however, we feel that there is considerable scope for variation in the basic assumptions without in any way violating actuarial judgment and, therefore, the net liability should not be regarded as being capable of precise computation to the same extent as in a life office valuation where the basic assumptions are limited to three, namely, mortality, expenses, and the rate of interest. Moreover, the effect of inflation and the extent to which it should be brought into account in a valuation (a subject discussed in detail later in this paper) and the question of the value to be placed upon the assets of the fund (also discussed more fully below), all constitute areas of uncertainty which lend support to the view that the net liability disclosed by a valuation of a pension fund is not a figure which can be regarded as uniquely determined, but rather as something which can be regarded as lying in a range of possible values from x to y .

10. To use a statistical analogy, the net liability in a pension fund valuation may be regarded as having a frequency distribution and, therefore, for a given degree of probability will fall within a range. Because of the six fundamental variables, the variance of the distribution might be expected to be much greater than in the case of the net liability in a life office valuation where only three variables are concerned. But in neither case can the net liability be regarded as having a unique value.

11. Another idea which has been gaining acceptance in recent years is the concept of an actuarial valuation of a pension fund as an instrument to determine or check the pace of funding the benefits of the scheme. When an employee retires at the normal pension age, the actual amount of the pension itself has now become definite and the capital value of his benefits is then much more precisely determinable as there are only the two elements of mortality and interest to deal with. Moreover, the interest factor is of far less relative importance because of the shorter remaining term of the liability. The capital value of the pension at the time of retirement should by then have been paid to the fund, and it should generally be the aim and object of a pension fund to build up by the date of retirement a sufficient sum to meet this emerging capital pension liability, on the theory that the cost of the pension for an individual should be met during his working lifetime when he is contributing towards the profits of his employer.

12. The speed at which the capital sums at retirement are built up in the fund is not of prime importance and to some extent is a matter of choice and convenience, although the ultimate cost of providing the pensions will be a function of the particular pace of funding which may be chosen. At one extreme it would be possible to pay to the fund the capital value of all pensions at the outset and this would be the fastest pace of funding, whereas at the other extreme it would be possible to pay to the fund the capital value of pensions at the moment of retirement and this might be regarded as the slowest practical pace of funding. It is of little moment from the point of view of meeting emerging pensions whether the sums are paid to the fund over the average working lifetime of the employees by roughly equal amounts each year, or whether larger payments are made to the fund in the early years balanced by smaller amounts as the retirement ages are approached. On the other hand, smaller amounts could be paid in the early stages with larger amounts later on. As an example, the single premium method of financing life office group pension schemes is an example of a slower pace of funding, while the annual premium method of financing such a scheme is an example of a faster pace of funding. One of the questions to be

considered, therefore, in the valuation is whether, in the light of all the circumstances known at the valuation date, the pace of funding then in operation should be maintained at its current level until the next succeeding actuarial review or whether it is desired that it should be accelerated or retarded within the limits declared to be permissible by the actuary.

13. The discussion so far has been concerned with the pace of funding of a pension scheme already in existence. It is first necessary to decide the pace of funding to be adopted at the outset on the institution of a new scheme. This is bound up with a so-called 'normal' rate of contribution which is usually the contribution rate required for future entrants to support the benefits at an average entry age. New schemes frequently start their existence with an initial liability arising in the main from the allowance of pension benefit, not necessarily at the full future service rate, for periods of service with the employer prior to the introduction of the scheme and from the insufficiency of the 'normal' contribution rate at the higher ages. The initial valuation made at the outset, therefore, should be directed to determining the pace of funding which the employer should adopt for the period until the first actuarial valuation of the new scheme. It may be that it will be decided to pay the normal contributions in the sense just defined for all members, together with a further annual contribution towards the funding of the initial liability. If the normal pace of funding for future service is defined as the payment of the normal contribution, then this provides a criterion against which the pace of funding implied by any particular contribution may be judged. It is noteworthy that this normal pace of funding for future service varies from case to case, for example, in a workmen's scheme in which the contributions and benefits are in fixed units of money, the normal pace of funding is faster than in the case of a staff scheme in which the contribution rate is expressed as a percentage of salary. It is difficult to define an absolute standard for the pace of funding and one therefore concludes that actuaries might with advantage adopt a somewhat more flexible outlook on the methods of deciding a pace of funding of a new scheme. It may be, for example, that there would be an advantage in a final salary scheme in merely fixing the employees' rate of contribution and fixing a different but single rate of contribution for the employer to take care both of the normal future service contributions and the funding of the initial liability. This latter rate would be expected to change in the future as the initial liability gradually becomes funded. Practice in this respect has undoubtedly to some extent been influenced, not unnaturally, by the requirements of the Inland Revenue concerning tax relief on employers' contributions,

under which in a fully approved fund a clear distinction is drawn between what are termed normal annual contributions and special annual contributions.

14. It may be thought that these considerations are to a very great extent self-evident, but they lead to a clear realization that an actuarial valuation of a pension fund is an essentially different process from the actuarial valuation of a life fund or a friendly society. This may indeed not be surprising, because although both are concerned primarily with the measurement of liabilities against assets an important secondary purpose of life office valuations is to determine an equitable release of surplus for bonus purposes. This feature is not normally relevant in a pension fund valuation.

15. If the concept of pace of funding is accepted, it seems to follow that the results of the valuation of the pension fund should not be determined by the actuary in isolation. Since the pace of funding may be varied within certain limits it is essential that the actuary should be in the full confidence of his client and should be aware of the place of pension costs in the broader financial picture of the company or organization with whose fund he is dealing. A valuation balance sheet drawn up in the traditional way of comparing the net liability with the amount of the fund and disclosing a surplus or deficiency is not necessarily the best way of presenting the valuation results. In a contributory fund it may be more helpful to determine the present value of all the liabilities of the fund and to deduct therefrom only the present value of the employees' contributions. This leaves a balance of liability which is to be met by the employer. Against this balance of liability the actuary has in his mind a normal contribution which is sufficient to provide the balance of cost of pensions for a new entrant and he knows the capital value of such employers' normal contributions. He can then recommend payments which the employer should make over the period until the next valuation.

16. We would, however, emphasize the importance which we attach to discussing the valuation results at an early stage with the client against his general financial background, prior to recommending the amounts to be paid by the employer during the ensuing intervaluation period. We say this without in any way suggesting that it is not the final and sole responsibility of the actuary to decide the valuation basis and the pace of funding to be adopted in a particular case. That responsibility belongs fairly and squarely to the actuary and neither he nor his client should wish that this situation might be otherwise. Nevertheless, this conclusion follows as a direct consequence of the idea that the valuation result falls within a range of values as discussed above.

17. Before concluding this section it is appropriate to examine the theory of the exclusion of negative values. In a life office valuation it is proper to exclude negative values, because otherwise a policy is included in the valuation as an asset and if that particular policy lapses that asset is never realized. Negative values should, therefore, be excluded so that credit is not taken for such an asset until the negative value has actually fallen into the revenue account. In a pension fund valuation the position is different for the following reasons:

(a) Negative values may arise because a contribution rate has been determined according to an average entry age—a procedure which results in considerable practical advantages.

(b) In a life assurance policy the premium is determined at entry and does not vary throughout the duration of the policy. Moreover, each policy has its own individual and separately identifiable premium. The contributions to a pension fund are receivable in respect of a particular post, because it is reasonable to suppose that if an employee withdraws he is replaced immediately by an identical employee, unless major changes in the establishment are taking place. It seems more logical, therefore, to regard the contribution income of a fund as a global amount not capable of strict identification with each individual employee. Such a situation has no parallel in a life office except in the extremely unlikely circumstances that all lapses are immediately replaced by identical new business.

(c) Pension fund valuations normally include a rate of withdrawal which is absent from a life office valuation. If the actual withdrawals in a pension fund approximate closely to those expected, the necessity for the exclusion of negative values appears to be at least considerably diminished.

We therefore propose a flexible approach to this problem and do not support the view that negative values should be automatically excluded in every case.

18. The treatment of negative values in local government super-annuation funds is governed by the appropriate regulations⁽⁷⁾, in which the actuary is specifically asked to state how he has dealt with the question of negative values. This question infers that negative values should be excluded and as a result of these regulations it is thought that they are almost always rigidly excluded in these valuations. We have sometimes wondered what would be the view of the authorities if a valuation were completed in which negative values had not been excluded.

THE DETERMINATION OF THE RATE OF INTEREST TO
BE USED IN THE CALCULATIONS

19. While the determination of the rate of interest is fundamental, both in calculating contribution rates and in making a valuation, neither the papers nor the text-books give the actuary much help in carrying out this task. In his book, D. A. Porteous⁽⁸⁾ includes only one paragraph on the subject and following C. E. Puckridge⁽⁴⁾, we quote this as follows:

... The rate of interest... has to be decided with reference to (i) the yield of the existing fund, (ii) the relative size of the annual sums which will have to be invested in the future, and (iii) the probable yield on these future investments.

In the succeeding text-book by R. J. W. Crabbe & C. A. Poyser⁽⁹⁾, the question is discussed rather more fully, but primarily against the same background. Here the procedure is to examine the present interest yield on the book value of the fund, which is referred to as j , and to consider in conjunction with this the effective long-term rate of interest, referred to as i , and the authors say that the relative importance of these two rates depends upon the amount of money which will fall to be invested at various times in the future as compared with the size of the existing fund at the valuation date. The authors then go on to consider the position when the current yield j is greater than i and in these circumstances suggest that the valuation should be made at an intermediate rate, say $i+r$. They also mention the question of the value to be placed upon the assets and suggest that in the circumstances where j exceeds i market values will usually exceed book values but they appear to be reluctant to advocate the writing up of book values in these circumstances. The alternative situation where j is less than i is then discussed and again it is suggested that an intermediate rate, say $i-r$, might be used. The authors, however, appear to favour in these circumstances the use of the fixed valuation rate i and an adjustment of assets from book value. They finally conclude with a brief reference to the basis of determination discussed more fully later in this section.

20. In the paper by Puckridge⁽⁴⁾, a different approach is indicated, which in the main follows Crabbe & Poyser's alternative method. He says that it is no longer possible to pass directly from the probable yield on future investments to a suitable rate of interest for a valuation merely by a general study of the yield on the existing fund and the relative size of the annual sums which have to be invested in the future. A much simpler plan is to value assets and liabilities at the rate of interest which it is anticipated can be earned on future investments.

21. This proposed method of determination of the rate of interest was not generally accepted in the discussion of Puckridge's paper, and

indeed a number of speakers disagreed strongly with it. However, in the light of the accumulated experience of some fourteen years since the date of his paper, we have reached the conclusion that it is essentially a sound method of approach. In other words we are of the opinion that the rate of interest to be used in the valuation of a pension fund should be the rate at which new money can be invested over a long period in the future. There is an important proviso to this conclusion, which is that the assets must be brought in on the basis of the same rate of interest, and this aspect of the problem is examined in the next section of this paper.

22. Let us consider in the first place the establishment of a new fund. In order to decide upon the rate of interest at which new money will be invested over a long period in the future, it is essential to be aware of the investment policy which the trustees will follow. This is an aspect of the problem in which the actuary can give great assistance, and he should discuss the relative merits of investing in fixed-interest securities and equity shares as a hedge against inflation. This should be discussed against the general background of the nature of pension fund investment and the future growth of the fund, which the actuary should explain, particularly emphasizing the long-term aspect of the problem and the absence of any need for liquidity. In fact, in setting up a new fund, the actuary should report not only on the contribution rate and the valuation of the initial liability, but on the investment problem as well. As a result of this discussion with the employer and when an agreed policy has been accepted, the actuary can then decide the long-term rate of interest upon which he is going to make the calculations. If it were decided to invest the whole fund in long-term Government securities (a course with which we would not by any means agree in present circumstances), the valuation rate of interest should be the long-term gilt-edged rate. Over a long period in the past this has averaged something between $3\frac{1}{4}\%$ and $3\frac{1}{2}\%$, and a rate of $3\frac{1}{2}\%$ would, therefore, be appropriate in the valuation. Some may disagree with this view in that they would assume that the present high interest rates are not a temporary situation, but may well persist for a considerable time because of changed economic circumstances, and in particular the great change in taxation levels and the growing appetite for the provision of world capital. Nevertheless, we recall that a similar view was expressed about low interest rates in 1947, although for different reasons, and in the event these low interest rates did not persist for any length of time. Until, therefore, a very much greater weight of evidence becomes available than there is at present regarding the future of the long-term gilt-edged rate of interest, we would feel fully justified in using a rate of $3\frac{1}{2}\%$ at the present time.

23. If, however, as a result of the discussion with the employer it is decided that a substantial proportion, such as for example, 50% of the assets of the fund are to be invested in fixed-interest securities and the remainder in equity investments, then the average long-term rate of interest which new money invested in this way will earn in the future must be estimated. This is a more difficult problem than in the example previously quoted, but a rate of interest of 4%, or possibly even higher, may then be appropriate.

24. In a valuation of a fund which has been established for some time, it is obviously of value, in determining the rate of interest as already defined, to examine the rate which has actually been earned on the fund since its inception or over the period of years since the previous valuation. This provides some measure, if calculated on book values, of the success of the trustees' investment policy and also of the extent to which they have adhered to the policy previously settled. We would emphasize that in our opinion it is inappropriate to determine the valuation rate of interest by reference to that which is being earned on the existing assets, allowing for the long-term future rate of interest and the comparative weight of new money to be invested as compared with the existing fund. It follows, therefore, that the valuation rate of interest when once determined should not be altered in the wake of short-term variations in market rates. The valuation rate of interest may be altered if the trustees make a marked change in their investment policy or if a sufficient amount of evidence accumulates to indicate a change in the long-term basic interest rates.

25. To investigate the yield being obtained on the investments already made a formula has to be used, and in practice the well-known formula of G. F. Hardy⁽¹⁰⁾, namely, that the yield can be found by the formula $2I/(A+B-I)$, is very often adopted. Although alternative formulae are mentioned in the text-books on compound interest, this particular formula of Hardy has become firmly entrenched and indeed is given an official blessing by being quoted on forms C. 28 and F. 40 to be completed by the actuary in valuing respectively a collecting and an ordinary friendly society, as the basis to be used in answering the particular question on the interest earned during the previous five years. This formula is most confusing to a client, who is invariably puzzled by the deduction of I in the denominator. According to the text-books, the formula can be derived by assuming that interest earnings are all received at the end of the year, while other income and outgo are presumed to be uniformly distributed over the year. The first assumption could not be more out of touch with the present-day facts in a large fund. There is some advantage in using the formula $2I/(A+B)$ which theoretic-

cally gives the force of interest, but which is sufficiently close for all practical purposes, is readily understandable, and can be checked by those who read the report.

26. Moreover, in the pension fund context, where in the majority of cases there is no difference between capital and income, Hardy's formula and the suggested alternative both suffer from another defect in that they take no account of capital appreciation on redemption. They will, therefore, give quite different yields for a low coupon stock as compared with a high coupon stock, when in both cases the redemption yield is identical. To take account of this, the yield on the fund should be calculated by taking the gross redemption yield for each fixed interest stock and weighting this by the amount invested in that particular security.

27. There is also another point to bear in mind in examining the yield on the existing fund. When a fund is invested to some considerable extent in equities the yield obtained by any formula which is based upon the actual interest passing through the revenue account and the book value of the fund, reflects the yield on the basis of the last declared dividend. Such a rate in the case of an investment with considerable growth prospects may be very low and will not reflect the long-term expected yield.

28. In considering investment in ordinary shares, considerable importance is attached by some trustees, and indeed by some investors in a wider context, to the so-called 'yields' quoted extensively in the financial press. These 'yields' are not yields at all in the true actuarial sense and may be more correctly defined as 'dividend price ratios', because they are calculated by taking the last declared dividend and dividing it by the market price. The yield on an ordinary share investment can only be precisely determined when that share has ultimately been sold. The yield could then be calculated by solving the equation of value which equates the purchase price to the present value at the time of purchase of the proceeds of the sale together with the present value at the time of purchase of all dividends received.

29. Estimates of the true yield on the basis just defined can be arrived at only if one is prepared to forecast the extent of dividend growth. There is also the impossibility of estimating the price at which the security will be sold and the time of such particular sale. These true yields can in fact only be calculated in retrospect, but when so calculated they are often quite surprisingly high for even moderate growth rates over short periods. We have made calculations of the true yields of the thirty constituents of the Financial Times Industrial Ordinary Index, assuming purchases at the highest price in 1950 and

sales at the lowest price from January to October 1960. Table 1 shows these results.

Table 1. *Table of yields of the thirty constituents of the Financial Times Industrial Ordinary Index*

Name of company	Yield (%)	Name of company	Yield (%)
Alfred Herbert	15.4	Leyland Motors	10.7
Associated Portland Cement	17.3	London Brick	16.6
Bowater Paper Corpn.	22.2	Murex	7.3
British Motor Corpn.	16.6	Paton and Baldwins	6.5
Courtaulds	11.6	P. and O.	18.5
Distillers	8.4	Rolls Royce	10.7
Dunlop	7.0	Spillers	16.1
E.M.I.	18.6	Swan Hunter	11.1
G.E.C.	1.9	Tate and Lyle	9.1
Guest, Keen and Nettlefold	16.6	Tube Investments	8.5
Hawker Siddeley	15.9	Turner and Newall	18.9
House of Fraser	37.8	Vickers	6.6
I.C.I.	16.4	United Steel	34.2
Imperial Tobacco	4.6	Watney Mann	12.8
Lancashire Cotton Corpn.	13.4	Woolworths	14.9

Notes

- (1) B.M.C. did not exist as such prior to 1952 and the purchase has, therefore, been assumed at the highest price of that year.
- (2) It has been assumed that United Steel was bought when first issued in 1954.
- (3) It has been assumed that all rights issues have been taken up at the time of issue.

30. This section of the paper on the subject of the rate of interest would not be complete without some reference to guaranteed rates of interest. The idea of guaranteeing a rate of interest in a pension fund was a good deal more popular some twenty years ago than it is today, and it is never our policy to set up a new fund including an interest guarantee. We are strongly of the opinion that in modern conditions guaranteed rates of interest are to be deprecated. One of the reasons sometimes advanced for the introduction of an interest guarantee is to iron out fluctuations in the valuation rate of interest used from time to time. In view of what has been said about the desirability of avoiding frequent changes in valuation interest rates, this so-called advantage of the interest guarantee has largely disappeared. Another reason for the introduction of an interest guarantee was the provision of a subsidy to the fund by the employer, and this was the case where the rates of interest guaranteed were substantially higher than those which it could

be expected the fund would earn from the outset. We think this is undesirable because such an interest guarantee is merely a disguised additional contribution by the employer of an unknown amount. As the fund grows the interest deficiency which the employer has to meet slowly increases, and if the employer is to subsidize a fund in some way it is better that he should agree to make special payments over a period of years, the amount and extent of which are known to him throughout. If, on the other hand, the rate of interest guaranteed is below that which can be earned on the assets over a long period in the future, then in practice it will be of no consequence, because it is unlikely ever to become operative. Finally, an interest guarantee may operate adversely against the investment policy because of the reluctance of trustees to purchase an investment when the dividend price ratio is below the guaranteed interest rate.

31. Even in cases where there is no interest guarantee, persons responsible for the investment of pension fund moneys often take the view that the rate of interest assumed by the actuary is a vital factor in considering investment policy, and that no investment should be purchased where the dividend price ratio is below that rate. This idea is quite unfounded since each investment should be judged on its intrinsic merit at the time, and undue regard should not be paid to what is often called the basic actuarial rate of interest.

THE TREATMENT OF ASSETS AND THE VALUE TO BE PLACED UPON THEM

32. The pages of the *Journal* are surprisingly silent on this subject. It is not mentioned in the classic papers developing the theory of pension fund valuations, where it is tacitly assumed that in a valuation the actuary will take the assets at book value or market value at the valuation date, whichever be the lower. Here again, the influence of life assurance techniques is apparent, because this basis of valuation has been used universally by life offices in making valuations, and it is only in recent years that it has really seriously been questioned. It is, however, significant to note that as long ago as 1925, C. R. V. Coutts⁽¹¹⁾, in his paper on Life Office Investments, made the following remark:

The adequacy, therefore, of the assets to meet these liabilities does not depend on their realizable capital value at the time the balance is struck. It is the interest-earning power of the assets which determines their value for this purpose. It follows, therefore, from this argument that the proper method of valuing the assets in a Life Assurance Balance Sheet, so far as they represent deferred liabilities calculated on an interest basis, is to value these assets also on an interest basis, i.e. on the basis of the income which they produce, taking into account, of course, in the case of redeemable securities, the basis on which they will be ultimately paid off.

In 1930, C. M. Douglas, in opening the discussion on a paper by A. C. Murray to the Faculty⁽¹²⁾, said with reference to the valuation balance sheet:

To the one side of liabilities there was directed the most devoted care and attention; . . . In contrast to this the assets side appeared to me at that time to receive an almost casual regard.

and later:

When it came to placing a value on these several assets from year to year, the middle market price was chosen in the sort of indifferent air that one price was as good as another. All this was in such vivid contrast to the rigid treatment of liabilities, the careful selection of rules and formulae which were applied in their valuation, that I used to wonder if the relative importance of the two sides were really quite so disproportionate as such treatment would suggest.

And yet again, in 1951, in replying to the discussion on his paper to the Faculty of Actuaries on the subject of Widows' Funds, D. A. B. Scrimgeour⁽¹³⁾ also realized some of the difficulties of the orthodox method, when he said:

Is it not better to deal separately with what is fact and what is assumption—in other words to apply the unknown future rate of interest to the known assets as well as to the known liabilities? The arguments set out in the paper for the method proposed and the appreciation of its practical difficulties and limitations are the result of many occasions on which the orthodox method has failed to give a satisfactory answer to the problems of appreciation or depreciation due to variations in market rates of interest. . . .

33. In spite of these indications of uneasiness, it is believed that the orthodox method is still in frequent use at the present time. It is convenient here to consider some of the disadvantages of using the orthodox method of taking the lower of book or market values. If the valuation is made at a time when market values are less than book and the former are adopted the results of the valuation become subject to the vagaries of the stock exchange prices at the particular date at which the calculations are made. It is not unusual for ordinary share prices, even in a time of comparative stability, to increase or decrease by something of the order of 10% in a comparatively short period of two or three months. It is true that the prices of Government and other fixed-interest stocks are not likely to fluctuate to this extent, but even in these cases large variations can occur in comparatively short periods and this is specially the case when the market is subject to political influences or some upheaval in the field of foreign affairs. It seems very difficult to justify a method of valuing assets which places a value upon the fund which may alter substantially if the valuation date were varied by only some two or three months.

34. If, on the other hand, the market value of the assets is in excess of the book value, and the latter is taken in the valuation, here again it is

difficult to put a precise meaning on the amount brought in. The book value of the assets is nothing more than a historical record of the purchase prices at which the investments have been bought over a long period in the past or their values as written up or down. It can have, except by pure chance, no relevance whatsoever to the value of the assets at the valuation date if such assets are to be valued on a basis consistent with the valuation of the liabilities. For example, if a particular redeemable security were purchased at a price of 75 many years ago and the date of the valuation happened to be shortly before redemption, it would be unrealistic to bring that security into the valuation on the basis of a value of 75. It is true that it is good accounting practice not to take credit for a profit on realization until such profit is obtained, but an actuarial valuation is a scientific estimate of the assets and liabilities of a fund and is not a record of accounting transactions. The absurdity of such a procedure is obvious if one considers the position of a fund wholly invested in one such security. To use a book value which is at a discount of 25 % on the amount of money which will be realized in the course of a very short time, is completely artificial and would not give the employer any indication of the real state of his fund. In practice the position is masked by the multiplicity of investments, but the underlying unreality remains.

35. It is also interesting to consider the position if a particular security is sold a day or two before the valuation date and is then repurchased immediately. If the whole portfolio were treated in this way, which would only be done if the market value were in excess of the book value, then the new book value at the valuation date would be equal to the market value and hence the assets would be written up from the old book value to the present market value. There would be no escape from this, because the profit on realization would have passed through the revenue account at the end of the accounting period. This technical operation of selling all securities and repurchasing them would have the effect of bringing out a completely different valuation result from that which would have been obtained if the transactions had not taken place, and yet the fund would be in the identical position and would hold the identical securities. It seems difficult to justify a basis of valuing assets which can bring out such differing results. It may well be commented in this connexion that the valuation rate of interest might have been changed to some other rate because the yield on the fund would obviously have been reduced, but inconsistent valuation results would still be obtained unless the assets and liabilities were exactly matched. If, however, the valuation rate is determined on the basis of §§ 19–31 of this paper, then this particular operation on the assets would not affect

the valuation results at all if the assets are valued consistently. Again, it may be said that this complete selling and repurchasing of assets at the valuation date would never occur in practice, but it is not by any means unusual in a fund which is pursuing an active investment policy for a number of switches of investments to be made from time to time. The arguments are equally applicable to such switches.

36. Another point of interest is that mortgages, such as loans to public or local authorities, are almost always taken at par because that is the price at which they were originally purchased and there is virtually no market. It seems impossible to justify a procedure which may value for example a 3% Government security repayable in 15 years at a figure of about 70 (interest rates on Government securities now being between $5\frac{3}{4}$ % and 6%), and to place on a corporation mortgage bearing the same rate of interest and repayable at the same point of time a value of 100. Again, if the whole fund were invested in either the one or the other of these two securities, completely different valuation results would be brought out if the orthodox method were used.

37. At times when interest rates are high and fixed-interest securities show substantial depreciation below cost, trustees of a fund are often reluctant to switch from short-dated securities into long-dated securities, although such a change would obviously be to the long-term advantage of the fund, thereby securing the higher redemption yield for a longer period. The reason for this reluctance is that the loss on realization has to be shown in the revenue account. Moreover, it is feared that by using the orthodox method of valuing the assets, the next valuation results will include a fund which is smaller by the extent of such realized loss and any surplus or deficiency would be detrimentally affected. The orthodox method, therefore, can have an adverse effect on investment policy, because the trustees of a fund may refuse to carry out a switch which is to the long-term advantage of the fund merely because of its adverse effect on the next succeeding valuation. This seems to leave the orthodox basis of valuing assets subject to severe criticism because obviously the trustees should adopt the best investment policy for the fund and the valuation techniques must be such that the results brought out are not disadvantageously affected. It is quite wrong that a valuation method should ever be the cause of a bad investment policy.

38. This discussion leads to the conclusion that the value placed upon the assets of the fund must be consistent with that placed upon the liabilities and that book or market values are of little relevance. Again, since the process of valuation is to estimate the future income and outgo of the fund and then to discount such income and outgo at the valuation rate, there seems to be no reason why the interest income should

be treated on any other basis. This thought leads immediately to the method of valuing the assets on a compound interest basis. In the case of Government securities or any other similar type of security, where the amount of interest income is known and will not alter in the future, and where the proceeds on redemption are known, then it is obviously a simple matter to arrive at a value of the fund on a compound interest basis using the valuation rate of interest. We are, therefore, firmly of the opinion that this method of valuing assets should be used in a pension fund valuation for this type of security.

39. The difficulty in connexion with the method arises in its extension to assets other than fixed-interest securities. The most important type of such securities in the case of pension funds is ordinary shares and here there is considerable scope as to the value to be placed upon such investments if one endeavours to follow the same principle. As a starting point the total annual dividends of the ordinary share portfolio as at the valuation date should be calculated and let us say that the total amounts to ΣD . The value of such an income in perpetuity at the valuation rate is $\Sigma D/i$ and the value to be placed upon the total portfolio of ordinary shares for valuation purposes may be taken as $\lambda \Sigma D/i$, where λ is an arbitrary multiplier. To take $\lambda = 1$ might be too optimistic. If λ were taken as 0.9 this would bring in a margin, which may be regarded as a safeguard against possible future decreases in dividends. On the other hand, if the portfolio consisted mainly of low-yielding equities λ might be taken as 1.1 to allow for some future growth. This sort of basis may seem arbitrary, but it must be considered in conjunction with the concept of the valuation as the determination or review of the pace of funding on the lines set out earlier in this paper. We suggest that in any case whatever its drawbacks this approach is more rational than taking ordinary shares at book or market values whichever are the lower.

40. It is helpful in considering the difficult problem of valuing assets to have a number of indicators and the method described by Gilley & Funnell⁽⁵⁾ is of interest. They endeavoured to produce an automatic basis of valuing ordinary shares on a compound interest method, but they use the market's evaluation of the risk that possible future dividends may change. The actual formula suggested is

$$\frac{\Sigma_{MV}}{C_{MV}} \times C_A,$$

where Σ_{MV} = aggregate market value of ordinary shares,

C_A = value placed by the actuary on £100 2½% Consols, and

C_{MV} = market value of £100 2½% Consols.

In practice $C_A = 2.5/i$. It follows from the formula that if the yield on $2\frac{1}{2}\%$ Consols is above the valuation rate ordinary shares will be taken in excess of market value in all cases. The method seems to suffer from the defect that at a time when the yield on $2\frac{1}{2}\%$ Consols is 6% as at present a fund valued at 4% would have the equity holdings written up to 50% above their market value. It is also significant to note that since the paper was written the reversed yield gap has appeared for the first time.

41. Finally, the book and market values will also be known and should be borne in mind, but no more.

THE TREATMENT OF POSSIBLE FUTURE INFLATION

42. All life assurance contracts, other than those in which the contributions and benefits are related to the value of unit trusts, and all pension schemes are designed against the implicit background assumption that there is to be no further inflation. In the past such an assumption was not unreasonable because we have had in this country long periods of stable money values, but in this century and more particularly since the start of the First World War, we have experienced periods of inflation of varying degrees interspersed with relatively short periods of stability.

43. The effect on pension schemes of inflation or of an abnormal increase in the level of remuneration arising from other causes depends upon the type of scheme which is being considered. In schemes where the contributions and benefits are defined in terms of units of money and are not related directly or indirectly to remuneration levels, inflation has little effect on the day-to-day working of the fund and does not upset the results disclosed by periodic valuations. On the other hand, the benefits provided by schemes of this sort tend to become insufficient because of the falling value of money, and they have, therefore, either to be supplemented or alternatively periodically revised in order to provide a level of benefits which is sufficient for the pensioner to be able to meet his commitments. In schemes where the benefits are related directly to salary at retirement, or alternatively to the average salary over a short period immediately preceding retirement, the pensions provided at retirement remain reasonably adequate even if the value of money falls. Actuarial valuations then reveal that the value of the benefits has increased to an extent which was never anticipated with the result that an excess of liabilities over assets is disclosed. In schemes where the benefits are related to average remuneration throughout service it is only the benefits in respect of future service which are affected and the financial effect is nothing like so great.

44. It has, therefore, become a matter of considerable importance in recent years to consider any steps which can be taken to meet inflation and this is equally the case whether the scheme is one in which the benefits are in terms of units of money or whether they are related to remuneration. Although there can be no certainty in these matters, it is generally accepted nowadays that a partial solution to this problem may be to pursue a policy of investing some proportion of the assets of the fund in ordinary shares or property, because in a period of inflation such investments may be expected to preserve their intrinsic value and to offset, at any rate to some extent, the effect of a fall in money values. If one could be certain that inflation would continue as a long-term trend, and that equity investments would always operate as a hedge in this way, then it follows that the proportion invested in equities should be 100%. In practice it is not so simple and the trend of investment in ordinary shares has progressed fairly gradually. The trend has been helped recently by the publicity given to certain successful extensions of investment policy into the equity field by some leading organizations resulting in the now fashionable 'cult of the equity'. Many years ago when the investments of pension schemes were wholly in fixed-interest securities, investment in ordinary shares was not considered appropriate, but as it came to be realized that inflation might be more than a temporary factor, then the target for equity investment was cautiously set at perhaps 10% and subsequently, as confidence grew, the sights were raised. At the present time a popular target for the distribution of assets appears to be one in which roughly 50% of the assets of a fund are invested in fixed-interest stocks while the other 50% are invested in equities. Indeed, these are the proportions proposed in the Government White Paper on the powers of investment of trustees.⁽¹⁴⁾ It is not, however, the function of this paper to consider the investment problem in any greater detail than we have just outlined.

45. Whatever the investment policy may be the question arises to what extent and how inflation should be treated in a pension fund valuation. The great difficulty lies in the virtual impossibility of quantifying the extent of future inflation, if indeed it is to occur at all. There are some who would argue that over the next ten or twenty years we may expect to be in a period perhaps of deflation, or if not of actual deflation, at least in a period of stable monetary values. Unlike other factors in a valuation, the experience of the past is of little use in determining the possible future trend of inflation. Our own view is that with the present conditions of full employment and both the Government and the Opposition committed to a policy of full employment, it

is most unlikely that there would be any long period of deflation, or even stable money values. We incline to the view that there is likely to be a long-term inflation in this country and that the Government will try by all means available to them to contain such inflation at a lower level than in other countries with which we compete abroad. Even if this is accepted in principle it is still difficult to judge the rate at which inflation may occur.

46. If it could be assumed, for example, that inflation would occur at a rate of 3 % per annum, then it would be a simple matter to calculate the effect of such inflation on the value of future contributions and benefits, if such contributions and benefits are based directly on remuneration levels. Indeed, it would only be necessary to include in the commutation columns another factor of the form $(1 + \theta)^x$, where θ is the actual rate of inflation to be assumed. If θ were a level rate and not assumed to vary from year to year in the future, it is obvious from an examination of the formulae that the inclusion of an incremental rate of this type in a final salary scheme is almost the same as the reduction of the valuation rate from whatever is assumed, say rate i , to an actual valuation rate of $(i - \theta)$ up to the point of retirement, the rate reverting to i after retirement. A very simple way, therefore, of allowing for inflation is to make the valuation at a rate of interest which is below that which one would assume based on the principles set out in this paper, except for the period after retirement. It is, however, important to note that if the valuation of benefits and contributions is made on the basis of a rate of interest of $(i - \theta)$ thereby allowing for an inflation rate of θ , such a reduced rate is not applicable in the valuation of fixed interest securities, which if treated on the principles already described should be valued on the original rate of interest, namely i , and not the rate of interest $(i - \theta)$. If, however, the assets were invested to some extent in ordinary shares, one could possibly justify valuing those shares on the rate of interest of $(i - \theta')$, where θ' is an assumed rate of dividend growth and would be less than θ . The underlying assumption is that any allowance for inflation in the liabilities should be accompanied by a corresponding allowance in the value of the assets wherever appropriate.

47. An alternative approach is to devise a salary scale which is considerably steeper than that which would normally be used. Such a scale is quite empirical but permits some flexibility to be given in the slope to reflect individual ideas of future inflationary trends as applied to salary levels.

48. Any method of allowing for estimated future inflation in a valuation is open to the criticism that in one way or another the employer will be required to meet the estimated additional liabilities before they have

in fact arisen. Thus he will be paying in 'dear' pounds for a liability that he could meet in 'cheaper' pounds at a later date, and it might be argued therefore that inflation should only be allowed for as it occurs and not in advance. This is given effect to by valuing the contributions and benefits at rate i and taking the assets on the compound interest basis already described, which in the case of equities allows for the effect of dividend increases to date, but does not allow for any future increases. To the extent that the net effect of any future inflation on contributions and benefits is not balanced by appreciation and dividend increases, there will be an emerging cost at successive future valuations. These considerations in no way preclude the actuary from strengthening his valuation because of possible future inflation, if the employer has indicated that within the limits of the desired pace of funding he wishes to pursue such a course.

49. The whole subject of the actuarial treatment of inflation is new and indeed to some extent controversial. The views of other actuaries will be welcomed in the discussion of this paper as to what steps, if any, should be taken to allow for inflation.

A PRACTICAL EXAMPLE

50. It is of interest and adds point to the various arguments put forward in this paper, if we give in simplified form a practical example of the problems confronting the actuary who makes a pension fund valuation in modern conditions. In this section, therefore, details are given of a largely imaginary and hypothetical case, which nevertheless is based on a particular set of circumstances which has arisen recently in practice. The figures cannot be identified with any particular fund and in order to keep the absolute size of the numbers in reasonable bounds, it may be assumed that we are working in units of £1000's.

51. The pension fund in question is a final salary scheme providing the normal types of benefits and including widows' benefits, of which it is not relevant to give details. The valuation covers a quinquennium, and the average rates of interest earned on the book values of the fund over the period are as follows:

Year of quinquennium	Rate of interest per cent per annum
	£ s. d.
First	4 5 0
Second	4 15 0
Third	5 6 0
Fourth	5 13 0
Fifth	5 17 0
Average of the five years	5 3 0

In the valuation, having regard to the investment policy of the fund a rate of interest of 4% was used, while the orthodox method of valuation would probably use the same rate and might well use a lower one.

52. At the valuation date, the book value of the fund was 545 made up as follows:

Investments	523
Cash	9
Sundry debtors less sundry creditors	13
Total	<u>545</u>

The distribution of the assets at the valuation date and the book, market and valuation values were as follows:

Item	Values		
	Book	Market	Compound interest valuations
British Government Redeemable Stocks	145	128	165
Debenture and Loan Stocks	60	48	70
Preference Shares	9	6	10
Ordinary Shares	309	450	380
Totals	<u>523</u>	<u>632</u>	<u>625</u>

53. Applying the normal processes to the valuation of the liabilities, the following results are obtained:

Liabilities

Capitalized values of:

Current pensions to retired members	92
Prospective pensions to active members	754
Prospective pensions to widows of active members	165
Benefits on death or withdrawal	45
Total liabilities	<u>1056</u>

54. We have here a situation which occurs with considerable frequency at the present time. The fixed-interest securities show a market value substantially below the book value, but the compound interest value on the valuation rate of interest exceeds both book and market values. The equity shares, which comprise a substantial majority of this particular fund, show a very large appreciation of market value over book value, the 'compound interest' value on the basis of current dividends being intermediate.

55. The valuation balance sheet drawn up in orthodox form for this fund is as follows:

Valuation Balance Sheet

Liabilities	1056	Fund at Book value	545
		Value of contributions	491
		Deficiency	20
Total	1056	Total	1056

It will be noted that in arriving at this solution a rate of interest of 4% has been assumed against a yield on book value of over 5%, while the net capital appreciation of no less than 109 units, taking market value over book value, has been ignored. If all the fixed-interest stocks are valued on a compound interest basis while the equities are taken at market value, there is an even bigger margin of value of the fund over book value.

56. Using the methods proposed in this paper, we suggest that the most meaningful thing to do is to value the fixed-interest assets at the valuation rate of interest and to place a value on the equity stocks of $\lambda \Sigma D/i$. On this basis and taking $\lambda = .95$ the fund becomes 628 units, which would turn the deficiency of 20 disclosed by the orthodox balance sheet into a surplus of 63. It would be very easy and not necessarily imprudent to disclose an even larger surplus.

57. Faced with these facts, which we reiterate are by no means uncommon at the present time, what view should the actuary take? It seems to us that the conclusion is inevitable that in the instance quoted the orthodox method is totally inadequate and, whatever allowance it may be considered necessary to make for inflation, a proper view of the pace of funding can only be reached on the basis of a valuation surplus and not a deficiency. It may be that the actuary would deem it necessary in a fund in such a healthy state as this to set up reserves against improving mortality or other factors, but this does not in any way affect the general line of reasoning we have put forward. We conclude that the presentation of an actuarial valuation on orthodox lines in such a fund as this would give a misleading picture. Even if an actuary adopts the traditional method and then recommends that no action be taken for the time being to liquidate the deficiency in view of the margin between the current yield and the assumed valuation rate of interest, we feel that the position is not presented to the trustees in the most helpful way. Indeed, our experience is that such an approach would tend to confirm the view held in some quarters that the actuary lives in some strange world divorced from reality. He carries out a valuation, finds a so-called deficiency, and then says that it doesn't really matter,

nothing need be done about it! In fact the deficiency does not exist, the fund is in surplus.

THE ROLE OF THE ACTUARY AS A PENSION FUND ADVISER

58. In concluding this paper, we would like to comment on the role of the consulting actuary as we see it in connexion with the advice and assistance required by clients in modern conditions. In general we believe it is desirable and indeed in the public interest that the actuary should come to be regarded as the individual to consult on all matters affecting the pension problems of a client. These matters may include not only the drawing up at the outset of whatever pension schemes are required and making the periodic actuarial reviews, but also giving of advice under the following headings at the outset and continuously after the schemes have been set up:

- (i) Investment policy.
- (ii) The preparation of a booklet explaining the conditions of the scheme in simple language.
- (iii) The addressing, if necessary, of all employees so as to explain the scheme to them and answer their questions.
- (iv) Co-operation with the legal advisers so as to ensure that the financial arrangements intended are implemented in the trust deed and rules.
- (v) Setting up the detailed accounting and recording systems.
- (vi) The question of 'Top Hat' arrangements for senior executives and their integration with the staff pension scheme.
- (vii) The provision of lump sum death benefits and any other arrangements, such as reinsurance, which might be required in the case of small numbers.
- (viii) The undertaking of complete secretarial and administrative service in the day-to-day running of a pension fund, if required by the client.

In order to carry out some or all of the above functions, it is necessary to maintain the closest possible liaison with clients, and this means making regular visits to their places of business to discuss the above matters with the executives responsible for pension matters and also to discuss policy matters directly with the Board. In fact, the relationship of the actuary to his client in our opinion can never be too close, always provided that it is maintained on a proper professional basis.

59. We would also like to comment on the specific problem of investment advice. The average company setting up a pension fund for the first time has little or no experience in general of the problem of pension

fund investment. If left alone the trustees are quite likely to invest a substantial part of the fund extremely short at a time when interest rates are historically high, in order to meet the excess of pension outgo over income which they expect to appear in the first few years of operation of the scheme. The long-term nature of pension liabilities and the absence of a liquidity problem are rarely appreciated and we therefore consider it essential that, in addition to the actuary's normal report on funding the scheme, a further report on the investment of the fund be submitted. In addition to explaining the long-term nature of the liabilities, this report should deal with the relative merits of fixed-interest stocks and ordinary shares and the need for spread in purchasing ordinary shares and the way in which such spread should occur between various industries. This subject alone is almost sufficient for a further paper, but we feel that the present paper would not be complete without a reference to this point of view which is so essential in present day circumstances.

REFERENCES

- (1) KING, G. *On Staff Pension Funds*. *J.I.A.* **39**, 129.9.
- (2) MANLY, H. W. *On Staff Pension Funds*. *J.I.A.* **45**, 14
- (3) EPPS, G. S. W. *Superannuation Funds*. *J.I.A.* **52**, 405.
- (4) PUCKRIDGE, C. E. *The Rate of Interest which should be employed in the valuation of a Pension Fund and the values which should be placed on existing investments*. *J.I.A.* **74**, 1.
- (5) GILLEY, D. F. & FUNNELL, D. *Valuation of Pension Fund Assets*. *J.S.S.* **15**, 43.
- (6) O'BRIEN, C. M. *The Schedules to the Assurance Companies Act, 1909*. *J.S.S.* **15**, 381.
- (7) Local Government Superannuation (Actuarial Valuations) Regulations, 1954 (S.I. 1224 of 1954).
- (8) PORTEOUS, D. A. *Pension and Widows' and Orphans' Funds*. (Consolidation of Reading Series.)
- (9) CRABBE, R. J. W. & POYSER, C. A. *Pension and Widows' and Orphans' Funds*. Cambridge University Press.
- (10) HARDY, G. F. *Compound Interest Tables and Formulae*. Transactions of the Actuarial Society of Edinburgh, December 1890.
- (11) COUTTS, C. R. V. *Notes on Life Assurance Investment Policy*. *J.I.A.* **56**, 121.
- (12) MURRAY, A. C. *The compilation of price index numbers and yield statistics relative to Stock Exchange securities*. *T.F.A.* **13**, 120.
- (13) SCRIMGEOUR, D. A. B. *Widows' Funds*. *T.F.A.* **20**, 191.
- (14) Powers of Investment of Trustees in Great Britain. H.M.S.O. Cmdn. 915.

ABSTRACT OF THE DISCUSSION

Mr D. F. Gilley, in opening the discussion, said that it was perhaps natural that when actuaries first turned their attention towards the financing of pension fund arrangements their views on what constituted the proper ways of financing such funds should be coloured by the ideas of adequacy of funds and equity between the members which they had come to take for granted in the administration of the life offices, which in those days were their major responsibility. Indeed, for so long as comparatively stable conditions obtained as regards salary progressions, rates of labour turnover, rates of interest, and market values of the sorts of securities in which pension funds were then invested, there was no pressing urgency for the ideas of their actuarial forefathers to develop.

On reading the paper he had felt the urge to try to formulate some principles of general application by reference to which pension fund finance might be rationalized, the old ideas displaying some inadequacy under modern conditions. The fundamental considerations he believed to be as follows:

The Trust Deed and Rules of a pension fund constituted an arrangement between the employer and the employee freely entered into on both sides. The employer was perfectly free to offer membership on any terms he chose and the members were perfectly at liberty to decide whether or not to join, even if a decision not to join implied that the employee must find employment elsewhere. Nevertheless, the employer had two moral obligations which in his view were of such importance that they should determine his attitude to what was fair and reasonable as regards the rate of funding and equity between the members. He had to ensure, first, that no employee was required to pay more than the cost of his own benefits, and secondly that, provided the employee paid the stipulated contributions, he would ultimately receive the stipulated benefits, subject to any reservations made clear to him at the time he was invited to join the fund—such as, for example, the possible consequences of salary inflation on the scale of benefit. It was the actuary's duty to advise the client on the ways in which he might fulfil his obligations and the implications of those ways. It might be that the employer would choose to limit his own freedom of action by the provisions of the Trust Deed which was drawn up on his instructions but, subject to anything laid down in the deed and to the two moral obligations he had mentioned, it appeared to him that the employer had complete freedom of action, notwithstanding that if he exercised it in certain ways unacceptable to the Inland Revenue he might live to regret it.

Some consequences of these principles were as follows: First, unless the Trust Deed or the employer specified otherwise, there were no such things as employer's contributions for a particular employee, nor members' accrued rights in excess of their accumulated contributions, nor past and future service rights. Secondly, surplus could be distributed in any way the employer chose unless he had already bound himself to do otherwise through the Trust Deed. Thirdly, any abatement of the amount of an employee's benefit in any contingency, or alteration of its nature, save as sanctioned by the Trust Deed, constituted direct and substantial prejudice of his rights. Fourthly, the apportionment of a pension fund should be made in two stages; first, the part built up from the employees' own contributions, which presented no difficulty, and secondly, the balance which should be apportioned by reference to the full liabilities not covered by the employees' own past and future contributions.

Whilst, subject to the Deed, the minimum rate at which the employer should fund that part of the liabilities which was not covered by the employees' own contributions was determined by the second moral obligation, the maximum rate of funding which an employer need undertake was that necessary to ensure that on the termination of the scheme there would be sufficient assets in hand to provide the benefits which the employer thought the employees ought to have in such an event. The actuary ought therefore to put himself in the position of being able to say to the employer: 'On a discontinuance of the scheme at the valuation date the assets then in the fund would have sufficed to provide approximately x per cent of what you regard as the benefits which ought to be provided in such an event and which are not covered by the members' past contributions.' To make such a statement the actuary would have to find out from the employer just what level of benefits he would wish to provide on a discontinuance. The employer might of course 'stand pat' on a Trust Deed which said that on discontinuance the assets would be shared out equitably, in which case, of course, x would always be 100 and the employer could reasonably adopt any rate of funding not less rapid than the minimum. Alternatively, the employer might have very definite ideas as to what the accrued benefits should be—particularly in the age of takeovers—and he might wish to adopt a rate of funding the contingent liabilities not covered by the joint ordinary annual contributions which would be expected to cause x to show an increasing tendency. Advised by the actuary as to the rate he would need to adopt to achieve his heart's desire on the one hand, and the minimum rate of funding which he ought to adopt in order to satisfy the second moral obligation on the other, he could then decide what rate to adopt within those limits, having regard to such considerations as his competitive position in his industry, the views of his shareholders, the views of his employees, possibly expressed through their unions, and other claims upon his profits.

A calculation of the extent to which the assets in the fund at their market value would suffice to provide annuities and deferred annuities at the currently obtainable rates would show the degree to which the employer's aims on a discontinuance could be met if it took place at the valuation date. The actuary could then review such factors as the effect of the future experience of the fund, the adequacy of the ordinary annual contributions to bridge the gap between the benefits on termination and the benefits ultimately payable, and the possibility of a divergence between the market values of the existing assets and the annuity rates obtainable in the market. He would also have to consider what the effect of providing the full level of benefits for employees whose retirement was imminent would be upon the proportion of accrued benefits covered by the fund in hand for the other active employees. In practice, the actuary would be spared some of the consequential headaches because most employers would be content to know the minimum rate of funding, and the most prosperous ones would want to know the maximum lump sum they could pay.

One of the things which had normally been taken for granted in arriving at the rate of funding was that additional contributions commenced shortly after the valuation result was known. That practice seemed to him to have its roots in life office procedure and to be wholly irrelevant in the context of pension funds. If, for instance, an enterprising Chancellor had succeeded in launching an irredeemable security at $2\frac{1}{2}\%$, should the actuary lower the valuation rate, bring out a deficiency and invite the employer to stump up? If he put up money at

such a time, was not the greater probability that it would depreciate or, more relevantly, that the yield would be less than he would get if he held his hand? Should the actuary lower the valuation rate and make the virtuous claim that he was thereby safeguarding the fund if he suspected (having regard to the history of interest rates) that yields were more likely to rise than to fall and that money which the employer put into the fund at that time was not used to the best advantage? Did not the long-term nature of a pension fund's liabilities and the principles which he had put forward indicate that, however the solvency of a fund was determined, good advice to the client might conceivably be to display for a few years masterly inactivity in the disposal of an alleged deficiency, notwithstanding its growth at interest in the meantime?

It was instructive to consider the realities behind the mumbo jumbo of negative values. To exclude them on the grounds that not to do so would be to put the fund in the position of taking credit for an asset which might not materialize might be quite irrelevant to the rate of funding which the employer should adopt. The employer should be made aware of the fact that the way in which his contributions were linked to the salaries of the members or to their number might be no more than an administrative convenience, and consequently that if a membership terminated the rate of contribution which he had to pay in relation to the salaries or number of survivors might either go up or come down. By excluding negative values the actuary was trying—ineffectually if there were benefits on withdrawal—to make sure that the rate of contribution in future need not go up as the result of withdrawals of negative value members not being replaced by similar new entrants. The effect, of course, was that the contribution definitely went up in the immediate future if a deficiency charge, in time-hallowed fashion, was made to commence from the completion of the valuation. Provided the employer was prepared to adjust his rate of funding logically, it would be appropriate, as an alternative to the exclusion of negative values, for the employer to undertake to pay additional contributions of commensurate value commencing several years later, when they would be needed only if the negative value asset had been lost and had not been made good by profits accruing from other sources. The elasticity of the rate of funding was an advantage to the employer not to be thrown away for the sake of an irrelevant nicety.

His remarks led him to the conclusion that in striving to determine the valuation deficiency or surplus the actuary was striving to do the wrong thing. He was confirmed in a view that the inclusion of a valuation balance sheet in the actuary's report was merely a bad habit of which they should break themselves if they were not to be hindered in presenting in the best possible way their advice to the employer, which was whether he ought to pay more or less money into his fund or to reduce or increase the benefits, and, if so, when the adjustment should best be made. Of course, the actuary could not put himself in the best possible position to advise his client unless he made a valuation—more particularly one which included the assets on a basis consistent with the liabilities. That was the tenor of the authors' remarks in the second and third sections of their paper.

He would perhaps be less than human if he did not react to the comments of the authors in §40. The basis of valuation of ordinary shares upon which they commented was not conceived as being automatic in its application. Indeed, the context from which the formula had been wrested made it clear that in the

form in which it was reproduced it was no more than a starting-point, and that the value obtained by the method might be adjusted if the actuary thought that the market's evaluation of the prospects of an ordinary share was unreliable or if the market's evaluation discounted the effects of future inflation for which no provision was made in the valuation of the liabilities. There also appeared in the minds of the authors some misunderstanding of the logic of writing up ordinary shares above their market value. If the balance of probabilities was that a group of ordinary shares was not overvalued by the market, and if the mechanics of the valuation were such that it was correct on incontrovertible theoretical grounds to include undated fixed interest stocks at prices in excess of their market values, it was illogical to shrink from including ordinary shares at values correspondingly in excess of their market values, albeit practical expediency might make desirable a precautionary deduction against the probabilities being misjudged. Truly, the actuary valuing the fund was in a better position to assess the relative values to the fund of ordinary shares and irredeemable gilt-edged securities than was the market, and he had the scope for giving effect to his own opinions through the use of the precautionary deduction factor, whether the formula of § 39 or that of § 40, modified as was intended, was chosen.

The authors expressed the view that if $3\frac{1}{2}\%$ was the proper valuation rate of interest to use for a fund substantially confined to investment in gilt-edged securities, a rate of 4% might be appropriate for a fund with wider investment powers which could invest up to 50% in equities. Other things being equal, it was to be hoped that wider powers would give the trustees the opportunity for an increased yield, but whether or not $\frac{1}{2}\%$ was the proper differential depended upon whether allowance had been made for growth as a result of inflation which was not allowed for in the valuation of the liabilities and also upon whether ordinary shares had yet achieved a status at which, in the absence of inflation, they might be expected to provide a return no better than irredeemable gilt-edged stocks. If that part of the current ordinary share yield differential below the gilt-edged yield which was not attributable to a discounting of the effect of future inflation growth made proper allowance for future levels of dividend which would accrue in non-inflationary conditions, then presumably substantially the same valuation rate of interest should be adopted whichever set of investment powers were taken. More particularly, if the actuary contemplated making a deduction from the calculated value of the existing portfolio of ordinary shares, which he would not make in the case of fixed interest stocks, it seemed illogical to assume that the wider set of investment powers justified a higher valuation rate of interest.

To be brief on the subject under discussion was to be either inspired or inadequate, and if he had only scratched the surface of what he thought were the major issues, he hoped the authors would forgive him for not attempting others of their points. They had done the profession a great service by laying out a conspectus of current thought from which they might assault matters which had had uncritical acceptance for too long.

Mr H. Tetley said that he would deal only with the few points in which he differed somewhat from the authors and would ignore the other 95% of the paper where he was in complete agreement with them.

In §17 they argued that it was 'more logical to regard the contribution income of a fund as a global amount not capable of strict identification with each

individual employee'. He thoroughly agreed with them as regards the employer's contribution and as regards miscellaneous income from profits on investments or other sources, but he thought it was extremely dangerous to maintain that view as regards the employee's contributions. Indeed, he would go further and say that in his experience there were great psychological benefits to be obtained by emphasizing that each employee's contributions were invested and carefully accumulated to provide his own benefits and the benefits of his dependants. To indicate that the employee's contributions merely went into a pool, where they lost their identity and were, so to speak, applied for the general good, was a dangerous policy. On the other hand, he thoroughly agreed that to take that attitude for the employer's contributions was most important, and it should be emphasized that, where in fact the employer's contributions were assessed in relation to salaries, that was merely a piece of mechanics and had no particular relevance.

In §§ 17–18 the authors referred to the question of negative values. He thought that all actuaries who dealt with pension funds would agree that negative values in the context of such funds were not of great importance. A withdrawal rate was usually incorporated in the valuation factors, so that withdrawals were allowed for. Further, there were three things which might happen when a man withdrew. He might be replaced by somebody else of the same age or possibly slightly younger; if that happened the negative value was not lost; it was in fact transferred to the new employee and the financial effect on the fund was negligible. He might be replaced by an older man: if that happened only rarely, of course, there was no trouble, but if it happened regularly it seemed to him that the actuary had a problem on his hands in any event. The indication seemed to be that the age at recruitment was tending to rise, and the actuary then almost certainly would have to reconsider his rate of contribution and see if it was still appropriate for the increased age of recruitment. Thirdly, the withdrawing employee might not be replaced at all, one explanation being that the employer was making more effective use of his employees or possibly introducing labour-saving machinery. If that happened they were still in a fairly favourable condition, because the burden on the employer of his pension commitments would tend to decrease with a smaller staff, and he would therefore be in a much more favourable position at the following valuation to make good any deficiency which might arise. He ventured to say that in the future negative values would tend to be even less important than they had been in the past, because benefits on withdrawal were tending to rise—mistakenly, in his view—and also, when there was contracting out (as in the whole of the local government field) there was the liability, which would become increasingly important as years went by, either to preserve 'cold storage' benefits or to make a payment in lieu to the Ministry. Those benefits would, of course, be valued as a commitment in the valuation and would tend to reduce negative values.

The authors stated that in the local government regulations the actuary was specifically asked to state how he had dealt with the *question* of negative values. He was not in any sense giving an official ruling on those regulations; he could only say that his own personal interpretation had never been that negative values had to be excluded. Indeed, when the legislators wished negative values to be eliminated they said so in no uncertain terms. He thought the wording was quite deliberately chosen to say, in the politest way possible in official

language, 'Have you thought about the possibility of negative values arising? Have you looked into the matter, and, if so, what have you done about it?' It was many years since he had examined valuations in detail, but he certainly had seen valuations for local government funds conducted by quite eminent actuaries which included a statement on the lines that: 'Negative values will arise at duration 1 for ages A to B at entry, and at duration 2 for ages A to C at entry. The size of these negative values is quite small and the total effect on the valuation liability is negligible in proportion to the total. In the circumstances they have been ignored.' He took that to mean that no attempt had been made to eliminate them. Certainly there had never been any question of rejecting such a valuation because it contained negative values.

Passing to §24, although he accepted nearly all the authors' arguments, he was not quite convinced by their statement that 'it is inappropriate to determine the valuation rate of interest by reference to that which is being earned on the existing assets, allowing for the long-term future rate of interest and the comparative weight of new money to be invested as compared with the existing fund'. He agreed that that was probably sound with a fund which was growing and which might be assumed to continue to grow for the indefinite future. In times of inflation that probably applied to a great many funds, but they had all had bitter experience in the post-war years of funds which had seemed to have an indefinite life being affected by nationalization, take-over bids or amalgamations, as a result of which they had become closed funds, and all the new recruits had been diverted to one of the other funds of the combined undertaking. In his Department's work they had in fact a number of closed funds. Those connected with the old Indian Civil Service had already started to run down, and some of the others had just about reached their peak and would start to do so in the next ten years. First of all the question of matching had to be looked at very carefully; the dates of the liabilities and the assets should be married as far as possible, but when that was done he would have thought that the rate on the existing fund was the one thing which did matter. He did not want to labour the point too much but he thought that in all cases an actuary would be wise to look at the yield on the existing fund very carefully, even if, in view of all the circumstances and the best forecast of the future of the fund, he decided to depart from it in arriving at his valuation rate.

On a lighter note, he was interested to see from §25 that the authors had had the same difficulty as he had had about Hardy's formula. He agreed that some formula had to be used to calculate a rate, but apart from statutory forms such as C.28 and F.40, there was no need to quote it, and in their valuations they no longer did so; they merely said 'the rate earned on the fund has been as follows' and they had never been questioned about it, except on rather rare occasions when an accountant had a different answer, and they had been able to explain it quite satisfactorily because he had excluded from his denominator all the non-interest-earning assets, such as cash in hand and sundry debtors, which they maintained should be included.

In §§42-49 the authors dealt with the very important question of inflation. He imagined that they did not contemplate making a specific reserve for inflation, but what they did was to use a special valuation technique in arriving at the liability without any attempt being made to subdivide that liability into two parts. That being so, and as it must be an extremely speculative guess, he was not sure that they were wise to revert to the full rate i at the end of the working

life. There was a lot to be said for it, but they were coming across increasing pressure for something to be done about existing pensions. Various stop-gap measures had been taken, and the practice might tend to grow. If it did, and if the increased pensions were met from the fund, the actuary might feel a certain amount of comfort if he had taken a lower rate of interest throughout life and not reverted to full rate at the age of retirement.

Another way of dealing with the problem had been used on occasions with some success. They had felt it to be uncomfortably speculative to allow for future rises in the general level of salaries, but they had been faced with the point that if nothing was done then quite an uncomfortably large deficiency was liable to appear at the quinquennial valuation. One way of meeting that difficulty was for the actuary to supply annually an approximate estimate of the capital cost to the scheme arising from pay increases granted during the year. By 'pay increases' he meant upward revision of salary levels. The employer could then raise his annual charges if he wished to do so. In one particular fund of which he knew, a very large one, they had a rather more elaborate arrangement: after each quinquennial valuation they had supplied to the managers of the fund a series of factors based on the valuation data which they could use, without further reference to the actuaries, in order to get an approximate idea of the cost to the pension fund of any increase in wage or salary levels which were contemplated. As a result of those factors the employers sometimes decided immediately to step up their contributions to the pension fund. Obviously the figure they used was never likely to be exact, and it was a rounded-off figure in any event. When the quinquennial valuation came to be made, the deficiency which had arisen was quite manageable, and indeed often represented in effect only the consequence of the last year's increases in salary.

He had concentrated entirely on points where he was not in full agreement with the authors, but he wished to end by congratulating them on an excellent piece of work. It was a most interesting and valuable paper.

Mr H. A. R. Barnett referred to § 14, where the authors made the important point that the valuation of a pension fund was an essentially different process from the valuation of a life fund or friendly society. Unfortunately, a number of funds were responsible to the Registrar of Friendly Societies and others to the Registrar of Non-participating Employments, and they were all to a certain extent responsible to the Inland Revenue. No matter what the actuaries thought, those official bodies would tend to regard the valuation of a pension fund as essentially the same process.

Later in the same paragraph the point was made that the purposes of the valuation were not the same as the purposes of a life office valuation, one of which was the determination of an equitable release of surplus for bonus purposes. There were, of course, some fairly young funds where the employer intended, as soon as he had finished funding the past service liability, to make some improvement in the normal benefits provided.

The suggestion was made in § 16 that some range of variation might be accepted in the valuation result, and he wished to comment that he did not think that any impression should be given that the valuation result was something which was negotiable.

In § 17 the point was made that the contribution income was not capable of strict identification with each individual employee. Subject to Mr Tetley's

remarks, he agreed with that in principle, but in the case particularly of certain funds which operated overseas it was frequently found that the tax authorities concerned asked for a split in that very way, and it was necessary, if sometimes embarrassing, to provide it.

Passing to §30, he wished to make a few remarks in support of their old friend the interest guarantee. There were still some employers who thought their actuary valued the fund at too low a rate of interest, and an employer might well guarantee a rate lower than the yield actually being received and lower than the yield he expected to receive in the future, but nevertheless higher than the valuation rate of interest, not with the practical view that some time in the future he would need to implement it but simply as a lever to persuade his actuary to raise his valuation rate. Alternatively he might guarantee a rate in the region of what he expected would be earned, or a little higher, and the guarantee would then have a real chance of needing implementation, and it might be argued that the advantage there was that it would give some acceleration of the rate of funding by a method in which the employer's additional contributions under the guarantee would be allowed for tax purposes by the Inland Revenue as and when paid, whereas if instead it fell to him to make a deficiency payment on a future valuation, he might find that that payment had to be spread over a number of years for tax purposes.

He would pass over the assets section because he had a very wide measure of agreement with what the authors said.

He thought it was dangerous to say, as the opener had implied, that the valuation balance sheet could be dispensed with. He feared that if the actuary did not give a valuation balance sheet in his report then the employer's accountant would come along and do it instead, for better or worse.

Finally, on the question of inflation, he felt they were possibly in deep water. If they deliberately funded for a certain degree of future inflation they might bring the Inland Revenue down upon their heads. On the other hand, if they were to fund for an indefinite amount of inflation without specifying that they were trying to provide for it, and if then a larger degree of inflation occurred which they could not have anticipated and which caused a deficiency, there could be a danger of the profession being brought into ill repute. From the point of view of the relationship between the actuary and the employer, it was essential to make it quite clear what was being done, even at the risk that, if the Inland Revenue did not like what was being done, the actuary might have to try again.

Mr J. C. S. Hymans thought that the authors would not claim originality for everything in the paper—indeed, it contained much that those concerned whole-time in advising on pension funds had been discussing for a long time—but it undoubtedly was a paper that needed writing.

He had the impression, rightly or wrongly, that many actuaries—and certainly many students—regarded pension funds as funds distinguished by the need for valuation with very complicated functions, and that the complication of those functions was such that the real problems, as set out in §6, were never considered. The fact was that the whole-time consultant very often did not use those functions with letters at each corner but instead used much simpler methods, so that he might give more time and thought to the kind of questions posed in the paper.

The President, in his address to the Association of Superannuation and Pension Funds, and the authors, in the paper under discussion, had emphasized the difference between valuations of life funds and valuations of pension funds, and what they said was undoubtedly true. It seemed to him, however, that there might be a similarity.

The life office fund, valued for publication on a net premium basis, was usually also valued internally on a more realistic basis. The former gave a measure of progress of the fund and the latter a true picture of what was actually happening. He had been experimenting along those lines, and he felt that pension fund valuations also might be done on some rigid form of valuation which controlled the progress, i.e. the rate of funding, and secondly be done on a realistic form such as was envisaged towards the end of the paper, and which would enable a forecast to be prepared of the income and outgo of the fund which would be both consistent with the 'realistic' valuation (with which it should agree very closely when capitalized) and at the same time produce year-by-year figures which showed that the actuary knew what he was talking about.

He had tried that idea on clients with, he thought, a fair amount of success, because it seemed to have given them a much better view of how a pension fund worked. Indeed, he would like to see included in the list in §58 'The education of the client and his institutional trustees (if any) in the workings of his pension fund'. It was a matter of some importance. Many of them had heard trustees, who ought to know better, congratulating themselves for having invested at above the valuation rate of interest.

One other thing on which he himself placed great importance in the education of the client was the parallelism of the income and expenditure account and of the valuation profit and loss account. After a few demonstrations the client began to understand that the valuation was not for the five years ending on the valuation date but for the future after that date. It was easy to see how nicely it could all tie in with the forecast.

He had attempted several methods of dealing with inflation, none of which was fully satisfactory. Theoretically, if equities kept pace with salaries and the fund was invested 100 % in equities, the problem did not arise—which was, he thought, what the authors had said in another way in §44. However, he had, in a 'topping-up' fund which was particularly susceptible to inflation, made a valuation which explicitly brought in inflation and resulted in the client making a large deficiency payment at a very opportune moment for its investment. The inspector at Somerset House, to whom the report was sent, as it involved the tax treatment of the payment, did not approve of bringing inflation into the valuation and thereby producing a deficiency, on the grounds that if the deficiency were liquidated (as it was) it might lead to overfunding or excessive pensions in the event of dissolution.

It followed that, if inflation were to be allowed for by the method of §47, it should not be expressed as such in the report.

The treatment of the assets was one of the most difficult of all the actuary's problems, and one of the most difficult arguments of investment managers to counter was that set out in §35. He himself was tending more and more to adopt a realistic valuation of assets and liabilities and then to adjust his valuation of the assets in his 'control' valuation to obtain a reasonably similar valuation result.

Valuation was no cut-and-dried operation. It was clear from the paper that the consulting actuary had to look at the problem from all angles if he was to do his job properly. The authors had done a real service in emphasizing that need.

Mr A. G. MacG. Fraser said that it would be obvious that the paper they were discussing set out the philosophy underlying the authors' modern approach to pension fund valuations. It should be equally obvious that he himself subscribed to the same philosophy.

He intended to confine his remarks to that section of the paper dealing with the pace of funding, because he believed that that was the most important part of a pension fund valuation. It was the root and the heart of the matter. In recent years, as he had gained experience of the financing of pension funds, he had become increasingly dissatisfied with the shortcomings of the conventional valuation methods. In his view the most important failure of those methods was that they gave an imperfect indication as to what pace of funding had been adopted and, perhaps more important, the most appropriate pace of funding. He had been giving increasing thought for some time to the subject of the pace of funding.

The authors referred to the pace of funding quite frequently, from §11 onwards, but their approach was on broad comparative lines, and he suggested that their comparisons lacked a base. They did suggest, in §13, that the normal pace of funding might be defined by reference to the 'normal' contribution rate, but he felt that that did not get them very far. He would say straight away that until very recently he had accepted that situation because he felt there were so many variables, and some of them so imponderable, that it was not possible to quantify the pace of funding; but he had lately changed his mind.

By a lucky chance his colleague Mr J. R. Bradley and he were brooding over a rather different theoretical pension fund problem—the size of a fund in a stationary state—when they hit upon what they felt was a new approach to the problem of the pace of funding. They were pursuing a line of research which they believed to be original and which had already led them to a number of conclusions which enabled them to view a pension fund valuation in a truer perspective.

What they had done was to quantify what they were calling for the moment the 'minimal' pace of funding: it could be defined as the pace which would provide the capital cost of pensions when the members retired—what the authors referred to in §12 as the slowest practical pace. It was in fact a pace of funding which would maintain a fund equal to the liability of the current pensioners only. One attribute of that pace was that it was proof against any inflation during the active membership. A second attribute was that for a given set of benefits and a not abnormal active membership distribution it was virtually constant when, for example, it was expressed as a percentage of the salaries of active members in a salary scheme. It would no doubt be said that merely to maintain a fund equal to the current pensions liability was no way to run a pension fund, and they would not disagree; but the minimal pace provided a datum point which, as far as they were aware, had been missing hitherto.

In the case of an existing fund with pension benefits based on salary, where the fund was naturally well in excess of the liability for current pensions, some part of the total investment income of the fund could be regarded as representing interest at the valuation rate on the amount of the current pensions liability. If

the balance of investment income was entirely derived from irredeemables, so much the better. If that balance of income was expressed as a percentage of the total active members' salaries and deducted from the appropriate minimal pace of funding percentage rate, the answer was a level contribution rate which would take the fund into a stationary position. If he might use a popular analogy, it would put the fund into orbit. It would be inflation-proof except to the extent that the balance of income failed to keep in step with the salary inflation experienced by members of the fund. He did not for one moment suggest that that was the pace of funding to adopt, but with that item of knowledge it was possible to see the effect of departing from the new datum point.

Perhaps he should mention the underlying foundations of the new approach, because he did not think they were readily apparent in his brief description. The first was Income—with a capital 'I'. Their approach considered pension funds in terms of income and not capital. The conventional valuation methods led the opposite way. Where the conventional methods found income they capitalized it and thereby, in his view, created most of their troubles which prevented them from getting a true picture of the valuation results. The authors had tackled the assets on the lines of income, and that, he was sure, was the right approach, but it was only part of the treatment, and should be extended to the other items in the valuation balance sheet.

The second foundation on which Bradley and he had relied was the stationary fund. They had considered a pension fund where there would be a fairly constant flow of new entrants, which would maintain the existing spread of active membership. Then they examined the progress of the fund's assets and liabilities from the current position to an ultimate stationary position. Incidentally, those assumptions enabled the postulation of replacement factors, which were likely to be much easier to deal with than the somewhat intractable problem of withdrawals and select rates, particularly in works schemes. However, that was one of the vistas they had not yet had time to explore.

What he had been describing so far was essentially the result of some theoretical work. He did not propose to go into greater detail, partly because it was theoretical and partly because it was all so recent, and needed some stringent tests to ensure that it had a more general application. Even so, only a few days previously a very peculiar valuation had come up in which their theory had enabled them to provide a viable solution to a problem where, due to lack of precedent and experience, they would—to put it frankly—otherwise have had to resort to trial and error. The fund in question had previously been subject to the fastest pace of funding by any criterion. The whole of the liabilities had been funded after each valuation, ignoring any future contributions. The employer wished to revert to a more conventional pace: what should be his rate of normal contribution? Their research gave them a reasonable answer in a few minutes. The answer also illustrated clearly the high pace of funding which had been reached. It so happened that the fund's assets were entirely in fixed interest securities, so they therefore had a corollary which seemed almost a paradox, that the fund was extremely vulnerable to inflation. That was because the contribution rate, which was related to salary, was relatively low, while the income of the fund was relatively high. The general conclusion could be drawn that in times of rapid inflation a lower pace of funding should be adopted, and conversely. But that was getting away from his main theme and into rather deep waters.

His object in mentioning their researches, which so far were incomplete and untested, was to indicate to other actuaries concerned in pension fund valuations what he thought might well be a new approach to the subject of the pace of funding. If new methods did result, it was probably unlikely that they would displace a conventional presentation of a valuation balance sheet, contrary to what the opener had said. He made that point because he, like the authors, was well aware of the difficulties of explaining to the layman the results of the valuation, and he was very conscious that the new approach also might well be beyond their grasp. He hoped it was not. So it might be that in pension fund valuations in the future they would reach a similar but rather opposite situation to that of the life office, which published a net premium valuation that might seem inexplicable to the layman, while cherishing in secrecy its bonus reserve valuation.

Mr J. P. Holbrook referred to certain theoretical aspects of the authors' suggestion, §§ 23–24, that the rate of interest to be used in valuing assets and liabilities should take into account the trustees' intentions regarding future investment policy. In the case of an established fund which had previously been invested entirely in gilt-edged securities, where the trustees decided to invest a high proportion of new money in ordinary shares, it would appear that the authors suggested that a valuation should be made on the basis of a higher rate of interest than would have been applicable if the trustees had not extended the range of future investments. One consequence of that would be that the value placed by the actuary on the gilt-edged investments already held would be reduced. Admittedly net liabilities would also be reduced, but the reduction in investment values appeared illogical, and it would, he suggested, be difficult to explain to a client. If the fund were invested so that the equated term of the existing assets was greater than that of the net liabilities, the increase in the valuation rate of interest would worsen the valuation result, even though an improvement in the investment earnings of the fund was expected. Those difficulties would not arise under the alternative approach—with which many actuaries were already familiar—of choosing the rate of interest for discounting both assets and liabilities by reference only to the average long-term rates obtainable on gilt-edged investments. On that principle, the value of an asset whose security was not absolute was obtained by discounting the current income and multiplying the result by a probability factor to allow for the risk of default or reduction in income. The idea was implicit in the method discussed by the authors in connexion with ordinary shares and differed only as regards the rate of interest used in the discounting operation. The determination of the probability factors presented difficulties; the concept of yield differentials might be helpful, but that concept would be followed out only in valuing the assets; the liabilities would be valued by reference to the gilt-edged rate. It might be objected that the use of a gilt-edged rate made no allowance for the higher returns which might be obtainable by wise investment outside the gilt-edged market. Equally, however, it ignored the lower returns which might be obtained, even by the wisest investors, if economic conditions changed.

He thought it was inevitable that the modern actuary would tend to be influenced by the situation which had prevailed for a long part of his working lifetime. Perhaps there was a danger that in current discussions of rates of interest and asset values the recent remarkable appreciation of ordinary shares

might be given too much weight, at the expense of the long-term considerations which were fundamental to pension fund work. In those circumstances, a technique which did not take credit for returns in excess of a gilt-edged rate on future investments until they were actually received might be preferable to one in which such excess returns were capitalized, on a necessarily speculative basis, and brought into account immediately.

Mr B. H. Fison referred to § 16, where the authors stated their view that it was the final and sole responsibility of the actuary to decide the valuation basis and the pace of funding to be adopted in a particular case. The opener, in dealing at length with the pace of funding, had used almost the very words that he was going to use himself, namely, that he felt the actuary should *advise* on the pace of funding but that the client should take the *decision* as to the particular pace of funding to be adopted, because he would know his own capital commitments, taxation position and general wages policy.

With regard to investment in ordinary shares, the authors used in § 22 a phrase which had been heard before—'equity shares as a hedge against inflation'. He felt that equity shares should really only be bought on yield considerations as being the most profitable investments for any particular fund, and by 'yield' in that connexion he meant the return secured by the presumably increasing annuity represented by future dividends rather than the dividend-price ratio at the time of purchase. In that context—and provided that the fund was a growing fund—it seemed to him that there was no objection to purchasing shares on a low initial dividend-price ratio if the best possible forecast of the eventual yield showed that it provided a satisfactory margin over, say, the yield obtainable on gilt-edged stocks. At any point in time it was the relationship between the expected yield on the ordinary shares and, say, the yield on Old Consols, representing the long-term gilt-edged interest rate, which determined whether or not ordinary shares were under- or over-valued. It was not directly the traditional yield gap, which, as the opener had mentioned, had lately in fact been reversed. As a corollary to that, he would disagree with the authors' generalization, in § 44, that if it could be taken as certain that equities would always preserve their intrinsic value, and offset at any rate to some extent the effect of a fall in money values, it followed that the proportion to be invested in equities should always be 100%. He felt it very necessary to point out that if equity prices were forced up by the activities of institutional and other investors to levels where the expected yield on the ordinary shares was then felt to be inadequate compared with the gilt-edged yields, in such circumstances ordinary shares would be over-valued and gilt-edged stocks should certainly be bought.

Finally, on the rather thorny subject of inflation, the authors stated that the experience of the past was of little use in determining the possible future trend of inflation, and he took it that in that context they referred to the fact that in the past there had been long periods when monetary values had been stable or had even fallen. Those who had never made any quantitative study of inflation might be interested to learn that there was an article in the *Lloyds Bank Review* of October 1960 by Dr Lipsey, of the London School of Economics, which referred to a price index which had been traced back to the fourteenth century. The index was based on 100 in the middle of the fifteenth century, and the current level was about 4000. That was quite interesting, and Dr Lipsey made the particular point that inflation had generally gone in fits and starts. There had

been five major inflationary periods during the past seven centuries, three of which—and particularly including the period during and immediately following the last war—had left their permanent mark on money values. Two of them, namely, those arising during the Napoleonic Wars and the 1914–18 war, had been followed by more or less severe depressions which had brought money values back to the immediately preceding levels.

When considering the trends that inflation might or might not take in the future, thought should be given to the underlying causes, one of which he felt to be the level of employment. Professor Kendall, in the 1960 Stamp Memorial Lecture, showed a graph relating unemployment to the rate of change in money wage rates. One of Professor Kendall's colleagues had provided some information covering the period 1861 to 1913, and a very smooth curve resulted. Professor Kendall brought the presentation up to date by putting on the graph points for the years 1949–59 inclusive, showing a remarkable degree of correspondence to the way in which the rate of change of money wages had varied with the unemployment level per cent over the past 100 years. It appeared from the graph that a 3% per annum rate of increase of money wage rates—which corresponded to the authors' proposal in their example that 3% should be allowed for inflation—was equivalent to that which arose when unemployment was at 2%. The line showing the rate of change of money wage rates was asymptotic to the axis of that rate of change when unemployment was 1%, so that if unemployment were held for some time at 1% or below, the rate of increase of salaries was infinite; and he felt that, as the government was pledged both to keeping inflation down and to maintaining full employment, it would be most interesting to see how they succeeded in those tasks.

Mr K. M. McKelvey thought the paper an extremely timely one, raising many points which came up for consideration with great frequency in consulting work. He was to a very large extent in agreement with the opinions expressed in the paper. It seemed to him that when an actuary came to make a valuation of an open, growing, pension fund and was thinking about the valuation rate of interest and the treatment of the assets, the only purely unknown factor was the rate of interest at which it would be possible to invest future net accretions to the fund and the redemption proceeds of existing dated assets. It was that unknown future rate of interest which, to him, was implied by the term 'valuation rate of interest'. Bearing in mind that it had to be an average figure for investment year in and year out over the future lifetime of the existing members, he did not see how the actuary could do better, inadequate though it might be, than to take some guidance from the past, and that brought him to a figure between $3\frac{1}{2}\%$ and 4%. Whereabouts in that range the rate was taken should depend upon the investment powers, policy and skill of the trustees. Very similar techniques of valuation would then be applied to liabilities and assets.

It was when inflation was introduced into the picture—as it seemed it must be, if only mentally—that the difficulties really began. He had taken out figures based on the recently completed valuation of a pension fund whose assets at the valuation date had a book value of almost exactly £4 million. The fund was growing by about a quarter of a million pounds a year, pensions were based on final salary, and normal contributions were expressed as a percentage of salary. Up to the valuation date the trustees had always been restricted to fixed interest

investment. If the liabilities were valued at $3\frac{1}{2}\%$, inflation was ignored, and the assets were taken at book value, the valuation disclosed a deficiency of £693,000. Valuing the liabilities at $3\frac{1}{2}\%$ and the assets in the manner suggested by the authors produced a surplus of £108,000. Valuing the liabilities at $5\frac{1}{2}\%$ and allowing for 2% per annum inflation up to retirement, and valuing the assets also at $5\frac{1}{2}\%$, a deficiency of £354,000 was produced, while if the allowance for inflation was continued beyond retirement, the result was a deficiency of just over a million pounds. Finally, a change of $\frac{1}{2}\%$ per annum in the rate of inflation allowed for changed the net result of the valuation by £200,000, taking account of inflation only up to retirement, or £550,000 taking account of it throughout the future lifetime of members. What he found both interesting and depressing about those figures was the wide range of results which could have been found in a contemporary actuarial valuation report. It illustrated the importance and truth of the point made in the paper, that the actuarial valuation of a pension fund could yield no precise answer but was a yardstick for regulating the pace at which the trustees' prospective liabilities were funded. Of the various possible results he had quoted, his own preference was for the one which valued both sides of the balance sheet at $3\frac{1}{2}\%$ and showed a surplus of £108,000. He could not accept the first result because it seemed unrealistic to him (and—what was of the utmost importance—would seem unrealistic to the client, whose confidence in his actuary would be impaired) to present a $3\frac{1}{2}\%$ valuation with assets taken at book values when at the valuation date the fund was yielding nearly $4\frac{3}{4}\%$ on book values.

He had three objections to the methods which included a specific allowance for inflation. The first, which he had illustrated, was that it made an enormous difference whether inflation was allowed for throughout future life or only up to the retiring age. It seemed at first easy to argue that when valuing on the basis of a set of rules which provided a pension based on retiring salary but not for any increase thereafter the actuary should allow only for inflation up to retiring age. If he was to assume future investment at a high rate of interest, like $5\frac{1}{2}\%$, throughout the future lifetime of existing members, it might be difficult to defend the omission of any allowance for inflation after retirement, because the high rates of interest might well prove to be correlated with the presence of inflation. The second objection to making specific allowances for inflation was that it took the actuary further than ever into the realms of guesswork, and a small difference in the assumption made had an enormous effect upon the valuation result. The third objection was that made by the authors in §48.

When there were equities in the pension fund portfolio, failure to make formal allowance for inflation could lead to a curious anomaly. Given a final salary scheme, with normal contributions which were a percentage of salary, the position with a formal allowance for inflation at 2% per annum and using a valuation rate of interest of $5\frac{1}{2}\%$ was that benefits and normal contributions were revalued at $3\frac{1}{2}\%$, or maybe at $3\frac{1}{2}\%$ up to retirement and $5\frac{1}{2}\%$ thereafter if allowance was not made for inflation after retirement; fixed annual deficiency payments were valued at $5\frac{1}{2}\%$, fixed assets at $5\frac{1}{2}\%$, and equities were valued along the lines suggested by the authors in §39, at $3\frac{1}{2}\%$. He was equating θ and θ' as mentioned by the authors in §46. He was not convinced of the justification of distinguishing between them. If £1000 was invested in $3\frac{1}{2}\%$ Funding Stock shortly before the valuation, the nominal amount bought at current prices would be around £1600, and its value at $5\frac{1}{2}\%$ brought into the

valuation would be £1074. Had the same £1000 been invested in an equity currently on a 4% dividend yield basis its value at 3½% would be £1086 (taking the authors' λ as 0.95), which was very close to the £1074 previously mentioned. That was the position with formal allowance for inflation. Omitting any formal allowance, and valuing both liabilities and assets throughout at 3½%, £1600 of 3½% Funding Stock would come into the valuation balance sheet at £1600, whereas the alternative equity share would still come in at only £1086. To raise its value to £1600 λ would have to be increased to about 1.5. He had no doubt that, to meet a long-deferred pension benefit which (whatever the rules might say) had to bear a respectable resemblance to a half of retiring salary, the equity share was the better buy for the pension fund, but he had yet to reconcile the need for a valuation basis which reflected that fact with his reluctance to introduce inflation factors formally into the valuation basis. As a start, he would not bring an equity in at less than book value, even if it had been one of these interesting insurance shares with a dividend yield measured in shillings and pence, but that did not solve the problem that the valuation basis must fully reflect one of the few things that he could be sure of, namely, that the equity share over the next 30 or 40 years was a more valuable acquisition than the gilt-edged stock. An indirect and rough and ready solution lay in the implications of §23, that the valuation rate of interest could be fixed a little higher for an equity-minded fund than for a fixed interest fund.

It was always interesting to talk to intelligent laymen about valuation matters and to try to convince them that both the actuary's feet were somewhere near the ground. The paper was of value in that direction, and he found the two concluding paragraphs particularly refreshing.

Mr G. H. Ross Goobey welcomed the paper and congratulated the authors on the sometimes provocative approach they had made to some of the problems. He was particularly in agreement with their emphasis on the importance of investment policy in almost all aspects of the actuarial valuation. There was one aspect, however, which had been mentioned by other speakers, mainly on a theoretical basis, and that was the pace of funding on which, too, the investment policy should be very much taken into account, in addition to the other factors mentioned in the paper. Generally speaking, so far as the funding by employees was concerned, he would say that the quicker the funding the better. Any reasonably managed pension fund should be able to invest the contributions of its employees at a more remunerative rate than its employees could do for themselves—if in fact they chose to invest at all. With regard to the company's funding, it was perhaps a little more difficult to argue that the fund would put the money to better advantage than the company in its own business; but if the money was properly invested in that sector of the market where the secular trend was upwards, he was sure that the final result should be satisfactory. As a very broad generalization he would say that, if the investment policy was one of equities, a rapid pace of funding should be aimed at, but if, on the other hand, the investment policy or powers of investment were in fixed interest securities and the trustees could not be induced to change it, then the slower the funding the better.

In the past it had been the general experience of most final salary pension funds, where the actuary had made no specific allowance for inflation and where the investment policy had perhaps not overcome the salary strain, for the valua-

tions to produce deficits. The generally accepted practice was for the actuary to recommend to his client to spread the deficit over a period of years, partly with the object of softening the blow to the employer and to fit in with the company's cash resources and to facilitate the allowance for tax. The client usually accepted the actuary's recommendations on the assumption that he need not consider other aspects, and sufficient thought was often not given to the investment implications. If, for instance, he found himself in funds before the end of the period, and in a position to anticipate the outstanding instalments at a time when it was suitable from an investment point of view to do so, it was unlikely that the terms of the arrangement would be altered.

As an actuary employed in commerce he wished to make some comments bearing on the general commercial attitude towards actuaries. He was particularly interested in, and in agreement with, the comments of the authors in §17 on the subject of negative values. In the past there had been a tendency for actuaries to take every opportunity of including margins in some of their assumptions. In a fund like a pension fund, where there were so many factors involved, the cumulative effect of all those safety margins would, in pre-war conditions, be to produce cautious forecasts very wide of the experience. On the other hand, actuaries had in the past refused to make any guess at future inflation, and in a way they had often been fortunate in that overall they produced answers which did approximate to the post-war experience. As a result of their traditional habit of taking opportunities of being on the 'right' side, however, actuaries were in danger of acquiring, in the commercial world, a reputation for excessive caution, for being able, not to forecast accurately, but to forecast so that they would not understate the liabilities—which was of doubtful value. If that idea were to be followed to its logical conclusion there was a danger that they would find commercial firms employing not actuaries but super calculating machines. In the old days nothing pleased an actuary more than for there to be a guaranteed minimum rate of interest for a pension fund. It seemed to remove the necessity for thought on that most important matter of the rate of interest to be used in the valuation, and he often automatically valued at the minimum guaranteed rate, whether it was likely to be realized or not. That sort of attitude tended to lead clients to regard the actuarial profession as very accurate and intricate calculators, but not advisers. He had heard of employers who were suddenly faced with alternative results of a valuation, such as the authors, in §9, suggested should happen, and were completely mystified and their faith in actuaries was rather shaken. He was therefore glad to see the authors' new approach.

Mr Tetley had mentioned the point of the level of pensions once the pension had been entered upon. In §11 the authors said: 'When an employee retires at the normal pension age, the actual amount of the pension itself has now become definite. . . .' More and more there would (he believed) be a movement away from fixed pensions in an attempt to preserve standards of living in the face of inflation. The more the investment trend moved towards investment in equities the more would funds be able to afford that obvious beneficial improvement.

Mr P. Basten said that in the section on the rate of interest in his Presidential Address Mr Redington had warned them of the need to distinguish real things outside themselves from products of their own minds. It would have been helpful if in the paper terms such as 'yield', 'rate of interest', and 'long-term

basic interest rates' had been printed in colours, distinguishing phenomena outside the minds of the authors from those inside. For example, in §24 the term 'rate', in the sense of 'rate of interest', occurred eight times. If he had understood the paragraph correctly, two of those references were to events outside the authors' minds and the remaining six were references to concepts within.

The authors preferred the assumption of a constant yield basis for future purchases and sales to the assumption of a constant rate of interest on book values. He was sure the authors would agree that both of those alternative hypotheses were extremely crude representations of the practical situation, and he was not convinced that the hypothesis favoured by the authors was likely to prove more satisfactory.

The opening sentences of §48 seemed to be an argument against funding rather than against making an allowance for inflation. The figures given in Table 1, however, suggested that, with a suitable investment policy, the advantages of funding would not be prejudiced by a depreciation in the value of the currency.

The authors invited views as to what steps should be taken to allow for inflation. Briefly, his view was that, in the notation of §46, a value for θ of 2% or 3% was desirable in current valuations. Thus for the category described as 'servants' in local government valuations there should be allowance for increases in remuneration of at least 2% per annum compound. Furthermore, he thought the allowance for inflation should be made by steepening the salary scale rather than by reducing the valuation rate of interest.

Mr P. R. Francis wished to comment briefly on two aspects of the paper. In §52 the authors indicated book, market and compound interest values of different classes of investment in a specimen case. For British Government redeemable stocks the compound interest valuation showed a value of 165 against a market value of 128, and for ordinary shares the compound interest valuation produced 380 against a market value of 450. The figures were quite typical of those currently found in practical valuations. The authors went on to multiply the compound interest value of the ordinary shares by a constant λ and in the next few paragraphs they took λ as 0.95, which slightly increased the effect of the point he wished to illustrate. On the figures as shown, if the ordinary shares were to be sold at their market value of 450 and re-invested in British Government redeemable stocks, they would probably end up with a compound interest value of something like 600 against a compound interest value of 380 multiplied by λ . That sort of anomaly was always difficult to deal with, and he thought that the true implication of a valuation on those lines was that the actuary was not, for valuation purposes, prepared to believe in all the future dividend increases anticipated by the market until he saw them; if he was not so prepared, it was difficult to justify the use of a valuation rate of 4% for a fund which was partly invested in ordinary shares as against a rate of 3½% for a fund which was solely invested in fixed interest securities.

In §58 the authors set out eight matters in which the actuary might be concerned as pension fund adviser. He fully agreed that the actuary might be concerned in each and every one of them, but he did not see the actuary in the dominant role in all those matters. To take a particular example, he felt that it was out of place for the actuary to take the dominant role in the setting up of a detailed accounting system for a pension fund—a role which properly belonged

to the accountant—just as it was inappropriate for the accountant to seek to intrude upon the actuary's proper field of deciding whether or not a fund was adequate to meet its future obligations.

Mr J. W. Williams said that Mr Macmillan's words, with which the paper was prefaced, were spoken in Cape Town about developments in Africa, and it therefore seemed appropriate to make a few remarks about the way in which South African pension funds were faring in regard to the matters discussed in the paper. They had had some special problems to contend with, and he did not think they had always dealt with them as clearly as had been done in Britain.

The difficulties caused by inflation increasing salaries to a greater extent than had been anticipated were exacerbated in South Africa because for the last 20 years most employees had received a statutory cost of living allowance in addition to their basic salary. It was originally introduced as a war-time measure to meet what was thought to be a temporary increase in prices due to the war. It had been gradually increased in sympathy with the Government cost of living index, and when he had left South Africa six months earlier it had amounted to over £14 a month in most cases. For a long time it had been generally appreciated that the allowance was permanent, but unfortunately in many pension funds it had only been made pensionable in recent years. Those funds where the pension was based on final or final average salary then had substantial additional liabilities imposed on them. That had been foreseen and some provision made by conserving profits earned by nearly all funds for a long time through their interest earnings and withdrawals being in excess of those assumed in the valuation basis. Some funds still had to increase rates of contribution. Generally the same additional rate was paid by all employees, irrespective of age, so that a subsequent valuation would reveal negative values over a wide range. In those circumstances an unnecessary and unjustifiable strain would have resulted from their exclusion. He agreed with the authors that there should be a flexible approach to negative values in pension fund valuations.

It had gradually come to be appreciated by the trustees of pension funds in South Africa that positive steps should be taken to assist in protecting their funds against inflation. Looking at the profitable ventures of their counterparts in the United Kingdom, and having faith that the tremendous post-war growth of South African industry would continue, some pension funds there started cautiously to invest in property and in ordinary shares of both industrial and commercial companies, as well as in mining finance companies. That move had never to his knowledge been made by the many pension funds of the central or provincial governments or by those of local authorities. Investment in property did not get very far because a Pension Funds Act was passed—it became effective in 1958—and the Registrar of Pension Funds appointed under the Act disapproved; he had consistently maintained that he would only approve of a fund investing in fixed property to the extent of one building for the fund's own use, contending that such investments could involve a clash of interests and that he had found from experience that lack of expert knowledge in the field of property could lead to serious losses. However, the Registrar had not raised any objection to pension funds investing in ordinary shares. Many had substantial investment in mining and industrial and commercial equities. There were virtually no first-class property companies whose shares were quoted on the Stock Exchange in South Africa.

In theory such a policy should have achieved the object of providing a gradually increasing income to counter inflation. Although from an income point of view the past experience had been satisfactory, the outlook was not promising. The 'winds of change' were blowing hard and were certainly not trade winds. Reflecting uncertainty about future dividends, the prices of South African equities had fallen—mining shares more than industrials, but all were considerably lower. Those South African pension funds that had adopted what was thought to be the enlightened policy of investing in equities were doubtless making an 'agonizing reappraisal'. The Pension Funds Act required not less than 40% of assets to be invested in the stocks of the Government, local authorities or certain public utilities. There were other approved categories but they were of minor importance. Long-dated stocks in that group yielded between $5\frac{5}{8}\%$ and 6%, but they too would be reflecting decreased confidence in the future if it was not for Treasury under-pinning. For example, a South African Government stock redeemable in 1967 and quoted only in London yielded about $8\frac{1}{2}\%$ to maturity, which was over 3% more than its counterpart in the South African market. By comparison the dividend/price ratios of ordinary shares of the class that would be purchased by pension funds probably averaged between 8% and 9%. There was no reverse yield gap there!

In such circumstances the rate of interest to be used in the pension fund valuation and the value to be attached to the assets were interesting subjects for debate. In practice, a valuation rate of 4% had been very commonly used in South Africa for some time, and there would clearly be reluctance to change it until the pattern of future events was less obscure. On the other hand, he could not see the Registrar accepting a valuation of assets that exceeded the market value. The method of applying a factor to the dividends valued as of perpetuity would be subject to such a wide margin of error that it would be valueless, although he had much sympathy for its use in the more predictable English background.

The South African actuary's dilemma was very real, and he would regard the problem of providing for future inflation as much less urgent than that of ensuring that proper provision had been made for liabilities computed on the basis of existing purchasing power. The long-term future of South Africa was so unpredictable that the latter task was more than sufficient to tax his ingenuity.

He fully agreed with the authors that the actuary had a continuing responsibility to the trustees in guiding them on investment matters. It was not enough to give a quinquennial review, and probably an admonition. The watching brief should be confined to matters of policy only. It was not desirable, even if practicable, to consider individual investments. In that connexion, he considered it important that the actuary should never place himself in the invidious position of receiving a reward, either directly or indirectly, from a third party with whom the pension fund he was advising had investment transactions. He should not be an investment agent or broker. He knew that that happened regularly in some professions, and he thought it was to be deprecated.

Mr D. H. Miles, discussing the level of funding, developed the analogy with the single premium method of financing life office schemes mentioned by the authors in §12. He would define two expressions: by 'prospective methods of valuation', he meant methods taking account of future pension credits and contributions; by 'single premium methods', he meant those referring only to

accrued pension credits, but in the case of a final salary scheme a salary scale factor would be used. The level of funding was normally lower under a single premium method than under a prospective method of valuation. There was an exception to that where the rate of increase of the salary scale exceeded the rate of interest used in the valuation, but in normal cases a single premium valuation valued the liabilities at a lower level than a prospective method of valuation. Was there any justification for funding at the higher level? As long as the single premium valuation was made on a basis not less stringent than would be needed on winding up, the fund would be solvent in such an event. For normal purposes, as long as an average rate of contribution was used over the funds as a whole, the entry of new members at younger ages would always be a source of surplus. The only occasion when it became inadequate was if the fund were closed, when an increase in contribution rates would be needed. The position might be more serious with a declining membership. Basically it was the intake of new entrants in the future which resulted in reserves set up by prospective valuation being more than was absolutely necessary.

A pension fund differed from a life assurance fund because, whereas a life policy was a fixed contract under which the assurance company had to meet the sum assured, under a pension fund future benefits accrued only if the fund continued in existence, and a continuing fund normally meant continuing new entrants. A single premium valuation might be more realistic than a prospective valuation, in that it avoided bringing into account contributions that might be received many years in the future, when investment conditions might have entirely changed. A single premium valuation in that form did not deal directly with the contributions payable, and that was a defect; in fact, it might be necessary to use a different basis for the calculation of the contributions. But was that a justification for pressing for the contributions needed to produce the higher reserves which the prospective methods of funding required?

Mr K. Sandom referred to the question of the valuation of assets, which had hardly been mentioned in the discussion. In §22 of the paper it was implied that a new fund, completely invested in long-term Government securities yielding 6%, would be valued at, say, $3\frac{1}{2}\%$. Regardless of any appreciation in market values, in five years' time that new fund by the authors' valuation would show assets at a value almost double the original purchase price. He maintained that the method would have to be watched, and an eye should always be kept, not so much on book values—the accountant's 'historic' data—as on market values, which were independent assessments of the prospects of each individual stock and share in the portfolio.

There was no magic in the actuary's estimates of the long-term rate of interest, however scientific the expressions were to convert to present values. The results were subjective to the actuary and arbitrary to the layman. The layman understood market values. If the actuary disclosed the overall market value, adding that a precautionary deduction was necessary because of fluctuations, he was sure he would gain the layman's support. Misconceptions were inevitable, but he thought anybody capable of noting the difference between 'assets' and 'liabilities' should also understand the necessity of retaining margins. The actuary was concerned with the view ahead. He attempted to telescope future events into a single statement for the actuarial balance sheet. The nearest independent value to a replacement cost was surely the market value. He sus-

pected that market values were generally considered, but pension fund members might be protected from the naked truth.

Mr R. W. A. Fowler joined with other speakers in congratulating the authors on bringing out so strongly the changes in pension fund thinking which had come about over the past years. He liked the concept of an actuarial valuation as a determination and review of a funding plan. The essential difference between pension funds and life assurance funds was that the latter were dealing with contracts made between two parties, whereas with the pension fund there was an employer in the background, and although he was not bound to underwrite losses due to, say, unexpected salary increases, it was usually his intention to do so. Consequently, the actuary's function was to ascertain the employer's requirements as to the 'shape' of future funding and then to forecast the requirements of the fund in that 'shape'. Apart from special requests by an employer for heavier or lighter funding, the most satisfactory form would often be on the basis of a level percentage of the salary rate, which was less sensitive to deviations from the assumptions made than other orthodox forms, and it should, if expertly assessed at the outset, be capable of being maintained over a long period. If it was to be so it was essential for the actuary to be as realistic as possible. If he was unduly conservative the results were more appropriate to an employer who wanted a heavy funding than to one who wanted a basis likely to remain level. It was therefore important to 'grasp the nettle' of inflation and to make assumptions which were sensible in the light of the history of the last few years, to estimate withdrawals as near as possible to current levels and to adopt a realistic interest rate. Under the first heading, he thought the tendency over the recent inflationary years had often been such that over a wide range of ages salary rises could be more appropriately described as arithmetical rather than geometrical. In a number of cases that he had examined, the average rises from all sources—inflation, merit and age—in any particular age-group had not differed materially from the average rise of the whole staff. In those circumstances it was not unreasonable to assume that the same pattern would emerge over the future, and to introduce the assumption that all existing salaries would increase by £X per annum. That produced final salaries for the younger members which might appear excessive, but they were far less so than those produced on any assumption involving the continuance of the current percentage increases produced by inflation.

If salaries were treated in the factual way he had suggested, it would be wrong, in his opinion, to be unduly conservative in the matter of interest assumptions, particularly with a fund invested in equities, and, having regard to the table in §29 of the paper, the rate of 4% as a factual estimate of the future seemed too low. One factor could be set off against another by using a comparatively low rate of interest, combined with a non-factual salary scale, but, while it might be pleasing to the actuary to find at subsequent valuations that he had been right for the wrong reasons, it was even more satisfying to find that he had been right for the right reasons!

On the question of valuation of assets he would hesitate to be dogmatic, since so much depended on the way in which the asset value chosen fitted in with the general presentation of the report. The important criterion to be observed was that the valuation rate of interest chosen, when applied to the asset value used, should produce an income to the fund approaching as near as possible in value

to the likely money accruals to the fund in the form of dividends and eventual profit on securities realized.

Mr F. W. Bacon, in closing the discussion, said that in view of the lateness of the hour he would concentrate his remarks on two points on which he found himself in disagreement not only with the authors but with most of the previous speakers, and would leave out all the points of agreement.

He would start by expressing the view that the most important single new feature in modern conditions of which the actuary had to take account was the secular upward trend in wage and salary levels, to which he would refer as 'uplift'. The authors had treated it as being a problem primarily of inflation, but he would suggest that it was equally important to allow for the uplift which occurred as a reflection of increasing productivity and growth in the national economy. The growth in productivity per head, assuming full employment, could be estimated at between 2 and 3% per annum. The degree of future inflation was, as Mr Tetley had expressed in more official language, 'anybody's guess'.

In his view the right way to provide for the contingency of inflation was through the proportion which was invested in equity shares, rather than in the valuation itself. Nevertheless, it was true that equities should reflect rising productivity as well as inflation, and therefore it was only necessary to make specific allowance, in valuing the liabilities, for the proportion not covered by the equity investment, and that could be done either directly in the salary scale or indirectly through the margin between the valuation rate of interest and the rate which it was expected to earn on the fund.

Far less was said in the discussion than he had expected about the question of the valuation of the assets. He suggested that the decisions on how to value the assets depended very largely on the decisions made under the previous heads, and particularly on what allowance was being made in the valuation for 'uplift'. If the interest margin was relied on to cover future uplift it would be wrong to capitalize excess interest in valuing assets. Similarly, if the equities in the portfolio were relied on for that purpose, it would be wrong to take credit for capital appreciation which represented discounting of future dividend increases. Credit could, however, be taken for dividend increases which had already occurred, either directly by capitalizing them or by using a higher valuation rate of interest. The whole problem would become increasingly important in the future as equities fulfilled the purpose for which they had been bought, but how much credit should be taken and in what form was a matter of actuarial judgment, and there was no unique answer.

His second point of disagreement was on the valuing of assets and liabilities at the same rate of interest. He had considerable sympathy with that method, which on the face of it sounded the perfect answer, but there were a number of difficulties. The first had already been mentioned in the discussion: that in a diversified portfolio it was necessary to allow for the risk element. The further the portfolio was from gilt-edged securities the more difficult that became, and so many arbitrary elements had to be introduced that the original principle was in danger of being completely submerged.

Mr Holbrook had mentioned the curious results that could occur if the terms of the assets and the liabilities were not matched, and in that connexion he was reminded that back in the 'Dalton era' he had made a valuation at 3% which

had resulted in a deficiency. Because the fund was earning over $3\frac{1}{4}\%$ he had made another valuation at $3\frac{1}{4}\%$; the result, unfortunately, was a bigger deficiency! He was afraid he had not the authors' courage. He had scrapped the second valuation and returned to the lower interest rate and the lower deficiency. The risk of such an untoward result was likely to increase as the equity content of the portfolio increased, and with it the chance that the mean term of the assets would exceed that of the liabilities. The difficulty really arose because a valuation treated the fund as a closed fund, whereas investment policy treated it as a continuing one, and the suggested method of valuing assets capitalized the difference.

Another objection to the method was that, if the valuation rate represented the long-term average rate of interest on new money, there would be periods in which the actual rate was above the average and others in which it was below. But if a valuation was being made in a period of high interest rates, the method capitalized the excess interest on investments made while yields were high, but no reserve was made for the shortfall of interest on future investments made in the subsequent periods when yields would be low. If a proper reserve was made on that account the values produced corresponded to those which would be obtained if the money were invested at the valuation rate, and in the long term and on the average, by hypothesis, those should be the book values, so perhaps there was something to be said for book values after all!

In conclusion, he would stress that there was no one single method of valuing assets which was always appropriate. The value to be put on the assets had to be considered in relation to the way in which the liabilities were valued, not only or even mainly from the point of view of the rate of interest employed but also from the point of view of the provision made for future uplift.

Mr N. C. Turner (Chairman), in proposing a vote of thanks to the authors, explained that what he was about to say represented the remarks the President would have made had he been able to stay until the end of the meeting.

He would have said that he had previously had occasion to remind them of the great size and rate of growth, whether measured by the number of members or the extent of the assets, of the privately administered pension schemes in Britain. In the case of some, which had statutory authority, there was a measure of official regulation affecting actuarial valuations, but of the remainder only about one-tenth were registered under the Validation Act, and therefore under legal obligation to submit to periodic actuarial investigation. Fortunately, all but a mere handful of the rest were put under a similar obligation by their trust instruments, but in all those cases there was no such central collection, scrutiny and publication of valuation results as the Board of Trade carried out for the life offices. In those circumstances the responsibility resting on the shoulders of the relatively small number of actuaries concerned was in some ways even more grave than that borne by the actuaries to the life offices, and the paper they had been discussing was for that reason the more welcome—not only to those who undertook consulting work, but (since some at least of the problems which it faced were of universal professional application) to them all.

Many speakers—and the authors themselves—had referred to the vital role so often played by ordinary shares in the modern pension fund world. Here the authors' λ , which occupied a middle place in the Greek alphabet, was surely also a fulcrum upon which the valuation process they had outlined inevitably

turned. It was a quarter of a century since they had had a serious industrial depression in Britain. They had forgotten the 'Geddes Axe', and the name of Jarrow had become as remote and meaningless as Peterloo. Was it really true that they lived in a new world altogether, free not only from want and fear, but also from substantial industrial risk—or at any rate from a risk that more than a 5 % reduction could ever fall upon their current dividends?

What did a professional man do, whose work involved uncertainties? He had, he believed, three plain duties: first, to seek constantly to expand his knowledge; secondly, to walk confidently in those areas already illuminated with the light of comprehension; and, thirdly, in those areas of darkness into which his understanding had not yet penetrated, to proceed with great caution. The paper under discussion had helped them with all three duties. The authors would, he knew, be the first to agree that the need was for more and more thinking about those heavy tasks and difficult problems, but those present would all acknowledge that the paper, and the discussion to which it had given rise, had shed more light into the dark places.

Mr Geoffrey Heywood, in acknowledging the vote of thanks, said that they were conscious that the paper contained a number of ideas which differed considerably from what they had called orthodox actuarial practice. Those ideas would, a few years earlier, have been rejected out of hand. Who, for example, would have dared, as did the opener, to speak of the 'mumbo jumbo of negative values'? Even the authors had hesitated to be quite so forthright! But he could say that in an early draft of the paper that particular paragraph was headed 'The Nonsense of Negative Values'.

In view of the controversial nature of those ideas it was very satisfying to the authors to find—although they had been criticized in detail, as they fully expected—general agreement in principle, and also to find that a number of actuaries were carrying out some of those ideas in their day-to-day work.

They were very much aware of the need to try to measure or quantify the pace of funding of a pension fund. They had one or two ideas on the subject, but as yet they were not by any means sufficiently far developed to warrant inclusion in the paper. But he particularly welcomed the comments of those who spoke about the subject—Mr Fraser and Mr Miles—and he would encourage them to go on with their ideas and researches, in the hope that they might ultimately write Chapter 2 of that particular exercise.

On the presentation of results and the closely allied subject of determining λ , he would sidestep the problem of fixing the numerical value of λ , but in the whole of that area he was reminded very much of the views expressed by their President in his Address. He had said that the determination of the valuation basis of a pension fund was the art, and that the valuation process was the science. In presenting the results to the client and in deciding upon the value of λ the actuary was, he felt, once again moving into the sphere of the art.

The final point he wished to make was on the last section of the paper, on the role of the actuary as a pension fund adviser. He was very glad to see that some people agreed with the authors' views. Some of the 'fringe' actuarial activities were, he thought, not regarded by some as quite within the actuary's proper sphere. He contested that view very strongly, especially on the subject of investments. But in all those areas there was a crying need for help and assistance and advice on pension matters from one end of the country to the other.

There were, he believed—in fact, he was told—others besides consulting actuaries operating in the field of pensions, who were only too willing to give such help and assistance with all the energy and force they could muster. If, therefore, the actuary's clients required such help, then, if he was to give the same service as others, he would inevitably become involved in those particular fields; and who was better qualified to give such advice? By doing so the actuary was meeting a real need of the executives concerned with pension funds. At the same time he was enhancing the prestige of the actuary, and in turn the prestige of the Institute itself.

The following written communications have been received:

Mr J. G. Day: Although basically it is income that matters for pension funds, I am disturbed at the idea expressed in the paper that an actuary should be prepared to value ordinary shares in a way quite independent of market value, and that it should be presumed that his value would be superior to that of the market (even if market value can only be used in an adjusted form, due to the rate of interest used in valuing the liabilities).

Valuing equities by reference to income has several obvious objections. One is valuing on last year's dividends, when it is future income that matters. A switch of investments, at equal market value, but different dividend yield, may involve the fund in a notional profit or loss. The market is a consensus of investors' views and if one buys equities on a current yield basis that is below that on undated gilt-edged stocks then clearly it is because one believes that dividends will rise, whether the reason is because of high current undistributed earnings, future earnings being ploughed back, the secular economic trend, or inflation. If one believes that one or more of these factors will apply then clearly one should value equities on a basis which allows for increased dividends—as current market values, with a reversed yield gap, do.

I would admit that there are three valid objections to market value for a pension fund valuation:

- (a) The market produces values which balance marginal buyers and marginal sellers.
- (b) Ordinary share market prices are mainly determined by tax-paying investors whereas pension funds are 'gross' investors, so that dividends are more valuable to them *vis-à-vis* capital profits or losses.
- (c) The net U.K. rate of tax applicable to a dividend definitely affects the value of that share to a pension fund.

Of these three objections, (c) is completely fair and valid; (b) has some basis, but if one argues along these lines, then one should also be prepared to apply the argument to investment policy—and very few trustees would agree to that; (a) is often over-emphasized, it may be true of fluctuations, but it is not true of the general trend of values (and if equities were greatly over-valued, pension funds ought to sell them).

Basing a valuation of ordinary shares on last year's dividends, with a factor of individual judgment λ , seems to me to be laying oneself open to extreme error. I favour a formula akin to that of Gilley & Funnell, but making some allowance for objections (a), (b) and (c) above:

$$\alpha\beta \frac{\sum_{MV}}{C_{MV}} \times C_A,$$

where Σ_{MV} , C_A and C_{MV} have the same meanings as in §40, α is a factor to adjust for tax that is not reclaimable due to net U.K. rates of tax being less than 7s. 9d. That is

$$\alpha = \frac{\text{net dividends plus tax reclaimed}}{\text{gross dividends}}$$

and β is a factor to allow for the element of risk, as when valuing reversions, so that it will cover fluctuations in value.

It may be objected that the formula still contains an arbitrary factor, but one is adjusting market value, a market value that is based on future expectations, not on last year's dividend, and one is applying two factors, one being known and calculable, thus narrowing the range for judgment on the arbitrary factor.

Mr J. R. Hemsted: Having listened with great interest to the discussion I think there are still several points worth making.

The first concerns inflation. In an expanding economy a rising standard of living could produce quite considerable salary inflation even in times of stable money. It has been established, according to Sir Roy Harrod, that there is no correlation between the degree of inflation and the rate of growth in the economy, i.e. in standard of living. A pension fund based on final salaries must attempt to immunize both against rising salaries (measured in real values) and against falling money values.

Fortunately the same treatment seems likely to immunize against both. Rising standards derive from increased productivity which in turn is based on increasing capital backing per employee. Much of this increased capital arises from retained earnings by industrial companies and these retentions in a period of expansion produce increasing equity asset values per share. There is therefore reason to think that ordinary shares have a built-in correction not only for falling money values but also for increasing standards of living, provided of course they are bought at the right price.

Considering the valuation rate of interest, I do not regard the adoption of a historical long-term gilt-edged fixed interest yield as theoretically sound. This yield was established in days of the gold standard, when there was relatively little gilt-edged stock in issue and quite a big demand from trust funds which had to provide guaranteed income. At the time these incomes were bought it was believed that they would maintain their purchasing power and, had the matter been given any thought, perhaps even keep pace with the then slow increase in standard of living. In these more enlightened days investors still look for about the same initial rate—say $3\frac{1}{2}\%$ —on investments of the 'standard of living' type, and a rather higher return where there is real value, with some risk, or where the income is fixed on money values.

To me, therefore, the 'nigger in the woodpile' is the idea of a historic long-term fixed interest yield. In my opinion we should value current rates of contribution, pensions, and equity dividends at about the same rate as proposed—say $3\frac{1}{2}\%$ —but value fixed income securities at a higher rate, say 7% . This would remove the present anomalies existing between valuation results, market values, and investment policy, and should result in funds being invested in such a way that growth in income in times of salary inflation will prevent deficiencies from arising.

Investment policy could be directed towards getting an overall initial yield of $3\frac{1}{2}\%$ or better, on a good spread of equities. The fact that this target could

have been fairly easily attained in the past suggests that this valuation basis is quite a conservative one.

It would probably bring home to trustees and accountants the real nature of equity investments if they could be persuaded to take credit in the revenue account for retained net earnings as well as gross dividends paid, and at the same time add the retained net earnings to the book value (cost) of the security. This would give effect in the accounts to the fact that, for any share, part of the equity earnings has been received net and the same amount reinvested in the company. This practice would result in the book value more nearly keeping pace in the long term with growing market value and would enable the actuary to demonstrate that there is quite a big margin of income over the valuation rate adopted.

Mr P. F. Hooker: I am very sorry to draw attention to something which seems to me to be a blemish in an otherwise excellent paper, but I feel that in the interests of students I must register a protest at the sentence in §25: 'The first assumption could not be more out of touch with the present-day facts in a large fund.' The assumption in question (that interest earnings are all received at the end of the year) is not, as the authors seem to imply, an unpractical assumption arbitrarily made by text-book writers in order that they may be able to reproduce the formula $2I/(A+B-I)$, but is a fundamental part of the theory of the effective rate of interest. In accordance with that theory, all interest received during the year is assumed to be immediately reinvested and therefore must not be brought into account until the end of the year in the derivation of the effective rate. The formula gives the effective rate of interest just as accurately as the formula $2I/(A+B)$ gives the force of interest.

Admittedly the formula is of very limited value, since it merely gives the running yield on book values, but let us not condemn it for a fault which it does not possess.

Mr R. C. B. Lane: The paper is largely concerned with the typical prospective valuation and the technical assumptions on which it is based but there is an alternative and in many ways complementary approach which is often most informative. I refer to the analysis of surplus or, as I prefer to call it, the reconciliation of the current with the previous valuation. Alternatively, it may be thought of as a retrospective valuation working from the position last time to the position now. An actuary will almost always conduct such an investigation, partly to confirm his results and partly to understand them better, but it is not as common as it well might be for the results to be included in reasonable detail in the report to the client.

If a table is set out, starting with the surplus or deficiency last time, and valuation profits and losses are added or subtracted under their various heads to arrive at a fairly close agreement with the surplus or deficiency now, the true working of the fund is clear for all to see. There is much less risk of confusion between fortuitous 'once for all' changes, and continuing sources of profit or loss, so that the progress of the fund into the future, up to the next valuation, can begin to be appreciated: the surplus interest, for example, over a conservative valuation rate, shows immediately as a continuing profit—the investment manager seeing it as such and being the less likely to think himself cheated by an over-cautious actuary of all credit for his good work: the importance, or other-

wise, of withdrawal profits is immediately apparent. It is, in my opinion, not too much to say that a valuation is incomplete without at least a rough attempt at such a reconciliation. With a little care it is surprising how well it all works out in actual practice.

Moreover, the detail given in a valuation, it also seems to me, is sometimes deficient in the way it is broken down and analysed. Too often bulk figures are given for a liability without any attempt being made to separate that part of the liability attributable to past service from that due to future service or that part due to current salaries from that due to the assumptions regarding future increments. If divisions of this kind are very clearly made certain important aspects of the fund's operations, it seems to me, become much clearer. To what extent is the provision of liability for past service still dependent on future contributions and not on accumulated and invested funds? To what extent will the fund prove sensitive to future salary increments of an excessive character? Broken down in this way, the answers to such questions, and others, become much more apparent and it is only upon a sound appreciation of such points that the company's officials can hope to make the right decisions regarding the most suitable pace of funding in the immediate future. In the process, too, a valuation is taken out of the realms of mathematical abstraction, not really capable of being fully appreciated except against an actuarial background, into the realms of straightforward and simple finance.

Mr M. D. Thornton, F.F.A.: The authors would add to the already considerable value of their paper if they would be so kind as to supply the following additional information.

(1) If as is suggested in §9 of the paper the valuation result can be regarded as lying between x and y , and if the figure of 63 in §56 is to be regarded as in the lower part of the range of possible values, could the authors also give a figure in the upper part of this range? We could then agree, not that any valuation result outside the range of 63 to k (if that is the figure) was necessarily unjustifiable, but at least that any valuation result lying within this range was, on the face of it, reasonable.

(2) How would the authors vary their valuation basis so as to produce the surplus of k ? Would they keep the valuation rate of interest unaltered but take a different value of λ , and if so what would that value be?

(3) What valuation rates of interest by the orthodox method would produce surpluses of 63 units and k units (the valuation basis being otherwise the same as that which with 4% interest produced a deficiency of 20 units)?

This information would give a numerical comparison of the two methods which would be most helpful. For example, it is difficult at the moment to see what difference it would make to the enlightenment of the client in the discussions of the valuation results at an early stage as recommended in §16, if the orthodox method, rather than the new method, had been used to produce the results, provided the results themselves were reasonable. In fact, would not the orthodox method provide a better background for discussion (explaining the rate of interest which it is assumed the Trustees will earn on their present fund and on new money) than the new method (explaining to the Trustees the chosen method of valuing the assets and in particular the equity holdings)?

Mr W. V. Webb, F.F.A.: I would like to refer to §23 which relates to the valuation rate of interest, and §39 which deals with the valuation of ordinary shares.

The authors indicate that the valuation rate of interest should be based upon the proportions of the fund which are invested in fixed interest securities and in equity investments, and upon the estimated average long-term rate of interest which will be earned in future in each class.

I suggest that the long-term rate of interest for a given class of investment may be related to that for gilt-edged. For equity investments, for example, the rate would be higher than that for gilt-edged for three reasons: first, there is a greater risk of loss of capital and income—the component of the excess allowing for this risk is in the nature of an insurance premium; secondly, the expense of investing in equities, and of looking after the portfolio of investments, is likely to be greater; where these expenses are met from the fund, and are not specifically allowed for in the valuation, they represent a reduction in the interest rate; thirdly, some reward may be expected for undertaking this extra risk and expense.

In assessing the valuation rate of interest, it would seem reasonable to take account only of the third item. Suppose that the long-term rate for equities is assessed at 1% higher than that for gilt-edged and that this third item is taken as $\frac{1}{2}$ %, then for a fund invested half in gilt-edged and half in equities, the valuation rate would be $\frac{1}{4}$ % higher than the estimated long-term gilt-edged rate.

In §39, a capital value is calculated for the equity investments by taking a proportion λ of the total current dividends divided by the valuation rate of interest, where λ is an arbitrary multiplier. I feel that λ should not exceed the proportion of the estimated long-term rate on equities for which credit is taken in assessing the valuation rate of interest. On the basis of the figures I have already used, and taking the long-term gilt-edged rate as $3\frac{1}{2}$ %, the value of λ should not exceed about 0.9. If the quality of any of the equities held by the fund was in doubt, a lower proportion should be taken.

This approach gives no credit for future increases in dividends from any growth stocks in the portfolio. The value of such increases is difficult to quantify, but if they do occur, succeeding valuations will give credit for increases already earned.

The Authors subsequently wrote as follows: After having had an opportunity of reading the discussion on the paper we were again struck by the unanimity of views in support of some of the ideas and methods which we have put forward. In particular a flexible approach to funding and a consistent basis for the valuation of assets were accepted almost without dissent, while the suggested treatment of negative values, which we expected to be more controversial, was welcomed by a number of speakers. It would now appear that the elimination of negative values in pension fund valuations may only occur very infrequently and in the most unusual circumstances.

There are two points raised by Mr Tetley on which we would like to comment. The view that employees' contributions are separately identifiable is one which seems to be quite widely held, but in our opinion this is largely a convention and a matter of practical expedience for which there appears to be no reason of principle. It is true that an employee on withdrawing from a pension fund usually receives a benefit which is expressed in terms of contributions he himself has made to that fund. This, however, is merely a way of calculating one of the benefits he is to receive and does not seem to be a valid reason for treating the employee's contributions on any different basis from those made by the

employer or indeed from any other sources of income to the fund. Another aspect of the same matter is that it is sometimes suggested that the employee's contributions, being different in nature from those of the employer, should be invested in a different way, for example by investing them in gilt-edged securities, while the other income of the fund may be invested in equities. We do not agree with this view and maintain that all the income to the fund should be treated equally from the investment point of view.

Mr Tetley's second point was that in the case of a closed fund different considerations arise and with this point we entirely agree. The general tenor of the paper was in connexion with open and growing funds and once a fund has become closed the investment problem takes on quite a different aspect and the question of matching assets and liabilities becomes most important.

We also welcomed the comments made by Mr Tetley on the subject of Hardy's formula, which matter Mr Hooker in his written contribution dealt with in more detail. We find this a difficult subject but our main objection to the formula, which we reiterate, is the difficulty which clients find in understanding the way the yield has been calculated. We did not intend to suggest that the alternative formula for the force of interest was theoretically more accurate in producing the force of interest than is Hardy's formula in producing the effective rate of interest, but it matters little in practice which result is used and the force of interest formula is more easily understood by the client. It has, however, perhaps been not inopportune to review Hardy's formula after its pre-eminent position for some sixty years even though we have to agree that it appears to have survived the discussion unscathed.

A number of speakers referred to the question of the actuary's responsibility in determining the pace of funding. They thought that the final responsibility lay with the client rather than with the actuary as suggested in the paper. On reflection we accept the criticism, but if a proper state of confidence exists between the client and his actuary, then in the great majority of cases the pace of funding which the actuary advises will be that which is finally accepted. In this connexion Mr Barnett remarked that he did not think that any impression should be given that the valuation result was something which was negotiable. We hope that he did not mean by this that the valuation result is something which is to be decided by the actuary in isolation and then presented to the client as a *fait accompli*. This is the very concept which we have made one of the main points of our paper, and from the point of view that the pace of funding is something which can vary within certain limits and that the valuation result has a range of possible values we do not agree with Mr Barnett's contention.

We were glad to note that there was a wide measure of agreement with the opinion that the so-called actuarial rate of interest is largely irrelevant when considering the proper investment policy which should be pursued in a fund and that it should not influence the investments purchased but rather that they should be selected on their merits.

It was interesting to learn from Mr Williams how the problems which face us in the United Kingdom have been tackled in South Africa against a very different background. In particular it was significant that there seems to be general allowance for inflation in pension fund valuations in that country, whereas it seems that in the United Kingdom such a general allowance is not normally made. Another point made by Mr Williams was that it is the general policy for consulting actuaries in South Africa to advise on investment principles

but not to advise on the selection of individual securities. In this country the practice of actuaries in advising on investments varies to some extent, but we are strongly of the opinion that provided the actuary concerned has taken the trouble over a number of years to study carefully the ordinary shares of leading companies, then with his background knowledge of the financial structure of the fund he is well qualified to give detailed advice on individual investments.

We now consider the points raised by Mr Thornton in his written contribution to the discussion, and make the following comments:

(1) We would regard the valuation result of a surplus of 63 units as set out in § 56 not as being in the lower part of the range of possible values, but as being in the middle. It is difficult to be precise on the actual range of x and y , as this depends on the pace of funding which is considered appropriate having regard to the general financial background of the company. It is one of the major contentions of our paper that the actuarial valuation in modern times is often an instrument to be used to help to determine the pace of funding to be adopted by the employer from time to time, and to the extent that this is true, any discussion of a valuation result as a piece of mathematics divorced from other relevant financial facts must be abortive and indeed meaningless. However, as a general indication of our feelings in the hypothetical example in the paper we think that the lower limit might be 50 units less than the mean and the upper limit 50 units greater than the mean.

(2) A particular valuation result within the limits x and y may be brought out by altering the pace of funding, by setting up special reserves, by considering the treatment of negative values, or by varying the value of λ when there are equity shares in the portfolio.

(3) In the case of the orthodox method the valuation rate of interest to produce a surplus of 63 units would be 4.4%. As one would not normally value at rates of interest other than in multiples of $\frac{1}{4}$ %, a rate of interest of $4\frac{1}{2}$ % per annum would have to be assumed to produce this arithmetical result.

Finally, we still maintain that the presentation of results as set out in the paper is more likely to be considered reasonable by the client than the basis of the orthodox method. This is borne out by our experience, especially in recent times, when it has not been by any means easy to convince a client that the orthodox method is sensible since it requires that ordinary shares should be taken at book value when their market value is possibly as great as twice this amount or even more, while at the same time fixed interest assets are taken at book values which are well above their market values, although perhaps below their redemption values.

In conclusion, we are conscious that the ideas on the pace of funding are very much in their infancy and much further thought and research should be devoted to this problem in the hope of being able to clarify the ideas and eventually to devise methods of quantifying this concept. We would hope, therefore, that those speakers in the discussion who indicated that they were already thinking on these lines will be encouraged to pursue their researches and submit the results to the Institute.