

THE ACTUARIAL MANAGEMENT OF A LIFE OFFICE

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IN recent years an unusually high proportion of the papers submitted to the Institute and to the Faculty have dealt with technical problems of life assurance management. The subjects covered include investment policy, valuation and bonus policy, the relationship between liabilities and assets and the relative merits of with-profit and without-profit business. The object of this paper is to indicate how these various subjects (with the addition of new-business policy) react on each other and to consider how far any over-all actuarial planning is possible, special regard being paid to modern developments in the different fields. Some repetition of what has already been said in recent years is inevitable, but no attempt will be made to summarize actuarial opinion on the topics under review, a task which would be impossible within the scope of the paper.

NEW-BUSINESS POLICY

2. It is natural to start a general review with a few remarks on new business, if for no other reason than that the new business underwritten by one generation provides many of the problems of succeeding generations. We shall refer only to those aspects of new-business policy which concern the actuary. Before doing so, however, we shall mention three fundamental non-actuarial considerations which must be kept in mind.

(a) The type of new business which can be written must be in general accord with the requirements and wishes of the public and with the economic and social conditions of the times. Only to a limited extent can assurance companies dictate the type of business they wish to transact.

(b) An assurance company is influenced in its new-business policy by its traditions and its past history. For the most part, life assurance is sold to the public by inspectors and agents backed by suitable literature and publicity concentrated on the office's special features. The direction of the sales effort cannot be drastically altered, e.g. by concentrating on with-profit instead of non-profit business or featuring one type of policy instead of another, without causing confusion among the sales staff and perhaps seriously affecting production. It follows that any major change should be undertaken mainly with an eye to long-term developments and not merely as a temporary expedient.

(c) To operate efficiently, a new-business organization must always work at 'full speed'. If, therefore, it is desired to limit the business transacted, this must be done by adjusting the terms on which it is offered to the public, not by asking the field staff to work at 'half-speed'.

Notwithstanding these considerations, new-business policy is a proper field for actuarial planning so long as the practical limitations are not forgotten.

3. Rightly or wrongly, the assumption is usually made that it is a good thing to transact a large and increasing volume of new business. Whereas in most industries an institution's prosperity is measured by the level of its profits, there is a tendency to measure the progress of a life office by its new sums assured regardless of type or profitability. Moreover, since the actual profit or loss on a particular block of new business will not be apparent for many years to come, one of the main safeguards which exists in most forms of industry against transacting unprofitable business is not present in life assurance.

The question may be asked whether the transaction of a large volume of business is to the public good. We should not be unduly influenced by the argument that, on economic grounds, it is desirable to encourage savings and combat inflation. At least, if this argument is conceded we should also concede the converse, namely, that in a depression such as that which occurred in the early 1930's, insurance companies should discourage new business and advise policyholders to borrow on their policies and spend the cash. There are, however, social as well as economic arguments, and most of us would maintain that an increase in life assurance and pensions business of the right type is a desirable object, always provided that it can be transacted at the right price.

4. On general grounds, it may be argued that a steady and moderate expansion of both new sums assured and new premiums is the ideal state of affairs from the standpoint of the office. Rapid expansion may only be possible if the office is prepared to transact business on unprofitable terms and will certainly bring with it difficult problems of organization, although occasions may arise when special circumstances, e.g. the opening up of new territories or the introduction of new types of business, justify rapid expansion. Contraction of business, on the other hand, is bad for morale and will eventually lead to the awkward task of reducing overhead costs.

NEW BUSINESS—FACTORS WHICH DETERMINE ITS AMOUNT

5. The principal factors are as follows:

- (a) The total amount available to offices as a whole—an amount which depends *inter alia* on trade conditions.
- (b) The efficiency of the office's organization.
- (c) The office's reputation and its past results.
- (d) The rates of premium for non-profit policies.
- (e) The commission terms.
- (f) The number of the field staff.

The first two factors do not call for any comment from the standpoint of the actuary.

6. Factor (c) relates primarily to with-profit business. From the standpoint of the existing with-profit policyholders, the accretion of increasing numbers of participating contracts would not be welcome if the bonus-earning power of the new business were substantially less than that of the existing fund. A special case of this kind will be discussed in the section headed 'Distribution of surplus'. In the general case, where the excess

earning power comes from miscellaneous sources or arises out of free reserves built up over a long period, it would be inequitable to regard the resulting surplus as the exclusive property of those who happen to hold participating policies at a particular moment. In general, therefore, there would be no justification either for closing the fund or for ceasing to transact new with-profit business in the interests of the existing policyholders. Only if the conditions were such that the new business seemed likely to rise to flood level might there be justification, in the interests of equity, for an increase in premium rates sufficient to regulate the flow to a more normal volume.

7. Premium rates are a powerful factor in regulating the flow of new non-profit business. It is clearly in the public interest that there should be competition to ensure that profit margins are not excessive. As in most industries, the argument is sometimes advanced that competition is wasteful and leads to the cutting of rates to uneconomic levels. Perhaps the danger is a more insidious one in life assurance with its long-term contracts than in industry generally, but nevertheless agreements to maintain premium rates are unsound in principle.

If competition provides protection for the general public, the responsibility for protecting the office against entering into unsound contracts rests in the first place with the actuary. The transaction of non-profit assurance business is a commercial undertaking, and the holders of the equity in the office, whether they be shareholders or holders of with-profit policies, are entitled to expect a fair profit in return for the protection they have given to the policyholders as a whole by the capital they have subscribed or the bonus loadings they have paid. It is the actuary's function to determine the rates of premium which will in his view make the chances of profit and loss equal and then to add a suitable margin for profit. The size of the margin must depend on circumstances as well as on individual opinion. Broadly speaking, we should have thought an average margin of 5% over the whole non-profit business the minimum which an office should aim to secure, but if the proportion of with-profit business is small, a larger margin may be desirable (see §16 *et seq.*). Naturally the percentage margin should depend on the type of business, a larger percentage being advisable when the contingencies involved are specially difficult to measure and *vice versa*. Short-term endowment assurance rates, for example, require only a small margin, while deferred annuity rates, involving an estimate of interest and mortality over the next half-century, should contain a relatively big profit margin.

The actuary must expect pressure from the new-business department to cut down the margin in the rates in order to secure more business and, while the final decision may not be in his hands, he has the duty of estimating the effect of a proposed cut and explaining the position to the management. It may be urged that it is better to have a small percentage margin on a large volume of business rather than a larger percentage margin on a smaller amount of business. Obviously this contention cannot be maintained if it will result in a fall in the total profit, but even if an increase in the total profit is likely, the percentage margin should not be reduced to a level at which the expected profit is inadequate in proportion to the volume of business.

An expected saving in expenses per unit is a legitimate item to include in estimating the profit which will accrue to the office if business expands, but any suggestion that a big expansion of business will result in major economies in working expenses requires careful examination. The proportion of the

expenses in a life office which are independent of the amount of business transacted is small and there is no evidence that size and economy of management go together. While it is always difficult to forecast the effect of increased business on expenses, it is one of the actuary's tasks to see that the problem is faced in a realistic way.

Where a serious fall in new business is feared, the actuary's position is a difficult one. It may not always be possible, or even desirable, to resist the pressure to cut premium rates, but at least it is essential that the actuary should make clear to the management what is the cost of the concession. If a substantial amount of with-profit business is transacted, the office will have more freedom to vary its non-profit rates—downwards without the risk of its safety being impaired, or upwards without so serious a fall in its total new business.

8. Commission rates can in certain circumstances have a big influence on the level of new business. This, however, is a controversial subject involving matters which are not primarily of actuarial interest and we shall resist the temptation to discuss it here.

9. Other things being equal, the amount of new business depends on the size of the field staff, but the relation is not a simple one. While the appointment of an additional inspector will, of course, tend to increase new business, it will not necessarily reduce the unit cost. Beyond a certain point in the expansion of the field staff, further spreading of the existing overhead expenses may be more than balanced by the reduction in the area of territory per inspector and the increased difficulty of giving close supervision. Similar considerations have to be weighed when the opening of a new branch is contemplated, since the increase in business must eventually be sufficient to carry the additional overhead expenses which are entailed. Careful costing is advisable before a decision is reached and, while the matter may not lie strictly in the actuary's province, he is well qualified to pose the problem in a realistic way.

NEW-BUSINESS POLICY—CLASS OF BUSINESS

10. As we have indicated, the control which an office can exercise over the class of business transacted is severely limited. Nevertheless, certain general considerations may be worth mentioning. With the ideal of steady expansion in mind, long-term business is more attractive than are short-term contracts which will soon have to be replaced if premium income is to be maintained. Such contracts as short-term endowments, although they serve a purpose to the holders and give a fillip to the new-business figures, are little more than deposits and are not really a suitable type of business for an assurance office. It is the special function of the assurance offices to deal in long-term contracts, more particularly those involving life contingencies in a high degree. From this standpoint, the development of pension-scheme business is eminently suitable both by virtue of the importance of the mortality element and because of the steady growth which it involves.

On the occasions when an office can exercise control over class of business in a positive way, decisions of the first magnitude may well be involved. A good example is the introduction of various kinds of retirement benefit schemes in recent years. The whole future of an office might depend on the decision taken as to whether or not it should enter these fields.

11. Immediate annuity business is a special case of a type of new business which can be switched on or off at short notice without detriment to the organization. Such contracts, being essentially straightforward, are sold largely on rates and no elaborate sales organization is necessary. As annuity rates depend on the level of interest rates at the date of purchase rather than the average level during the lifetime of the contract, they must in any case be liable to frequent alteration. The cost of administration is small and there is therefore no reason why an office's competitive position should not be altered frequently and at short notice according to the management's ideas as to the profitability of the business in current conditions.

WITH-PROFIT AND WITHOUT-PROFIT ASSURANCES

12. In a paper by J. B. Dow read at the Faculty of Actuaries Centenary, this subject is discussed from the angle of the office transacting a high proportion of non-profit business. We should like to supplement his paper by devising a rough measure of the protection afforded by with-profit business of the traditional type.

For this purpose we find it more illuminating to consider representative examples of individual policies than to use a model office. Figures are given in Appendix A relating to with-profit and without-profit endowment assurances maturing at age 65 for terms of 20 and 30 years. It has been assumed that the past experience has been in accordance with the assumptions made in calculating the premiums and that the bonus declared in the past has been at the rate for which the premiums were loaded, i.e. 30s. % compound, in other words there has been no surplus from other sources. Interest has been taken at 3 % net with A 1924-29 Light mortality and initial expenses at £3 %. The tables show in the first place the full reserve values at quinquennial intervals calculated on the same basis as the premiums.

13. The first margin which with-profit policies provide against adverse experience lies in the surplus which has accrued since the last declaration of bonus. We shall assume that, although the calculations are based on a bonus compounding annually, profits would be distributed only once every five years. On the assumptions stated, the margin from this source would be zero at the beginning of the quinquennium and would rise to a maximum value immediately before a vested bonus was declared. The tables show these maximum values, i.e. the amount required to provide five years' bonus at 30s. % compound. For an office declaring a bonus more frequently the margin would be smaller—an argument against too frequent declarations. If we assume an even distribution of business at different durations, the margin provided by five years' bonus would be rather over 10% of reserves.

14. The remaining protection inherent in with-profit policies lies in the reserve for future bonus, i.e. the excess of the full reserve over that which would be required if no further bonuses were declared. The greater part of this margin is of value only to the extent that the policies are maintained in force. When a policy is surrendered the office keeps the excess of the reserve value over any guaranteed surrender value and to that extent has some margin against loss whether the contract is with or without profit. If an office does not guarantee surrender values, it may be argued that the whole reserve is available as a margin. The position in those cases where recent quotations

had been made or where loans had been granted either by the office or another party, would, however, be open to question, and in practice the office would wish to adhere to its old surrender value basis if possible. Typical surrender values are shown in the table along with the excess of reserves over surrender values. It has been assumed that bonuses at 30s. are vested right up to the date of surrender.

For paid-up policies it has been assumed that proportional values would be allowed and that existing bonuses to date would be added. These paid-up policies have been valued by the same table as was used for calculating premiums but without making any allowance for the value of future bonuses. Even if the practice of the office is to allow paid-up policies to participate, there is no guarantee that any bonuses will be paid in future and no liability need be assumed. Accordingly the same reversionary factor has been used for both with-profit and without-profit policies.

In proportion to the corresponding reserves, the with-profit policies provide bigger, but only slightly bigger, protection to the office than those without-profit in the event of surrender, but the margins are relatively greater for the participating contracts if paid-up policies are taken.

15. To make a proper comparison, some assumption must be made as to the proportion of policies which will be maintained. Considering first the with-profit office, it is noteworthy that during the Second World War non-profit policies gained in popularity, but there was no major move to give up existing with-profit contracts or to convert them to the non-profit class. It is probable therefore that in most circumstances a with-profit office would have the protection of the surplus accruing up to the end of the current quinquennium (assuming bonuses to be declared only once in five years)—in other words the faith of its policyholders would at least survive until the office failed to declare a vested bonus. Using the same illustration as before, this would ensure a margin of over 10%. Thereafter we must allow for a certain proportion of discontinuances. It should be very much on the safe side to assume that only one-third of the policies are continued in full, one-third being surrendered for cash and one-third made paid-up. The average margin would then be about 15% for 30-year endowments and over 10% for 20-year endowments. This is in addition to the accumulation of 5 years' surplus. The margins from the two sources are not strictly additive, but it would seem nevertheless that, on the assumptions we have made, the total margin against contingencies in the with-profit office would be over 20%. If all policies were maintained, the margin would be over 30%. The inclusion of shorter term endowments would reduce the margin, but, on the other hand, whole-life business would increase it. The policies we have used as illustrations may very well be sufficiently representative.

16. For non-profit policies there is no automatic margin except when a policy is given up. Using the same proportions of policies maintained, surrendered for cash and declared paid-up, the over-all margin would be about 5%. It follows that in order to be equally well protected against adversity the non-profit office would need to build up additional reserves equal to more than 15% of its liabilities. To achieve so big a margin, a purely non-profit fund would require a long period of favourable conditions. For a 30-year endowment assurance a margin of 15% in the premiums is equivalent to a margin of 1% in the net rate of interest, the corresponding margin

for a 20-year endowment assurance being $1\frac{1}{2}\%$ net. Clearly an office could not hope to earn these margins over the rate assumed in the premiums for long, since the fall in premium rates which would follow for new policies would endanger the maintenance of the old business. The requisite reserves could not therefore be built up over the lifetime of a single generation of policies. A much longer period than this would be needed, and if the office were expanding rapidly the objective would be virtually impossible of attainment.

17. We conclude that there is no doubt about the greater protection afforded by with-profit assurance business loaded for a substantial reversionary bonus compared with similar non-profit business.

The question may justifiably be asked how big a margin of protection is in fact desirable. To this question no precise answer is possible, but it may be helpful to consider some of the contingencies against which protection is required.

A fall in the gross rate of interest would not normally involve a severe loss on the non-profit business if the investments were of suitable date. The greatest danger would occur if the fund contained a big proportion of recent business. A new block of 30-year non-profit endowments considered as a separate fund could not be fully protected against a fall in interest rates until it had been in force for 8 years, even if the fund were invested in irredeemable stocks. In general, however, a large measure of protection would be feasible. Possibly the greatest danger from this source would arise if interest rates fell slowly over a long period. There would then be a tendency for non-profit premium rates to lag behind the fall in interest rates. Obviously non-profit business cannot be expected to pay if the rate of interest earned over the whole term averages less than the rate assumed in the premiums.

A fall in the net interest rates due to a rise in the rate of income tax cannot be guarded against by matching. In the case of a rise in the effective rate from 7s. 6d. to 10s. in the £, the loss on an evenly distributed block of 20- and 30-year endowment assurance business would be about 7% of the reserves.

Mortality losses in any future war defy reasonable forecasting. The net effect on an assurance company would depend on how far the extra mortality extended to the older ages. A more tangible problem is the effect of a substantial addition to the span of life by the discovery of new methods for treating the degenerative diseases. This is a problem primarily affecting pensions business which we have not yet discussed. It is worth noting, however, that if the effect were to reduce the future mortality rates for a man aged 65 to those previously appropriate to a man of 60, the value of an immediate annuity guaranteed for 5 years would be increased by about 15%. The rates of mortality being experienced in Holland and Norway show that an improvement of this magnitude is no flight of fancy. Finally, the risk of losses from the granting of options too freely has to be taken into account.

18. Is it then possible to suggest what margin of free reserves is desirable in a purely without-profit fund? Any figure must be arbitrary, but we suggest that for an assurance fund consisting primarily of medium and long endowment assurances and undergoing expansion at a moderate rate, it would be desirable to aim at a margin of 10%. Such an over-all margin would be obtained without setting up special reserves if approximately half the business were on a with-profit basis loaded for a compound bonus of about 30s.%.
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This suggests that as a guiding rule an office might aim at an even division of its assurance business between with and without profit. There are, however, two other reasons which favour a larger proportion of participating business.

The first is the desirability of giving policyholders some limited protection against the fall in money values. Actuaries are by no means unanimous in regarding this as a desirable objective, but we consider that it is legitimate and desirable. Accordingly we feel that offices should encourage the transaction of more with-profit business than they otherwise would because of the greater freedom it gives to invest in equity shares or property (see §35 *et seq.*).

Secondly, in transacting non-profit business an office exposes itself to forces over which it has no control. In theory it can be argued that the risks of transacting non-profit business are not great if an adequate margin is kept in the premiums. In practice the action of a few competitors in cutting margins would mean that the office must follow suit or suffer a serious drop in new business.

Taking all these factors into account, we feel that there are strong arguments at the present time for aiming at a higher proportion of new with-profit business than 50% of the total—60% or even 75% might be preferable. If the office loaded for a smaller bonus than 30s.%, the percentage would need to be correspondingly higher and *vice versa*.

WITH-PROFIT AND WITHOUT-PROFIT PENSION BUSINESS

19. No discussion on this subject would be complete without a reference to group pension scheme business, although recent developments make it difficult to generalize.

In so far as with-profit group business is based on the reversionary bonus system, the protection to the office will not be dissimilar from that provided by assurance business. True non-profit business, under which premiums are guaranteed throughout membership in respect of benefits being purchased at a given time, is similar to ordinary non-profit assurance business with four additional sources of danger. First, the guarantee may extend into the future so that it is equivalent to guaranteeing the current rates to new business under the scheme arising within, say, three years. Secondly, if premium rates fall, it may be difficult to withhold the benefit of the new rates from existing business—the same applies in theory to ordinary business, but the risk of pressure being brought to bear on the office is not so great. Thirdly, it is more difficult, because of the long-term nature of the liabilities, to protect the office against a fall in interest rates by investing in sufficiently long assets, especially if the business has been growing rapidly. Fourthly, improving mortality works against the office instead of for it.

20. With-profit business under which a substantial part of the profits is distributed as a rebate of premium requires special consideration. Clearly it does not give the same general protection as when the bonus is reversionary, but the system does at least ensure that the office is protected against fluctuations in interest rates, provided each premium is invested in securities of appropriate term. At times the premiums actually received under the system will be smaller than the non-profit premiums for the same benefits and during such periods a bigger reserve can be built up under a non-profit contract. This bigger reserve is, however, necessary—and may in fact be inadequate—to protect the non-profit fund against, *inter alia*, a drop in interest rates. The

with-profit contract, on the other hand, is already protected because future premiums will depend on future interest rates. There is little doubt, even although the bonus is in the form of a cash rebate, that the contract gives the office greater protection than a non-profit contract.

In determining the balance of the total fund as between with-profit and without-profit business, we suggest that schemes business participating mainly by rebates of premium should be left out of account. It should generate sufficient protection for itself, but not enough to provide any protection for the non-profit business of the office. Non-profit schemes business should certainly be included along with other non-profit business.

21. Whatever may be said about the future, there is no denying the fact that the transaction of non-profit schemes business has proved profitable to the offices in the past ten years. This has arisen through a combination of two factors—rising interest rates and a fixed tariff of premium rates determined when interest rates were low. The introduction of with-profit schemes makes it unlikely that this pattern will be repeated in the future. In fact, there is a tendency for so-called non-participating schemes to be given a guarantee limited to the premiums actually paid within a period of seven years—a system which has much in common with the system of paying bonuses in the form of premium rebates.

NEW-BUSINESS POLICY—CONCLUSIONS

22. To sum up, we consider that a definite new-business policy is desirable and that this policy should have regard to actuarial considerations. The long-term interests of the policyholders, future as well as present, should be regarded as paramount and, in general, shorter term considerations should not be allowed to overrule these interests. A moderate rate of expansion with a good proportion of long-term with-profit business seems to us to be the soundest policy, avoiding on the one hand the lure of disproportionately big new-business figures and on the other hand the temptation to favour unduly the existing with-profit policies by discouraging new participating contracts.

INVESTMENT POLICY

23. We are concerned with investment policy only to the extent that it depends on the spread of the liabilities according to date and the proportion of the liabilities relating to with-profit and without-profit contracts. For this purpose—and indeed for other purposes also—there are two major aspects of investment policy to consider:

- (a) the spread of the assets according to maturity date, and
- (b) the proportions invested in fixed-interest securities and equities respectively.

INVESTMENT POLICY—DISTRIBUTION OF ASSETS BY DATE

24. There is fairly general agreement that the normal asset distribution of a purely non-profit fund is one which immunizes the fund against a change in interest rates—it being understood that in a rapidly growing fund complete immunization may not be achieved even if the whole fund is invested in

irredeemable securities. Any departure from a position of full immunization involves an element of speculation which would be dangerous unless there were adequate free reserves.

25. No such general agreement exists about the normal spread of assets in a with-profit fund, if, indeed, there is any distribution which can be designated the normal one. Clearly, the margin of safety inherent in a with-profit fund allows greater latitude in investment and, furthermore, the larger the bonus loading, the wider is the permissible variation on either side of whatever is regarded as the normal distribution. For any fund it is possible to determine the maximum permissible average maturity term of the assets to avoid insolvency after a rise from the current level of interest rates to a given maximum. Similarly the minimum average term corresponding to a given fall in interest rates can be calculated.

To illustrate the margin which exists on different hypotheses, a single block of with-profit 30-year endowment assurances effected at age 35 has been examined. Where the premiums are loaded for a big bonus, the margins are so large that there is virtually complete protection against any likely variation in interest rates except when the future life of the fund is short. Accordingly, the illustration is based on fairly low bonus rates, i.e. 20s. % compound and 10s. % compound. It is assumed that premiums are based on 3 % net interest, and that this rate has been earned and bonuses paid right up to date. (This rate of interest is equivalent to about 5 % gross which might be taken as a rough approximation to the average rate obtainable on new investments in the past few years.) The assumption has also been made that all policies would be kept in full force and that no bonuses would be paid in future. The maximum average investment terms when the net rate of interest rises to 4 % and 5 % and the corresponding minimum average terms when the rate falls to 2 %, 1½ % and 1 % are shown in Appendix B. The average terms to achieve full immunization and paid-up immunization at 3 % interest are given in the tables for comparison.

26. The figures illustrate once again the strong position of a with-profit fund provided the bonus loading is not too small. It is clear that in general the investment policy of such a fund can safely be conducted with little regard to the spread of the liabilities. In particular, where the fund is growing rapidly, it will be possible to protect it against a fall in interest rates however rapid the growth may be.

With premiums loaded for a 20s. bonus, even if the net rate of interest fell to the very low level of 1 %, a with-profit fund would remain solvent although the mean maturity date of the assets were far below the paid-up immunization term and *a fortiori* below the full immunization term. With a 10s. bonus there is, of course, less latitude. Assuming, however, that the minimum rate of interest to be reckoned with is 1½ % net (this is equivalent to about 2½ % gross which, with a fair proportion of the assets invested in stocks other than British Government Securities, implies a yield on the latter rather below the lowest level reached in 1947), the paid-up immunization term would only fall short of the minimum if the duration in force were less than 10 years and the duration to maturity, therefore, more than 20 years. The limiting maturity terms for a with-profit fund consisting of policies loaded for a 10s. bonus may be used as an approximation to the limiting terms for a fund evenly divided as to with-profit and without-profit policies, the former being loaded

for a 20s. bonus, or a fund of which only one-third is with-profit, the loading being for a 30s. bonus.

27. With so many variable factors, it is impossible to reach any general conclusion. It is, however, apparent that without hypothecating a ridiculously low rate of interest the rate of growth of an office could be such as to make it dangerous to use the paid-up immunization term as the norm. On the other hand, the circumstances of the office may make the risk of insolvency from a change in interest rates a negligible contingency, in which case immunization in the interests of security is unnecessary. Nevertheless, from the standpoint of investment policy, it is still essential to know what mean asset term is to be regarded as normal. Accordingly, while we do not want to labour a subject which has already been discussed on a number of occasions in recent years, we find it impossible to develop our main argument without some further remarks on the different methods of immunization.

28. It may justifiably be argued that as full immunization is necessary to protect a non-profit fund, it should be regarded as the normal mean investment term for a with-profit fund consisting of policies having only a small bonus loading, but this argument tends to lose its validity as the bonus loading increases and the degree of similarity to a non-profit fund diminishes.

Another approach is to consider the expectations of the reasonable policyholder. This approach is superficially attractive, but it raises the difficult question 'How reasonable is a reasonable policyholder?' Any investment policy based on this consideration must turn on the office's interpretation of the policyholders' reasonable expectations, and it is clear from previous discussions that opinions on this subject differ.

29. The effect of the mean asset term on bonus-earning power is another factor which deserves consideration. It is not the general practice of life offices to make frequent changes in their with-profit premium rates. It is more usual to allow bonus rates to reflect changes in earning power. Gross anomalies between similar policies effected within a short time of each other are thus avoided.

A disadvantage of the practice is that, when interest rates change, the bonus-earning power of the new business at the new rate of interest will usually differ from the new rate of bonus earned on the existing business. Let b be the rate of bonus supported by the premiums under both new and old business at the old rate of interest, b' the rate earned by the new business and b'' the rate earned by the existing business at the new rate of interest. The relative values of b , b' and b'' will depend, *inter alia*, on the mean maturity date of the investments, but there will be one mean investment term, m_1 (shorter than m_2 , the paid-up immunization term) at which $b'' = b'$; b'' will lie between b and b' provided the average maturity term is greater than m_1 and less than m_3 , the term appropriate to full immunization. The difference between b'' and b' will increase as the maturity term increases from m_1 through m_2 to m_3 and the bigger the difference the longer will it take before the average rate earned on the business as a whole settles down at the new level, b' . In theory, the new level would not be reached till all the old investments had gone off the books. For practical purposes, with the masking effect of miscellaneous profits and interest on the estate, the new level would probably be reached sooner, but clearly the smaller the departure from m_1 , the sooner would it tend to be reached.

30. An argument in favour of using m_3 as the norm is that it makes for greater stability in bonus rates. This is easily seen if we consider the possibility of interest rates fluctuating on either side of a mean over a period of years. The average bonus might then be the same whether the average term of the investments was m_1 , m_2 or m_3 , but the last would provide the greatest stability and the first the widest fluctuations.

Paid-up immunization makes for greater consistency in the bonus-earning power of new and existing business than does full immunization. It does not, however, achieve the maximum possible consistency, because it assumes that the assets will normally be invested in securities with a mean maturity term which notionally ensures the maintenance of the original rate of bonus, b , on the paid-up part of the policies. Still greater consistency would be obtained if the mean investment term were m_1 , since the new and existing business would then earn the same rate of bonus. Paid-up immunization is therefore best regarded as providing a compromise between consistency and stability.

31. How far investment policy should be influenced by the existence of guaranteed paid-up policy provisions is another matter. So far as ordinary business is concerned, we cannot believe that the risk of wholesale discontinuance need be taken into account. The same is not necessarily true of pension scheme business where the best solution is surely to refrain from giving over-generous paid-up policy guarantees and, still more so, surrender-value guarantees. As has been pointed out elsewhere, a fund cannot be immunized against two different sets of liabilities.

32. In the light of these arguments, we see no justification for laying down a general rule as to the asset term which should be regarded as normal in a with-profit or mixed fund. An exception must be made in the case of a rapidly growing fund, a large proportion of which is non-profit, where a fully immunized position is desirable unless there are large free reserves.

Accordingly, while it is important that a suitable basis for determining the norm should be fixed, the choice of basis must be a matter of opinion. We ourselves prefer to regard a fully immunized position as normal even in a preponderantly with-profit fund, because we attach more importance to stability in bonus rates than to consistency in bonus-earning power between new and old business. We would emphasize that we are referring only to the normal distribution of assets, because we see no reason why an office should not take a view on future interest rates, provided it keeps within appropriate limits determined in the manner suggested in §25. We certainly do not rule out the possibility of going longer than the term for full immunization, but we would not expect to escape criticism if, having done so, interest rates rose. Equally, in our opinion, the investment policy would invite criticism if interest rates fell at a time when the mean term was short of full immunization.

We realize that some actuaries may prefer to adopt a shorter term as the norm on the view that the bonus-earning power of existing business should be responsive to changes in interest rates. Paid-up immunization may then be a convenient half-way house. We do not accept the criticism of full immunization that it converts with-profit contracts into guaranteed bonus policies. The essential feature of a participating contract remains, i.e. the premiums are substantially more than sufficient to provide the fixed benefits. To invest in such a way as to limit fluctuations in profits does not alter this essential feature.

A PRACTICAL METHOD OF ASCERTAINING THE
FULL IMMUNIZATION TERM

33. There is perhaps a danger that the matching of assets may come to be regarded as a subject for actuarial discussion rather than an important element in practical investment policy. It may not therefore be out of place to mention that the full immunization term can be ascertained without the laborious work of estimating the future trend of the fund.

All that is necessary is to carry out two bonus reserve valuations at different rates of interest and to estimate what the asset values would be in circumstances which would make it appropriate to use these rates of interest. The rate of bonus which could be maintained throughout the remaining lifetime of the business must then be calculated in each case. If the two rates are the same, the fund is fully immunized. If not, the asset and liability values already calculated provide the necessary data for determining the correct immunization term.

The investigation may conveniently be carried out when a valuation is required for other purposes, and one of the sets of figures would normally be based on the current market values of the assets and the corresponding rate of interest appropriate to the valuation of the liabilities. It is not, of course, suggested that the rate of bonus emerging from this valuation would necessarily be a suitable rate to pay at the time. It is important to note that the valuation of the liabilities for this purpose should include contracts to the extent that they are guaranteed, e.g. it would not be appropriate to value group pension business on a paid-up basis if future premiums were guaranteed.

34. In a similar way, the approach described in §25 may be used to ascertain the permissible variations in the average maturity term. Having fixed the limiting rates of interest, the corresponding liability excluding the value of future bonus has to be calculated. This will indicate the maximum permissible change in assets to maintain solvency and hence the maximum or minimum average maturity term which is permissible.

For purposes of investment policy, only an approximate indication of the immunization term and the permissible variations on either side of it is necessary. Refinements of method are therefore out of place. Further, it would not be essential to investigate the position more often than once in five years unless the composition of the business were changing rapidly.

INVESTMENT POLICY—EQUITY SHARES

35. The nature of the liabilities and the size of the free reserves should also be taken into account in determining the maximum permissible proportion of the assets which may be invested in equity shares. For some purposes, equities are regarded as akin to irredeemable securities, but their values obviously depend on other factors besides the ruling rate of interest. While the future movements of equity prices must always be a matter for conjecture, it is possible to set some sort of limit to the possible fall in values. Since the beginning of this century the fall in British equity prices as measured by such indices as the *Financial Times* and the *Actuaries Investment Index* has never been as much as 60% from a peak to the next succeeding low point. Admittedly in the U.S.A. there was a fall of nearly 90% in the *Dow Jones*

Industrial Index from the peak of 1929 to the low of 1932, but this may perhaps be regarded as exceptional.

At any given time it is possible to suggest a margin of safety which should suffice to cover the maximum loss on the equity portfolio. The size of the margin must be a matter of opinion. It will depend on whether one is concerned only with permanent loss of value or whether one wishes to take account also of a possible temporary loss which might prove awkward if it occurred at an unfortunate moment, e.g. at the time of a valuation with a view to the distribution of profits. Suppose that k is the maximum depreciation on present market values which is envisaged.

36. The next step is to estimate the value of a function we shall call the 'remainder', R , i.e. the excess of the total assets at market value over the liabilities on a gross premium basis, making no allowance for future bonus. (The remainder is a special case of what has been called the estate.) It can then be argued that R/k can safely be invested in equities provided the balance of the fund is reasonably matched.

The assumption that all the existing business will be maintained in force until death or maturity is implicit in this argument. Some downward adjustment in R may be desirable to allow for the risk that some of the bonus loadings will not be received if with-profit policies are discontinued. A similar adjustment in respect of non-profit business would be advisable if the rate of interest used in the valuation were higher than that which was used in calculating the premiums—a net premium valuation for assurance business and a paid-up policy valuation for group pension business might be a convenient way of ensuring that credit was not taken for profits which depend on the maintenance of the policies.

It is important to bear in mind, however, that the object is to obtain guidance on broad lines as to the maximum proportion of the assets which may safely be invested in equities and that the normal niceties of valuation work are inappropriate.

37. The value of R will depend on a large number of factors, not the least important of which is the amount of surplus undistributed. R will accordingly fall sharply when a vested bonus is declared. Clearly the bigger the proportion of with-profit business, the bigger will R be in relation to the total funds.

A fall in equity prices would tend to reduce R . On the other hand, the lower the level to which prices fall, the less scope should there be for a further fall and the office might think it safe to assign a lower value to k . On balance, the reduction in the permissible maximum, R/k , might be roughly commensurate with the fall in equity prices. In practice it is unlikely that so consistent a view would be taken. If, for example, a value of $\cdot 6$ were assigned to k and markets fell by that fraction, it is highly improbable that the office would regard any further fall as impossible. This points to the importance of not understating k , especially when markets seem relatively high. Perhaps this contention is merely another way of saying that the right time to buy equities is when prices are relatively low.

DISTRIBUTION OF SURPLUS

38. For the well-established office, the most difficult problems under this heading arise out of the existence of capital profits realized or unrealized. These come from two main sources, i.e. from successful forecasting of the trend of interest rates and from appreciation in equity shares.

Under the former class we exclude capital appreciation which corresponds to an increase in the liabilities, e.g. the result of a general fall in interest rates, and include only those profits which are due to the departure from an immunized position with successful results. The amounts involved are not in general likely to be large and should not therefore call for any special treatment. They would normally be used to swell the estate and provide added security for present and future policyholders and additional income to increase the bonuses of the with-profit section.

DISTRIBUTION OF SURPLUS—CAPITAL APPRECIATION ON EQUITY SHARES

39. Appreciation from this source can be of much larger dimensions and will not be accompanied by a corresponding rise in the liabilities, except possibly under the heading of expenses. Distribution of profits in the manner traditional to the office may therefore involve a degree of inequity which ought not to be disregarded. A further consideration is that the fall in the value of money has led to some criticism of life assurance in its traditional form. Investment in ordinary shares can go some way to mitigate the loss in real values, and this points to the desirability of giving the benefit of any appreciation to those whose reserves have earned it. We shall base our remarks on the simple case where substantial appreciation to a new plateau of market values has occurred over a short period.

40. In general, higher dividends would accompany the appreciation. Failing any special bonus distribution, these dividends would swell the interest profits, and future as well as present policyholders would benefit from the resulting higher bonuses. In fact, if the increase in income were permanent, the youngest policyholders would tend to derive the greatest benefit although they had provided a relatively small part, or even no part at all, of the funds on which the appreciation was earned. It is no solution to increase premium rates for new entrants. Not only would this leave the biggest relative share of the higher dividends to the policies taken out just before the change of rates, but it would also perpetuate the problem by leaving the source of the higher revenue undisturbed so that higher premiums would lead to higher bonuses and so on.

[An ingenious comment on the subject was put forward by the President of the Faculty of Actuaries, Mr F. J. McGregor, in his recent address. He suggested that taking credit for appreciation which reflects sums fruitfully ploughed back into the business might be likened to the amortization of redeemable stocks purchased at a discount.]

41. Even if the principle of dividing capital profits is conceded, the problem is not without its difficulties. In equity, one should not proceed, even in the simple case where the appreciation has taken place over a short period, on the basis of a distribution in proportion to the reserves of the various groups of with-profit policies. More accurately, the participation

should depend on the portion of the full reserve of the particular group which represents the reserve for future bonus, because the amount which may be invested in equities is related to this. As duration in force increases, the amount of the reserve for future bonus will rise to a maximum and will then fall away towards zero immediately before the maturity date of a group of endowment assurances and at the end of the life table for a whole-life group.

42. A logical solution would be to issue policies under which the whole or part of each premium would buy a share in an equity fund on lines similar to those devised for variable annuities in the U.S.A. We are, however, dealing with participating contracts as they exist at present in this country and not with such special forms of contract as may be issued in the future. We propose therefore to indicate some ways in which a partial solution can be achieved within the existing framework.

(a) A special vested bonus may be declared, the amount of which would inevitably be somewhat arbitrary. Only that portion of the appreciation which the office regarded as permanent should be used for the purpose. The distributable portion could be increased if desired by selling equities and investing in fixed-interest stocks, thus realizing the capital profit. In fact if the office held the full R/k in equities, then *ipso facto* no part of the appreciation could be regarded as permanent and a sale of equities would be a necessary prerequisite to the declaration of a bonus out of capital profits.

The choice of a method of distribution between different groups of policyholders presents problems. A solution which has been adopted by more than one office is to pay a single uniform reversionary bonus, the rate being independent of the duration in force save for a graded reduction at the very short durations. A disadvantage of the method is that it does not lead to any formal system of distribution. On the other hand, it leaves the office free to deal with any future developments either in a similar or in a different way as appears best in the circumstances.

(b) A special intermediate bonus which would never vest could be paid out of capital profits. The amount of the bonus would depend, *inter alia*, on the level of equity prices at the date of the claim. The main advantage of this system is that it does not involve any assumption as to the permanence of the appreciation. If all the appreciation disappeared owing to a fall in equity prices, future claims would not receive the special bonus. The office would therefore be fully protected, and no policyholder could reasonably claim that he had not received his share of the profits. Accordingly the office could take a more liberal view than in the case of (a) on the proportion of the appreciation to be set aside to provide the special bonus.

Complications would arise if there were substantial further appreciation in future, since the amount paid out should then depend not only on the level of equity prices at the time of the claim, but also on the average level at the time of paying the premiums. Strictly speaking, therefore, the special bonus should vary with a number of factors, although it might be possible to find a moderately simple formula for distribution which was sufficiently equitable.

(c) A more orthodox although probably less equitable solution is to leave the capital appreciation untouched but to pay special bonuses out of the increase in dividends. Under this system it is impracticable to divide the whole additional income among the policyholders who are entitled to participate therein because the number of these policyholders will gradually fall and

eventually reduce to zero. The logical course is to fix a suitable scale of additional intermediate bonuses which will apply both now and in the future to claims among the policies entitled to participate in the special distribution. The rate of bonus would have to be such that the maximum additional bonuses likely to fall due for payment before any given valuation date would not exceed the additional dividends accruing up to that date. Otherwise the deficiency could only be made good by drawing on the capital appreciation or using part of the surplus belonging to the with-profit policyholders as a whole. The cost of the additional bonus would start at or rise to a maximum and gradually diminish to zero; the share of the additional income falling into general surplus would show the same pattern in reverse.

This system can be regarded as a variation of (b) and, as in the case of (b), it is liable to become rather complicated if further appreciation superimposes a second or a third series of additional bonuses on the first.

43. If inflation ceases or continues only at a modest rate, the problem described in this paragraph may prove to be of passing interest only. If, however, inflation continues, it may well be that the next five or ten years will see the emergence of a new system of bonus distribution avoiding the chief defects of the various systems described.

OFFICE ORGANIZATION

44. The solution, within a life office, of problems of the kind discussed in these notes requires close co-operation between the actuarial staff and the investment and new-business departments. Good organization and a clear and firm lead from the highest level are essential to this, but it may well be that day-to-day informal contacts between individuals will do more to encourage the interchange of ideas than will formal discussions. Of special importance are close relations between the senior new-business officials and their actuarial colleagues. Failing this, there is a risk that the new-business department will tend to function as a separate entity instead of as an integral part of the organization.

45. Many of the matters dealt with in this paper have been discussed in the course of our office duties. Inevitably, therefore, we have from time to time assimilated views advanced by our colleagues, and it is impossible to say how far, if at all, the arguments used originated in our own minds. We acknowledge gratefully the help we have obtained, whether consciously or unconsciously, from our colleagues. At the same time, we must emphasize that we take full responsibility for any views expressed. Moreover, in so far as we deal with office practice, it should not be assumed that the procedure we recommend is necessarily followed in our own office.

APPENDIX A

Margins to meet adverse contingencies (see §12 et seq.)

Premiums and reserves based on A1924-29 Light mortality, 3% interest, loaded for 3% initial expenses and 30s. compound bonus (for with-profit policies).

Years in force and premiums paid	Reserve value	Value of 5 years' bonus	Margin if maintained, i.e. reserve for future bonus	Typical surrender value	Margin if surrendered	Value of proportional P.U.P. with no future bonus	Margin if made paid-up
<i>With-profit 30-year endowment assurance, age at entry 35</i>							
5	15·2	5·5	21·6	11	4·2	12·4	2·8
10	36·0	6·4	20·7	27	9·0	28·7	7·3
15	59·7	7·2	18·6	47	12·7	49·7	10·0
20	87·0	8·4	15·0	74	13·0	76·8	10·2
25	118·5	9·7	9·2	108	10·5	111·3	7·2
30	156·3	11·2	—	156·3	—	156·3	—
<i>Non-profit 30-year endowment assurance, age at entry 35</i>							
5	8·9	—	—	7	1·9	8·5	·4
10	22·4	—	—	18	4·4	19·3	3·1
15	37·7	—	—	31	6·7	33·2	4·5
20	55·1	—	—	48	7·1	50·5	4·6
25	75·4	—	—	69	6·4	72·3	3·1
30	100·0	—	—	100	—	100·0	—
<i>With-profit 20-year endowment assurance, age at entry 45</i>							
5	24·4	6·3	16·1	19	5·4	21·7	2·7
10	55·5	7·3	13·0	47	8·5	50·0	5·5
15	91·5	8·3	7·9	83	8·5	86·7	4·8
20	134·7	9·7	—	134·7	—	134·7	—
<i>Non-profit 20-year endowment assurance, age at entry 45</i>							
5	17·6	—	—	14	3·6	16·6	1·0
10	40·7	—	—	35	5·7	37·9	2·8
15	67·5	—	—	62	5·5	65·0	2·5
20	100·0	—	—	100	—	100·0	—

APPENDIX B

*Maximum and minimum average maturity terms to avoid
insolvency if interest rates change (see §25 et seq.)*

With-profit 30-year endowment assurance—age at entry 35—premiums based on A1924-29 Light mortality, 3% interest, loaded for 3% initial expenses.

		Duration in force (Term to maturity)					
		5 (25)	10 (20)	15 (15)	20 (10)	25 (5)	
Loaded for 20s. com- pound bonus	4	No limit	No limit	No limit	47.4	12.9	} Max.
	5	No limit	No limit	No limit	27.0	9.2	
	1	19.3	11.9	8.1	5.2	2.6	} Min.
	1½	No limit	2.6	3.5	2.8	1.6	
	2	No limit	No limit	No limit	No limit	No limit	
Loaded for 10s. com- pound bonus	4	No limit	No limit	No limit	25.7	9.0	} Max.
	5	No limit	No limit	No limit	19.7	7.3	
	1	8.6	29.5	16.1	9.0	4.0	} Min.
	1½	6.6	23.6	13.4	7.7	3.5	
	2	20.6	12.1	8.2	5.2	2.6	
Full immunization term		Not possible	Not possible	28.6	13.6	5.6	
Paid-up immunization term		37.7	26.2	17.7	10.9	5.2	

ABSTRACT OF THE DISCUSSION

Mr J. D. Binns, in introducing the paper, said that in order to limit its length the authors had found it necessary to make assumptions and generalizations which might puzzle the reader. For instance, in the matching exercises they had assumed, without actually saying so, that, when rates of interest changed, they did so uniformly for all maturity terms. The behaviour of securities during the past 2 years, with short-dated stocks varying in price as much as longer-dated stocks, had, however, been distinctly upsetting for conscientious matchers, although the authors did not claim to come within that category. For example, in § 32 they said that they saw no justification for laying down a general rule as to the asset term which should be regarded as normal in a with-profit or mixed fund, and that view found support in the table in Appendix B, in which as the bonus loading decreased there was an inducement to get closer to the immunization term. The average bonus loading over the whole business, including non-profit, had to be well below 10s. before any real immunization squeeze set in, although when the squeeze became effective, it forced them to the full immunization term.

Later in the paper, in discussing the proportion of assets which might prudently be invested in ordinary shares, the authors had left it vague whether k was an estimate of the maximum absolute depreciation per unit or an estimate of the relative depreciation per unit of equities compared with irredeemable gilt-edged stocks. For an expanding fund they considered the latter to be the better. On that basis the theory was that the fund, excluding the remainder, was originally invested in fixed-interest stocks just covering solvency valuation on an immunized basis. From that balance of the fund, sales of irredeemable fixed-interest stocks were made and the proceeds reinvested in equities so as to increase the total in equities from R to R/k . Provided that the relative depreciation in equities never exceeded their estimate, they would always be able, in theory, to switch back into irredeemable fixed-interest stocks and so again cover the solvency valuation with fixed-interest stocks and on an immunized basis. With a closed fund, no doubt it would be preferable for k to be an estimate of the maximum absolute depreciation, and the theory there required sales of short-dated stocks instead of irredeemables.

Another point was that even a fund with little or no remainder, such as a fund which was substantially non-profit, might still have a small proportion of its reserves invested in equities in the hope of gaining some offset to rising renewal costs in an inflationary era.

In the section on distribution of surplus, the authors expressed no concern as to whether a special distribution was made from realized or from unrealized capital profits. The effect of possible changes of tax in the future, and in particular the possibility of a capital gains tax, should not be forgotten.

Mr H. Frederick Fisher, in opening the discussion, said that in their first paragraph the authors indicated that the paper was partly a review of various subjects discussed by the Institute and the Faculty during recent years. In 1952 Redington had developed the mathematical theory underlying the matching of assets, to be called immunization. In the discussion thereon and in a subsequent paper, Bayley and Perks had advanced the view that in with-profit funds immunization should be limited to the paid-up portion of the business.

H. G. Clarke, in 1954, had further discussed the problem of matching and considered its effect on new business. Dow, in a paper written for the Faculty centenary, had analysed the effect of non-profit business on solvency.

There had been differences of opinion, but basically all those writers had been seeking two of the objects dealt with in the paper under discussion: (i) the solvency of the office with a maximum freedom from investment worries, and (ii) an equitable bonus policy, with reasonable stability of rates.

It seemed to him that they had in fact been re-discussing practical problems similar to those raised by the controversy of an earlier generation on the net premium versus the bonus reserve valuation. There were new settings and techniques; inflation and equity shares coloured their views, but fundamentally they were seeking sound and equitable actions in the face of wide financial variations.

The authors first considered new-business policy. As they rightly pointed out, it was not possible to dictate the desire of the general public or, it might be added, the effect of legislation, such as the Finance Act of 1956, on the type of new business. A public service had to be offered, but he suggested that the words at the end of § 3 'transacted at the right price' were most important, particularly for non-profit business. It was perhaps unfortunate that the description 'non-profit' rather than 'non-participating' should have come to be used, since if the stability of the office was to be secured every policy should contribute to the 'estate' of the office—using that term in its broadest sense. That was particularly necessary in times of growing proportions of non-profit business, and with the effect of inflation on the growth of funds as a whole. Traditionally they spoke of marginal loadings in non-profit premiums for 'fluctuations and profits', but it might be desirable to use the word 'stability' or even 'solvency' instead of 'fluctuations' in order to remind themselves of the financial hazards.

J. B. Dow, in his paper referred to in § 12, had said:

When rates of interest are rising or have risen it is natural to feel that without-profit rates can be improved, and it may be that actuaries have been and are sometimes too prone to act on this feeling.

In §§ 17 and 18 the paper set out many arguments, illustrated by the relative protection of with-profit and without-profit reserves shown in Appendix A, that should make actuaries more reluctant to act in that way.

Before leaving the subject of new business, he wished to refer to § 9 dealing with expansion and expenses. In the industrial-ordinary life offices it was not uncommon for new business premiums to be increasing while the full-time agency force was diminishing, inflation and the swing to endowment assurances playing a part in that process. With regard to the overhead expenses of new branches, it did not follow that the target level of production originally envisaged would be sufficient to support the overheads. He had recently analysed the overheads of some 300 branches of an industrial office, and it had become evident that it was a subject which must be kept under review. The frequency distributions of the individual items of expense, set against relative production measures, made the problem particularly suited to actuarial investigation and comment, as was suggested in the paper.

On the subject of investment and immunization, there were two particular points in which he personally had difficulty in applying the theory to practice.

First, he found it hard to judge when the market rate of interest had 'permanently' moved by 1 % or any other figure, and secondly he could not accept that market values of assets were necessarily the right values to use in a valuation made for the purpose of distribution of surplus, where solvency was not in question.

In § 29, for example, the paper dealt with the various aspects of bonus-earning power after a change in the rate of interest. Now if the new money rate changed suddenly, for example, by virtue of a change in Bank rate, what effect did that have on the actuary's views as to the proper long-term rate of interest for use in non-profit contracts? During the last 10 years the new money rate in the gilt-edged market had varied from $2\frac{1}{2}\%$ to $5\frac{1}{2}\%$ and, while immediate effect might be given in single premium rates to such changes, it seemed difficult to depart from an average rate of, say, 3 % or $3\frac{1}{4}\%$ for calculating annual premiums for long-term contracts. There should in theory be a change of view varying indirectly with the term in the case of annual contracts. To a traveller in a railway train with a wide panoramic view from the carriage window, the distant scene did not change nearly so rapidly as the passing telegraph poles. The actuary was in the position of a man who had made the journey many times before, and was able to measure a particular journey against his normal expected experience. That analogy should not be pressed too far, but, when the train slowed down or speeded up on its scheduled run, the actuary measuring solvency was not so interested in the immediate foreground as in the rate of change of the distant view.

If it was desirable and justifiable to pursue a comparatively passive policy on interest rates in long-term premium bases and, as Redington had shown, a similar policy on valuations for distribution of surplus, it was clearly desirable to follow a policy on immunization which harmonized with those, whilst at the same time following long-term investment trends. Suppose, therefore, that on the range of rates which he had mentioned the actuary had used 3 % for premiums, estimating that that left him $\frac{1}{4}\%$ margin. Then when new money rates over a period averaged 3 % or less on, say, a 5-yearly moving average, it seemed to him that new investments should be directed towards paid-up policy immunization, or even shorter, increasing the term of investments as the average new money rate of interest rose until at, say, 4 % full immunization should be the objective, with an even longer term when interest rates were higher. Investment policy could not, however, be changed for every minor fluctuation. He did not subscribe, therefore, to what the authors stated to be a general agreement that full immunization should be the normal objective for purely non-profit funds. The distribution of assets between those backed by eventual capital guarantee and those without such repayment must influence the position.

It might be held that that approach would force the actuary to 'take a view' of the market. In his opinion, the actuary could not avoid doing so, since in fixing or maintaining premium rates he must assess future averages. It was, however, a long view rather than a short view that he must take. If the market rate of interest rose above that allowed for in premium rates, the actuary should rejoice, since a shortfall of interest during the contract was then less likely. The fact that he had an apparent temporary capital loss as against an actual interest shortfall was of less concern provided that the investment policy was such that capital would be available—without loss—to meet claims by death and maturity. As the authors showed in Appendix A, surrender margins were usually significant, and in any case surrender values were not normally guaranteed. While market values were usually criticized at times when they were artificially low,

it was possible, when the market rate of interest was less than that assumed in the premiums, for them to be too high in a valuation for distribution.

Appendix B was a helpful demonstration of the solvency problems of a with-profit fund, but he thought that most actuaries would be more interested if the assumption were not 'that no bonuses would be paid in future', but rather that future bonus would not fall below, say, 75 % of that loaded for in the premium. That had the same effect as increasing the proportion of non-profit business, and it was possible to make use of the table to find an approximation, as the authors indicated in § 26.

The paper gave a useful method of checking total immunization by the use of two bonus reserve valuations, which undoubtedly saved labour. The caveats entered, however, should be carefully noted. The actuary would be looking to part of the supportable future bonus brought out to build up the future 'estate' of the office, and the amount required for that purpose might vary according to the age and stability of the fund in question. Even if the fund appeared to be immunized, the problem of humped funds (to which inflation and proportions of non-profit business had contributed)—as visualized by Haynes and Kirton—might affect the actual position.

He wished to comment on the values assigned to R and k in the calculation of permissible investment in equities. Presumably the gross premium valuation referred to in § 36 was a complete solvency valuation, and actuaries might not be inclined to subject the whole of the future bonus loadings to absorption by depreciation. As in an earlier comment on Appendix B, he suggested that some part of the bonus loading should be retained in arriving at R , which would not then fall so sharply on a declaration of bonus. The authors indicated that if a view was taken of the market, k might be varied. It appeared to him that, over the range of average experienced interest rates, progressive values might be assigned to k in a similar way to the progression of the mean term of the assets on immunization.

The capital appreciation of equity shares presented four difficult questions. At what stage, to what extent, to whom, and how should it be distributed? He did not agree with the argument of § 41 that equity was satisfied if distribution was proportionate to the value of future bonus. That appeared to award far too much to recent long-term policies, possibly not in force at the time at which such investments were made. R/k was calculated for solvency purposes even if including all future bonus, and equity and solvency rarely went together: the actual investments were made out of current reserves, and many policyholders who might have benefited were no longer on the books. An arbitrary distribution was inevitable, but it would first be desirable to test its apparent equity.

Suppose that it was decided to distribute any appreciation above x % of the purchase price, that a share or its equivalent was now $(x+y)$ % above purchase price, and that the investment had been made t years ago. Then y/t might be treated as the annual distributable appreciation and each annual unit of bonus loading paid during the t years might be given proportionate credit.

That obvious approach could not be carried out individually on assets or policies without considerable labour, but broadly viewed it might give an indication of the position in a particular fund. An approach of that type might lead to a reversionary distribution of type (a) of § 42. The real difficulty in times of financial variation was to assign a value of y , and that undoubtedly suggested the alternative approach (b) of paying the additional bonus on claims only.

Method (c) was even more cautious, virtually absorbing all the capital appreciation in the 'estate', and would only be justified if y was comparatively small.

Mr R. J. Kirton said that the sentence in § 2 of the paper reading '...the new business underwritten by one generation provides many of the problems of succeeding generations', would certainly be well appreciated by all of his own generation.

He wanted to speak about one particular subject which he thought came well within the ambit of the actuarial management of a life office, namely, options. He would not talk about them from the point of view of immunization. As the authors said, it was not possible to immunize against two different sets of liabilities, although it might be of interest to speculate as to what was the best form of immunization against one, two or three different sets of liabilities.

The point that he wanted to make could best be illustrated by a simple example. An office might give a policyholder the right, as an option, to effect a contract in 10 years' time for a single premium of £1000, that contract being based on 4 % interest, and in 10 years' time the rate of interest ruling might be 3 %, 4 % or 5 %. If the rate was 5 %, it was extremely improbable that the option would be taken up. Indeed, the office might well find itself competing against its own option. If, on the other hand, the rate of interest ruling in 10 years' time was 3 % the option would probably be taken up, and the reserve would require to be something of the order of £1300, if it was a very long-term contract, as compared with the single premium of £1000. In other words, at the end of 10 years the office had to find £300 to set up the additional reserve.

That was just a very simple example, but the same sort of argument applied to any option, the point being that an option, unless the exerciser was extremely ill advised, could only be onerous or neutral; it could never be a benefit to the office once it was granted. It might be a benefit in getting new business, but once it was on the books it was a potential burden. The question that he wanted to ask was, what should the office do? Should it at the one extreme set up the present value of that potential £300 loss, which was about £200? Should it, at the other extreme, leave the surplus in 1967 to take care of any potential burden? Should it—somewhere in between—make an assessment of the probability of that loss arising and set up a reserve of £200 multiplied by that probability? Those questions seemed to him to be essentially problems of actuarial management; and, where an office was transacting a large amount of business with substantial options, he wondered whether it would not be better to show in its valuation a specific reserve against those options, as a matter of discipline, rather than to set up a contingencies reserve.

Mr G. V. Bayley thought that the authors had been compelled to revive the controversy over matching and indeed the very character of with-profit business, so he wished to try to identify one or two of the more important issues by considering a simple example. Suppose that the mean term of total immunization of a with-profit fund was 20 years and that of paid-up immunization 10 years. The investment department invested the assets at a mean term of, say, 15 years. Then suppose that there was a uniform rise of 1 % in the rate of interest. Had the fund made a profit or a loss? Those who advocated paid-up immunization as the valid origin from which to judge the practical situation considered that the fund had been harmed by that change. The remaining premiums on the existing business supported lower bonuses than the new business did. On the

other hand, those who advocated total immunization as the right origin rejoiced at a profit because they could declare higher bonuses on existing policies than the premiums originally supported at entry. The authors of the paper, if he had understood correctly § 32 and Mr Binns's introductory remarks, did not know whether they had made a profit or a loss.

The need to define an origin, or normal investment term, was crucial to any scientific discussion of equity, investment policy, premium bases, and so on, but it had been misunderstood as limiting their freedom of action in investing the funds. He was glad that the authors had gone such a long way towards removing that misconception. But in doing so, he thought that in §§ 27-32 they were guilty of sitting on the fence.

Like the opener, he did not believe that total immunization was either necessary or sufficient to protect a non-profit fund from changes in the rate of interest. All it did was to immunize that fund against a fall in the rate. The only real security was adequate reserves of one form or another, and adequate premiums in the first instance—premiums which did not necessarily rely on the assumption that every premium would be invested at the same rate of interest as the first. The second point was that the system or model of paid-up immunization did not rely for its justification upon the risk of wholesale discontinuance.

As to with-profit business, he thought it possible to diagnose in recent discussions two broadly different approaches. The first or traditional approach, based on paid-up immunization, was simply that each premium was invested in the market conditions ruling at the time it was received. Future premiums were left to look after that part of the policy which they purchased; the bonus loadings in future premiums took care of that. The other approach was to take full credit for future premiums, including future bonus loadings. What he had called the traditional approach produced a remainder fund— R in the authors' notation—which could be equated to retained reserves plus the present value of future bonuses on the notional paid-up policies. The second idea produced a much larger R because in effect it included the value of *all* future bonuses. Those two solutions, therefore, produced markedly different results for the formula R/k , and incidentally the larger result could for some funds justify the investment of the whole of the assets in equities. He was unconvinced by arguments which led to such a high limit as that for the equity portfolio. To take credit for future bonus loadings was to take credit for considerable negative values. If that was done, and then the depreciation on the equities approached anywhere near the assumed limit k , would not existing policyholders, particularly those of recent duration, be likely to discontinue their policies? If they did so then their bonus loadings would evaporate with them, and the business remaining on the books would be in jeopardy. Switching into fixed-interest stocks would not retrieve that situation. In other words, the business could not in fact stand as much depreciation as k . His own preference was, therefore, for the much simpler and less nerve-racking limit suggested by Ogborn and himself in their paper to the 14th International Congress of Actuaries, 1954 (*Transactions*, 2, 112). R should include only the present value of future bonuses on the paid-up policies, or, what amounted to much the same thing, future bonus loadings should be left out of account in the authors' formula. He would admit, however, the concept of the suggested denominator k . The authors admitted the limitations of their own unmodified R , but the practical adjustments that they made in § 36 to meet them produced a final result more consistent with the approach that he had just described and coming much closer to the practical world in which they lived.

The distribution of capital appreciation was bedevilled by its measurement. In such shifting sands it was a comfort to find one rock—the prices actually paid for the investments in question. If their market values multiplied by $(1-k)$ produced a lower aggregate result than their cost prices, strong reasons were needed to distribute the appreciation and he thought that it would be necessary to be satisfied that the expansion of the business had been outpaced by the growth of the 'estate'.

Mr M. E. Ogborn drew attention to the last part of the paper, because, as when reading a book, it was more interesting to read the end first and to find out what happened, before looking at the way in which the author arrived at it. The part to which he directed attention was the paragraph referring to the possible emergence of a new system of bonus distribution. The authors suggested that it might be a result of continuing inflation, but he would suggest that it was more a product of the modern tendency to invest in equities, and that that was a problem to which actuaries should direct their attention—whether there was any need for a reconsideration of their traditional methods because of the modern desire to invest in equity stocks rather than in fixed-interest stocks.

He found that problem most easy to handle if it was approached from the paid-up point of view already mentioned. The liabilities could be divided into the interests already purchased—the paid-up policies—and the interests remaining to be purchased. Those interests corresponded, on the other side of the account, to the assets in hand (which related to the paid-up liabilities) and the premiums remaining to be paid (which related to the interests remaining to be purchased). That sort of approach did, incidentally, help in the consideration of problems of valuation, and if the paid-up policies were valued on the customary conservative basis, it did in fact produce an answer very much like the net premium method which had been traditional in British life assurance, though it gave more freedom of action because the valuation could be varied more easily to allow for changes in the values of the assets.

In using the paid-up approach, he thought it was more helpful not to go to the remainder R and k as the authors did, but to consider the gearing of the fund. If the paid-up policies—and he did not mean the usual proportionate paid-up policy but the theoretical paid-up policy underlying the premiums—were valued on a basis consonant with the experience, and the resulting liabilities were compared with the market value of the assets, the result was a statement of the gearing of the fund. The value of the liabilities might be, say, $x\%$ of the market value of the assets; that measure of the gearing was rather similar to the Stock Exchange 'gearing', except that it was based upon capital rather than upon income.

In the valuation of the paid-up policies on a basis consonant with experience, it might be that, particularly for non-profit business, there would have to be an allocation of a part of the free reserves to allow for a possible deficiency on the future premiums of existing business. After making such adjustments there would be a measure of gearing in which, say, the liabilities were $x\%$ of the assets. If the market level varied, the $x\%$ would vary, the valuation of both assets and liabilities being taken on the new basis. The excess of the value of the assets over the liabilities was much the same thing as the R quoted by the authors—the remainder—because he understood them to suggest that the value of R should be computed on the basis of a net premium valuation, which should

give fairly similar results. He would prefer, however, to call the surplus the bonus fund, since it was the fund out of which distributions to policyholders and proprietors were made. He would not regard the $x\%$ gearing as defining the proportion which might be invested in equities, but as giving a pointer to the consequence of investing any given percentage in equities. If exactly $(100-x)\%$ of the assets was invested in equities, then the paid-up liabilities might be set against the $x\%$ of fixed interest stocks, and the whole of the bonus fund against the $(100-x)\%$ of equity stocks. If the market values of the equity stocks fluctuated, then fluctuations would follow proportionately in the bonus fund. If the proportion in equities was less than the bonus fund, it would have a dampening effect on fluctuations, and if it was more it would have an amplifying effect.

In considering equities in relation to bonus problems, he thought that they needed to take account of the fact that there were different kinds of equities which might be defined, he supposed, principally by the expected rate of growth of dividend in the particular equity, a rate which might vary widely. In that connexion he had been much interested in Mr McGregor's remarks, quoted by the authors, that the expected growth in what were called 'growth stocks' might be regarded as a kind of amortization of redeemable stocks bought at a discount. Conversely, there might be a similar negative amortization in stocks that were expected to decline. If the equities attained a new level—and particularly in the case of growth stocks it was expected and hoped that they would do so—it seemed to him that there should be some differentiation between the existing interests bought at the old prices and the future interests to be bought at the new prices; i.e. the existing fund would consist of equities which had appreciated in value and which gave a comparatively high yield on cost price to the paid-up policies, but the future premiums on the same business would have to be invested in those equity stocks at current market prices. In his view, investment in equities demanded some approach to a valuation based on market values. That was an unorthodox view at the moment, for which he had not been able to find much support; but the problem of what was the best method of bringing in the growth in values of equity stocks should, he thought, be given serious attention.

The best solution that he had seen was that the market value should be brought in on the basis of a 10-year average, which was going part of the way towards current market values. He did not suggest that, having brought in the stocks at something approaching market values, the capital appreciation was necessarily all distributable, or all distributable at once, but he thought it gave a clearer view of the problem. If, as the authors suggested, only the dividends on equity stocks were distributed, it seemed to him that that was equivalent to carrying forward a large surplus from valuation to valuation; thus at any given valuation a large part of the surplus had really arisen, not from the quinquennial period which was being considered, but from previous periods, and the classical solution of that problem was a bonus increasing with duration. If, therefore, distributions of surplus were confined to the dividends earned, that seemed to lead in the direction of a bonus which increased sharply with duration. If, however, capital appreciation on equities was included in the surplus, he thought that it should be related to the amount of the bonus fund which was the part of the assets that would bear the brunt of adverse experience. The bonus fund was essentially 'quadratic' by nature (i.e. it was a function both of the duration and of the unexpired term). The table in Appendix A gave some indication of that.

As he had already said, the paid-up policies would not necessarily be proportionate ones, but the last column of Appendix A gave the margin if made paid-up on that basis, and gave some pointer to the bonus fund. There should be added the value of 5 years' bonus from the third column in the table (reduced, he thought, because that was probably based on a rate of 3% less $1\frac{1}{2}\%$ as an allowance for future bonus, whereas there was no need to do so in the bonus fund that he was discussing). How the distribution could be related to the bonus fund in practice, he did not know. It did suggest that in the early years of a policy, say in the first third of its term, the bonus should be less than in the later years.

In the table in Appendix A, under non-profit business, the authors showed no margin in the fourth column, whereas earlier in the paper they had said that they intended to include a margin for fluctuations in profits in the premiums. If they had done so, he thought that it would have appeared as a margin in the fourth column.

He felt that considerations such as he had been discussing had been present in some recent bonus distributions, and he thought it would be of great interest to see how bonus systems were developed to meet the needs of the new situations that were facing them.

Mr J. R. Hemsted referred to § 24 where it was stated that there was fairly general approval for investment in accordance with the full immunization term. A growing life office could not do that in practice, because there were no securities of sufficiently long term. It must seem to many of them that inflation would be with them on and off for many years and, quite probably it might be that they would not, therefore, for a long time be able to invest in accordance with that immunization term. Thus the problem was somewhat academic. He wondered how it was that in the past more offices had not become insolvent, since practically all must have invested short. The answer, he supposed, was that the danger was from a permanent fall in interest rates, and in practice the interest rates had moved up and down. Some maturities had had to be reinvested at a lower rate, but on the other hand, some had been reinvested at a higher rate.

The conclusion to which he came was that in the past actuaries had probably kept a good margin in the interest content of premium rates. When market interest rates had been low, they had been afraid to assume that they would ever get higher. When the rates had been high, they had been unwilling to assume that they would be able to invest future premiums at that rate. It seemed to him that there was some risk that offices would say that they need not bother about investment of future premiums at a high rate of interest, and that therefore there was less danger in cutting their rates. He felt that they ought to be careful to retain the margin.

The second point that he wished to make was on § 29, where the authors had used the phrases 'mean maturity date', 'mean investment term', 'average maturity term', and 'mean asset term', so making the paragraph more difficult to follow than if they had kept to one description. Taking the best reading he could, he had made m_1 greater than m_3 , which was quite contrary to the authors' result.

He had found § 33 on the calculation of the immunization term very interesting. The authors said that the alternative was the laborious method of estimating the future trend of the fund, but he himself was rather attracted by

the alternative. If it were possible to go through the labour of estimating the premium income, claims and expenses year by year, and also calculating for investments the interest and redemptions, there would emerge a simple string of figures representing the net income or outgoings of the office year by year, which could be valued at different interest rates and, if desired, at different rates for different terms.

The percentage to be invested in equities had already come in for some discussion. Everybody seemed to be concerned with the possible depreciation in equities, treating them as if no other asset would depreciate in the same circumstances. He felt that most companies were investing in equities as a hedge against inflation, and the risk would come with deflation or an absolute depression; in those circumstances they would not only have the equities at a low level because of reduced profits and dividends, but they would also find cover on fixed-interest stocks much lower and possibly some preference dividends passed. There could be depreciation on other investments too; for example, in house purchase loans payments might fall into arrear and offices might have houses on their hands which they could not sell. He thought that the question of the percentage in equities should be considered in a broader context. Could they not work out an immunization against depression and inflation by balancing a certain percentage of equities against, say, Government securities? Presumably in a real depression the latter would, owing to a lowering of rates of interest by the Government, show a considerable capital appreciation and would therefore offset depreciation in equity holdings. He felt that that would be a better approach than the rather negative one described in the paper.

On the question of distribution of capital profits, he thought that perhaps it should be left to those who had an embarrassment of riches. He felt that the tendency would be, if inflation continued, for an increasing percentage of assets to be put into equities, particularly if the Government showed that they could control recession, and it would then be found, in time, that much of the without-profit funds were invested in that way. It might even be felt, eventually, in some cases that it would be quite out of the question to confine bonuses resulting from capital profits to the with-profit policyholders.

Mr W. Perks, referring to Mr Kirton's comments on options, suggested that an actuary should not grant an option unless he could quote a fair price for it, and if he could quote a fair price for it he would usually be able to fix a reasonable reserve for it.

In commenting on the paper, he spoke as an actuary, and not as an investment manager. It was the actuary of an office who had to advise his board about premium rates and bonuses and the many other actuarial aspects of the business, and he might sometimes have to take the investments as he found them.

In § 28 the authors discussed the basis of what had been called paid-up immunization. Unfortunately, they wrongly assumed that it depended essentially upon the idea of a 'reasonable policyholder'. Bayley and he, in their paper and in the discussion, had been at pains to make it perfectly clear that the objective and logical basis of their system was the assumption that each premium would be invested in the conditions ruling at the time of its payment, an idea that could not possibly be reconciled with the total-immunization principle. The essential point was that premiums, bonuses, surrender values, paid-up policies and valuations, should all normally reflect that assumption, as Mr Ogborn had said at the Faculty Centenary meeting and as Mr Bayley had again stressed that

evening. They had never said that investments should closely follow that pattern in practice. Their argument was that the effects of any departures from it should not be ear-marked to any particular group of policies, but should be treated as a profit or loss for the office as a whole. Like Mr Bayley, he hesitated to use the word 'estate' but he thought the idea could perhaps be sufficiently conveyed by saying that such profit or loss should be treated as an addition to or subtraction from the 'estate'.

The authors appeared to have devised an alternative concept of a consistent system which reflected one of the features of Fig. 1 of the paper by Bayley and himself. The suggestion was that there was an investment mean term rather short of the paid-up immunization mean term which, on a change in the rate of interest, would result in an equivalent movement in earned bonus rates on the full sum assured, both for existing business and for new business; but he feared that that idea was largely illusory, because it assumed that the necessary reinvestments that must take place before the existing business and the new business matured (i.e. reinvestments at different dates for the two groups) would be made at the new current rate of interest. The only way in practice of ensuring the realization of the authors' claim would be to switch at once to a paid-up immunization basis and so abandon the authors' ideas for the next change in the rate of interest.

Incidentally, he thought that the traditional attitude of British offices to valuations for distribution on the uniform reversionary bonus system would effectively prevent the bonus consequences of the authors' suggestion from working themselves out in practice, since a rise in the interest rate did not immediately increase the investment income, and nobody would regard the rise as so permanent as to move the valuation completely on to the new interest basis.

As Mr Binns had already mentioned, there was a certain amount of fallacious reasoning in discussions on the subject of matching, resulting from an implicit assumption that the interest-rate structure was always uniform as between short, medium and long-term investments; but it was, he suggested, a unique feature of the paid-up principle that it did not, in theory, depend on that uniformity assumption. He still claimed that the system of Bayley and himself was the one and only self-consistent system that corresponded to British life assurance practice.

The authors maintained that there was no objection to investing even longer than the total-immunization term. They were entitled to their view, but it should be clearly recognized that such a situation involved the risk of having to reduce bonuses when interest rates rose. In effect, it meant attempting to invest in advance not only all the future premiums on existing business but also some of the early premiums on new business not yet written. For his part, he found it difficult to justify either of those two attempts.

In view of what the authors said in § 24, he wished to put it on record that he did not accept total immunization as a proper basis even for non-profit business. He felt, with the previous speaker, that there might be a serious danger that a superficial acceptance of the total immunization principle might seem to justify rate-cutting and weak valuation standards.

On the question of distributing part of the profit or appreciation on equities, he wished to make three observations. First, the considerable differences between the methods so far used and the incidence of their effect on different groups of policyholders were such as to make him wonder whether all of the

methods could be right and even whether any of them were fair. Secondly, it seemed important that the policyholders who got the benefit should be those who would have borne the burden if the speculation had gone the other way. He wondered whether any of the methods so far used stood up to that test. Thirdly, he agreed with the thought contained in the reference in § 40 to certain remarks by Mr McGregor, the President of the Faculty. On the analogy of dated stocks bought at a discount, he would have thought that there were two possibilities, either to put the capital profit to inner investment reserve in line with the common practice of British offices for dated stocks, or to let it out gradually over a long period on some system corresponding to amortization. That arrangement would presumably be coupled with a process of building up the open investment reserve more rapidly, thus largely offsetting the effect of amortization. While appreciating Mr McGregor's remarks, the authors did not seem to him to have followed out the logical implications of Mr McGregor's analogy.

Mr N. Benz said that the thought *Great Expectations* had come into his mind on taking up the paper. He hoped that the authors would not misunderstand if he said that before he had finished it, he had thought of other novels by Dickens. He might mention *Our Mutual Friend*, *Bleak House*, *Old Curiosity Shop* and *A Tale of Two Cities*.

The first point on which he wished to comment arose from what he might call the *Bleak House* section of the paper, which began at § 12. No speaker had so far made the important point that all the ratios related to reserves. Sometimes reserves could be very small in relation to the sums assured. His second point was that, though they must always be willing to learn new facts, he was a little astonished to read in §§ 19–21 that what he had imagined to be a with-profit group pension contract must be regarded as non-profit because the bonus took the form of reductions of premiums.

On the difficult question of what proportion of assets should be invested in equities, his feeling was that there were two main difficulties. The first was to avoid arguments that proved too much. It was so easy to bless an argument that seemed to suggest that at all times 90% of the total assets ought to be held in equities. The second was to avoid principles that would lead to the sale of equities at a time when their market values were near their lowest level. He thought that the authors had had those difficulties in mind, and that they had rightly directed attention to market values, but a more manageable function than R/k could readily be found by looking not at capital values but at interest requirements in relation to the valuation basis and cost of bonus.

The question of capital values was also the key to the other problem that was discussed at the end of the paper—the distribution of what might be called windfalls or 'embarrassment of riches'. The latter seemed to him a suitable phrase for circumstances which he did not think had often been paralleled before and which, as the authors suggested, might not be paralleled again. He agreed with what they said in §§ 39 and 40, but he began to part company from them in § 41 *et seq.*—because there would usually be one particular group of with-profit policyholders who ought to receive the benefit, irrespective of how it should be divided between them. It would be necessary to act quickly, and if the view was taken that most of those policyholders were getting a very good bargain indeed, he submitted that to strive to obtain a system that rigidly

allowed for equity between policyholders within the group was going too far. He felt that the ordinary concept of the man-in-the-street was that, since most policyholders had done very well indeed, it did not really matter if some of them had just done only very well and others exceedingly well.

Mr S. H. Cooper referred to the method suggested in §§ 35-37 for determining the maximum amount of the funds which could safely be invested in ordinary shares. Having determined the maximum amount of depreciation which was likely to occur in the value of the equity portfolio, the authors suggested that the amount invested in equities should be limited so that the maximum depreciation could not exceed the 'remainder', *R*. If he had correctly understood the meaning of the function which the authors called the remainder, it followed that any depreciation in excess of the limit envisaged when fixing the amount of the equity portfolio would absorb the whole of the free reserves of the fund, including any reserves for future bonus and any margin in the valuation bases for assets and for liabilities, and would encroach upon the cover required for the basic liabilities of the fund. In that context it seemed to him that they should be concerned with possibilities rather than probabilities, and he had been rather surprised to see the authors dismiss the American experience of 1929-32 as exceptional.

He was also dubious about the figure of 60 % given in § 35, because some figures which he had obtained indicated that depreciation somewhat in excess of that figure had taken place in the period 1928-38 and that a further fall had occurred in the early years of the war to something a little over 20 % of the 1928 values. In order to obtain a good spread of equities he had taken an index based on the market values of a selection of investment trust ordinary shares with a radix of 100 on 31 December 1928, and he found that the corresponding figure 10 years later—i.e. before the outbreak of war—had been 37·7. The index had continued to fall in the early years of the war to a minimum of 22·6. He admitted that there was an element of 'gearing' in that index which would not apply to direct investment in ordinary shares, and the figures might also have been affected to some extent by holdings in the United States, where the slump in ordinary shares had apparently been more pronounced than in the United Kingdom. It might be said that the period 1928-38, which had included a severe depression, was exceptional, but surely they must be prepared for the exceptional experience in fixing a limit which involved the solvency of the fund. The war years and the years following the war could hardly be regarded as normal, and they must take into account the effect of the high armament expenditure, which continued to be a feature of the economy. He wished to make it clear that he was not suggesting that ordinary shares were not suitable investments for a life assurance fund, but he thought regard should be had to the worst possible circumstances in applying the measure proposed by the authors.

It was suggested in § 39 that the value of ordinary shares could be expected to follow the same course as the cost of living. He had compared his index of investment trust ordinary shares with the cost of living index, both reduced to 100 on 31 December 1928, and the corresponding figures 10 years later were, as he had said, 37·7 for the market value of investment trust ordinary shares and 93·6 for the cost of living index. The figures for 31 December 1940 were 22·6 and 117·6. He wondered about the reaction of with-profit policyholders who were caught up in the effect of a period such as that.

Mr F. M. Redington sent the following written contribution, which was read to the meeting:

I regret that I cannot be present at a paper on subjects in which I have been much interested. There are two aspects on which I should like to make some comments.

The first is immunization and here I find myself in general agreement with the authors. I have not in the past advocated any particular form of matching and have in fact emphasized the inconsistencies and disadvantages of particular forms—not least total immunization. The more I see of the subject the less inclined I become to advocate a particular form. They all have their points. I think we can regard asset-matching theory as a continuous musical keyboard on which we can distinguish many notes and can give descriptive labels to at least five. These are the upper and lower solvency points, the total immunization point, the paid-up immunization point, and the interesting point where the susceptibility of existing and new business to interest changes is the same (in the authors' terminology, where $b' = b''$).

These five all have their uses which vary in different circumstances. The last, as I pointed out on Skerman's recent paper, is of value when considering a young overseas fund. I think that paid-up immunization has a special relevance for the new self-employed contracts. These have one form of decrement only (other than death)—namely, conversion to a paid-up policy. Moreover, ceasing to be self-employed is an important cause of decrement which cannot entirely be regarded as optional to the policyholder. An office which chooses, largely for its own convenience, to grant annual premium contracts has perhaps some responsibility to share with the policyholder the risk that he will cease to be self-employed. If this is so the office will bear the point in mind in its calculation of paid-up values and in its investment policy.

The other subject is the effect on distribution of large improvements in equity shares. The watchful actuary will continually be noticing items in his surplus which in theory are not properly distributable in the form of a uniform reversionary bonus. It is very rare, however, that such an item will fulfil all of three conditions:

- (a) that the item is significantly large,
- (b) that it is always in one direction, so that even taking a broad view over the generations, the ups and downs do not cancel out,
- (c) that its incidence is widely different from the uniform reversionary system.

If any of these three conditions is absent the actuary can reasonably accept the item as falling within the broad tolerance of the uniform system. But recent increases in equity dividends completely fit all of these conditions. The item is large: nobody seriously feels that over the years inflation and deflation are equal forces. And as to incidence, these increases in surplus have their origin mainly in the larger reserves of the older policyholders, whereas the uniform bonus system gives the least benefit to the older policyholders who have little time left to participate and most to those future policyholders who are not yet even on the books.

It is a matter for most serious thought. Furthermore, it may be a matter of more than transient interest. None of us in the life assurance world has anything but distaste for inflation and we perhaps speak of it with reluctance. It may,

however, be a phenomenon which may cause us to reconsider some of our more cherished attitudes. Warning shadows of variable annuities are already crossing the Atlantic and developments of State pension schemes in Germany and elsewhere are part of the same picture.

I have not time to go into the technical question of the different possible remedies. I doubt whether a perfect solution exists but I would express at any rate a theoretical distaste for distributing capital appreciation, if only for the reason that you cannot distribute capital depreciation. I find various solutions tolerable and practical as special methods to deal with special events but if we are seeking a solution to a more general problem we need more careful thought.

Mr B. Robarts welcomed a paper which underlined the interdependence of the many problems with which the life office actuary had to deal. He thought it was salutary to emphasize that no one of those matters could be considered on its own. The actuary responsible for the management of a life office, or for advising the management, found himself surrounded by a considerable number of variables, each of which exerted some pull on his judgment and affected the pull exerted by the other factors. Obviously, the circumstances would vary according to the particular office concerned, but there would in any case be many considerations apart from the three basic factors of interest, mortality and expenses on which all of them had been brought up.

It was inevitable, he thought, that the authors should have confined their attention to a few of the principal factors with which the actuary had to deal. He thought it would be a pity, however, if the impression were created that actuarial judgment should be confined to those problems which were susceptible to strict actuarial analysis. That would imply a division of thought between the actuarial and non-actuarial management of a life office, whereas in fact the need was for the actuary's comprehension to be as wide as possible, so that he could relate many of the problems which were strictly non-actuarial to others of an actuarial character on which important policy decisions depended. From that point of view, he should perhaps have some knowledge of staff management and recruiting, of branch and agency organization, and certainly of the facets of the conduct of overseas life business, if his office operated in that field.

That led him to two other points. The first concerned the training of an actuary. It was manifestly impossible to attempt in an examination syllabus to introduce the breadth of information that he was suggesting the actuary should have. In fact, there were many who felt that the examination syllabus was too long already. But it did seem to him that the main responsibility must therefore fall on the daily work of an actuary for giving him that breadth of experience which would enable him to expand his horizon to include many matters which were outside an examination syllabus and outside the immediate tasks on which he happened to be engaged.

He considered it important that an actuary should have, as part of his training, some contact with the selling organization. It was a truism that life assurance was sold rather than bought, and he felt that the business could only prosper if those who were responsible for its central direction had close contact with the selling side, in addition to being able to assimilate the many actuarial aspects of major policy decisions. In parenthesis, he would add that perhaps the authors had under-estimated the possibility of controlling the type of new business written by an individual office, although he was entirely in agreement with them that policies, once laid down, were not susceptible to rapid changes.

The other point that he wished to make was the necessity for the management of a life office to have well-prepared figures laid before them at regular intervals so that the problems might be digested before important decisions of policy were taken. One of the joys of their profession was that there was seldom only one answer to a problem, and he thought that much benefit could be derived from well-informed discussion between a compact group at the centre. It added greatly to the value of that discussion if all the members of the group could come together with the same general breadth of information, but to achieve that was not at all easy. There was far more involved than simply statistics of new business, rates of interest, expenses and valuation results. He believed, in fact, that the actuary had a special duty to perform in seeing that the statistics available covered a sufficient range of information without being cumbersome, and in seeing that they were intelligible to his less technical colleagues so that they also could enter fully into the discussion of the problems involved. In any case, once important decisions had been taken at managerial level they would usually have to be presented to a board of directors who would almost certainly have little, if any, knowledge of actuarial matters, and might even view with a certain innate suspicion technicalities which were beyond them. It was there, he thought, that the breadth of an actuary's training could be most helpful in enabling him to see beforehand the difficulties that were bound to arise in the minds of his directors, and thus to present his case in such a way that it was comprehensible and convincing to a non-technical board.

Mr S. F. Isaac, in closing the discussion, said that the authors made clear at the outset that they made no attempt to summarize actuarial opinion, and he certainly would not attempt to do so. There must inevitably, he thought, be differences of opinion and differences of emphasis among actuaries, and he felt that it was a good thing that it should be so. It added variety and interest to life and it made for competition, which brought him to the first part of the paper, dealing with new business.

He was sure that the authors were absolutely right to stress the dangers of excessive competition and the over-emphasis that was placed on new sums assured by people who ought to know better. Obviously, they all wanted as much good new business as they could get, but he felt that they were all exposed to temptations arising out of the competitive element and the emphasis on new business. At the time of speaking, he thought there were four particular temptations against which they should be very much on their guard. The first, which had been mentioned by the opener, was the temptation to cut margins too fine, which was specially dangerous at a time when interest rates were relatively high. Then there was the temptation to disregard the probability that over the years the trend of expenses was more likely to be towards an increase rather than a decrease. Another insidious temptation to which they were all subjected was the temptation to lower their standards of selection by accepting business without health evidence at rates of premium which were calculated on the assumption that the business would be carefully selected. Lastly, they had to resist the temptation to grant too many and too generous options, a point which had been stressed by Mr Kirton. He was not sure that he had understood Mr Perks rightly. He had understood him to say that a charge should be made for all options. He was inclined to think that there were a number of options which they gave for which it was not really practicable to make any charge at all.

He thought that the authors had made a very good case for the protective merits of with-profit business, and he felt that most people would agree with them, at least up to a point. The authors had to simplify the problem, but he thought that they might have over-simplified it by perhaps slightly over-stating the protective merits of with-profit policies. He felt that they had been a little less than fair to the non-profit business. The strength of an office must depend on the adequacy of the premiums it charged and what it did with them, and what it did with the surplus. The authors had assumed that experience in the past had been strictly in accordance with the assumptions made in the calculation of premiums. Was it not reasonable to assume that the experience in the past had in fact been favourable? In the with-profit office the surplus would have been largely distributed, but in the non-profit office some part of the surplus at least would have been set aside to build up additional reserves.

As regards the future, was it entirely reasonable to take credit for future bonus loadings and ignore future bonuses entirely, even for a proportion of the business, and could not the non-profit office also take credit for some margin in future premiums? He felt that it was possible to make a better case for non-profit business.

The problem of matching of assets and liabilities and immunization, or attempts at immunization, had been much discussed in recent years. There had been quite radical differences of opinion, and it was apparent from the discussion that those differences were still unresolved. He thought it was desirable to keep the distribution of investments by date constantly under review, and from time to time to investigate roughly the degree of immunization which was secured, provided they did not expect too much from their investigations, which in the nature of things had to be based on a great many assumptions and must be bedevilled by all kinds of problems associated with options, both on the asset and liability side of the account, and by guarantees. He felt that the most valuable purpose served by any of those investigations would almost certainly be to impress upon them the need for substantial free reserves for use in emergency.

He had been interested in § 33, in which the authors referred briefly to a method for avoiding the labour of forecasting the future trend of a fund. He had much sympathy with Mr Hemsted, who was anxious to estimate the future shape of the fund on a variety of assumptions. It was an Herculean task, but perhaps it might not be many years before the use of electronic computers would enable them to estimate the shape of things to come on a variety of assumptions—changing mortality, generation mortality, expenses perhaps varying as the years went by according to the view that was taken of inflation, and (what was even more important) the varying rates of interest at which the income would be invested in future years. Such investigations of emerging costs could, he thought, be much more illuminating than methods which, as Mr Menzler had once said, ‘swept up everything into a single portmanteau figure’, namely the present value.

The authors suggested a basis for determining the maximum proportion of the assets to be held in equities. Like Mr Bayley, he was rather doubtful whether R should be calculated without any allowance for future reversionary bonus, but he was also bothered by k , which depended on assessment of whether market values were relatively high or low. The authors did not say how that assessment could be made, and he had not heard anything in the discussion which helped much in that direction. Probably most people would agree that

the proportion to be invested in ordinary shares must depend largely on the size of the with-profit business and the amount of free reserves. Some would go further and take account of the desirability of obtaining some protection against rising expenses in the future. It might be said that the proportion to be invested in ordinary shares must depend on the status of the shares concerned, since, for example, those of public utilities and banks were not subject to the same degree of fluctuation as some industrial equities.

As to the best method of distributing the 'embarrassment of riches'—the capital appreciation of ordinary shares—various alternatives had been put forward and discussed, and he did not know which was the most equitable. He doubted whether any one was more equitable than another. With the opener, he thought that any such distribution must be largely arbitrary, and he was bound to confess that he was dubious about a 'special intermediate bonus'. The authors said that if it had to be discontinued, for example, in a slump, no policyholder could reasonably claim that he had not had his share. Of course, if he were dead he could not, but if he were alive he could and no doubt would. The holders of maturing policies would surely be dissatisfied if, following a slump, an additional bonus were suddenly discontinued or reduced severely. It might be reasonable, but he thought that it would be extremely difficult to explain.

In their conclusion, the authors had properly emphasized the need for over-all actuarial planning. It was right that attention should be drawn to the many technical problems with which actuaries were concerned and that a number of cautionary notes should have been sounded, but he thought that everybody would agree that mere knowledge of techniques was not enough, that there were no foolproof systems in their business and that what they all needed was wisdom to combine their knowledge of facts and techniques, on the one hand, with solid principles, wide experience and sound instincts, on the other.

The President (Mr C. F. Wood), in proposing a vote of thanks to the authors, said that an actuary had been defined as a Scotsman with a slight knowledge of mathematics and a keen business sense. The authors of the paper, although both educated in London, were Scotsmen; he was not in a position to comment on their mathematical ability, but their paper had undoubtedly demonstrated their keen business sense. Both authors were officials of an office which had high traditions of service to the Institute and the Faculty. Members greatly appreciated the work and the thought which had gone into the writing of the paper and they appreciated still more the thoughtful gesture of those two Edinburgh actuaries returning to London to present a paper to the Institute on a subject which was full of topical interest and which had produced an excellent discussion.

Mr J. L. Anderson, in reply, said that the authors were very gratified that there should have been such a good discussion. On the subject of immunization he intended to say only one or two things. First, in the authors' view there was no single system of immunization which was appropriate in all circumstances. Secondly, in his view, with which he hoped Mr Binns would agree, its main use was as a guide to investment policy. In that connexion he did not accept the criticism that the authors were 'sitting on the fence' in their choice of a system of immunization. § 32 of the paper made it quite clear where they stood in that matter. The point they wanted to emphasize was that there was room for

differences of opinion, and that the view that was taken depended on what were to be regarded as the most desirable features of a bonus system.

On the subject of the proportion to invest in equities, the authors would be the first to agree that the function R/k was only a rough practical measure. Their main contention was that the proportion to be invested in equities should bear some relation to the proportion of the fund which was with-profit. In the authors' view their method was a convenient way of approaching the subject, but they did not want to be in the least dogmatic about the values assigned to R and k . Clearly, so far as k was concerned, there was a great deal of scope for differences of opinion.

The authors had referred to three systems for distributing profits on equities. They felt that the system to be used must depend both on the circumstances of the office and also on the incidence of the appreciation in equities. They had themselves had experience of a particular case, where alternative (a) had been adopted because it seemed to be reasonably equitable in the circumstances. They agreed that any solution must be an arbitrary one.

On the subject of office organization, he had been much interested in Mr Robarts's and Mr Isaac's contributions. The authors felt very strongly on the matter, and he wished to underline what was stated in § 44 of the paper, particularly on the subject of new business organization. The authors felt that the ideal solution was to have a new business manager who was also an actuary. At the same time, it seemed to him to be absolutely essential that the new business manager should be a man who had earned his position by having demonstrated his selling ability in the field and not a man who had been promoted without having sales experience.

The opener had instanced the case of non-profit business when there had been a fall in interest rates and had asked what should be done about the premium rates and the spread of investments in those circumstances. It seemed to him that the actuary must first decide whether he considered that the fall in interest rates affected his views on the level of future interest rates over a long period. If so, then obviously he must increase his scale of premiums unless they already contained a more than adequate margin. If, on the other hand, he regarded the fall in interest rates as a temporary aberration, the logical course would be to go short; but he emphasized that that might be a dangerous operation for a purely non-profit fund. Personally, he would hesitate to quote non-profit premiums based on an interest rate higher than that obtainable at the time whatever his view might be on the future trend.

Mr Cooper had quoted some figures based on an equity index of investment trust equities, but he would not for a moment accept that as a suitable measure. The factor of gearing which Mr Cooper had mentioned must have a big effect, and much greater swings might occur than in the case of industrial equities.

In conclusion, he would emphasize the importance of applying actuarial principles to most of the major problems of life office management, including new business and investment department problems as well as those of the actuarial department itself.

Mr S. C. Damlé has written:

In the present paper the authors have been good enough to give a practical method of ascertaining the full immunization term and an index for fixing the limit for investments in equities. Their suggestion about a special intermediate bonus which would never vest but could be paid out of capital profits is ingenious;

but no satisfactory solution to meet complications arising from further appreciation appears to have been given. It appears, perhaps, that piecemeal adjustments here and there for one cause or another, to modify the results of the uniform reversionary bonus system (which broadly secures equity and has an inherent stability in it) may not be desirable. On the whole, the contribution method of distribution of surplus may still be claimed as the most equitable system and may be chosen if thought necessary.

As regards the immunization of investments in the case of with-profit business to ensure solvency, I would incline to the view that in a sufficiently large fund the bonus loading may well be regarded as providing for it. Bonuses do not form part of the contractual obligation of the insurer and, therefore, immunization of investments may not be necessary to ensure solvency. Investment towards socially and economically desirable ends may be more important.

The authors subsequently wrote:

It has been suggested that we have been less than fair to offices transacting a large amount of non-profit business in our comparison of the protection afforded by with- and without-profit contracts. Certainly we have approached the subject primarily from the standpoint of a with-profit office, but we do not think that our comparison is unfair provided parts of the paper are not taken out of their context. Appendix A by itself might seem to favour the with-profit office unjustifiably, but this appendix should be read in conjunction with the argument in §§ 12-16. Our object was to estimate the protection inherent in a with-profit fund on certain assumptions, and thus to show what free reserves a non-profit fund would need to build up in order to obtain an equal degree of protection. We appreciate that offices transacting mainly non-profit business can, in certain circumstances, build up adequate reserves. The point we wished to emphasize is that there may be times when business is expanding so rapidly that it is impossible to build up these reserves quickly enough and in these circumstances with-profit business undoubtedly provides greater immediate protection.

We are in general agreement with Mr Redington's remarks on the subject of immunization. In our view the primary object of calculating an immunization term is to give some broad guidance on investment policy. For a non-profit fund, the main concern would be to protect policyholders against a fall in interest rates and for this purpose we consider full immunization, so far as this is possible, to be the best solution, save to the extent that there are sufficient free reserves to give freedom of action. The opener suggested that a different degree of immunization might be appropriate when interest rates are low, but we should prefer to regard full immunization as the norm, but to admit the possibility of departing from the norm if a strong view were taken as to the trend of interest rates. On this subject we should like to emphasize that it is very easy to talk *in vacuo* about investing short when interest rates are low, but it is much more difficult in practice to be convinced that they really are low and are almost certain to rise. It is frequently argued now that interest rates were obviously at a low point in 1947, but at the time there were many who saw no reason why they should not be forced down much lower.

We were a little surprised to hear doubts expressed about the suitability of full immunization for a non-profit fund. It may be that the further explanation given above will go some way to reconcile the different points of view. We would suggest that the crucial question to be answered is as follows: 'In a non-profit

fund, at a time when you consider that interest rates are equally likely to rise or fall, would you try to invest the assets so as to immunize the fund completely against a change in interest rates?' Our answer would be emphatically in the affirmative.

The fear was expressed by several speakers that when interest rates are high the principle of full immunization might be used to justify annual premium rates based on the current level of interest rates instead of the average level which, in the opinion of the actuary, is likely to be earned over the term of the policy. We entirely agree that any such justification would be spurious and that to give effect to it would be likely to involve a subsidy to the new business at the expense of the old. But the fear of such unjustified cutting of premium rates is surely no reason why full immunization should not be used as a guide to investment policy and, as already indicated, we are primarily interested in its use for this purpose.

Turning to the position of a with-profit fund and again dealing with the matter from the investment angle, we stand by what we have said in § 32. If this paragraph is read as a whole our views will be seen to be unequivocal, but we emphasize that there is considerable room for variations in the choice of a norm according to how much the actuary wants bonus rates to respond to changes in rates of interest. In their defence of the paid-up system of immunization, Messrs Bayley and Perks explain the underlying assumption, i.e. that each premium would be invested in the conditions ruling at the time of its payment. We appreciate the usefulness of this approach when dealing with equity between one class of with-profit policyholders and another (see Anderson's paper in *T.F.A.* 17 and his remarks on Redington's paper in *J.I.A.* 78). We do not agree with its extension to other fields. A policy is a single contract, not a series of contracts, and the office is entitled to proceed on the assumption that it will be maintained, although certain precautions are necessary; e.g. onerous options must be avoided. Accordingly, we see no logical justification for using paid-up immunization as a guide to investment policy. On this aspect of the subject, we do not know where Mr Perks stands, although we gather that Mr Bayley would use paid-up immunization as the norm. Nor do we agree with the application of the system to the calculation of surrender values and paid-up policy values. If a policyholder discontinues his contract in circumstances unfavourable to the office, he has no valid cause for complaint if the office grants surrender and paid-up policy values which will ensure that it is no worse off as a result of the discontinuance. Accordingly, an office is fully justified in framing its investment policy in what it considers to be the interests of the continuing policyholders, even if in certain circumstances this might result in less favourable terms for those who discontinue their contracts.

One speaker indicated difficulty in understanding § 29. For a neat verbal demonstration of the appropriate relationships of what we have called m_1 , m_2 , and m_3 , reference may be made to the second half of Hickox's remarks in the discussion on Skerman's paper of 28 January 1957 (*J.I.A.* 83, 102).

This leads to the discussion on the function R/k . We agree that negative values should be eliminated in calculating R , but we do not think it reasonable to make no allowance for any future premiums. If there were severe depreciation, we would argue that those wishing to surrender should suffer rather than that the solvency of the fund should be in danger. Naturally one would expect criticism—this is inevitable if the investment policy has been seriously wrong—but provided that unwise guarantees of surrender values have not been given,

the payment of the office's fixed liabilities should not be in jeopardy. It may well be that in practice our ideas of a suitable maximum proportion in equities for a given fund might not differ much from those of Messrs Bayley and Isaac. So much depends on the degree of conservatism used in fixing k and we agree with Mr Isaac that this involves an assessment of whether markets are high or low. We emphasize the importance of conservatism and agree with Mr Cooper that possibilities as well as probabilities must be considered, although we think that his use of an investment trust index is unsound. Clearly, no formula is any substitute for judgment. Our approach is an attempt to make it easier to measure the risks inherent in the problem on which judgment has to be exercised.

If an office is convinced that the long term trend of equity prices is upwards, it may take a less conservative view on the value of k ; clearly it is unnecessary to pay so much attention to the next fall in prices if one is satisfied that this is to be succeeded by a still bigger rise. We ourselves feel, however, that it is wiser to base k on an estimate of the potential fall before the next bull market begins without regard to possible later developments.

Opinions differ as to how far one should seek to achieve equity between one class of policy and another in distributing special gains from investment in ordinary shares. The opener doubted the correctness of using the reserve for bonus as a guide, on the grounds that this would give too much to recently effected policies. It should be noted, however, that in § 41 we indicated that the reserve for this purpose would be limited to the total reserve so that a recently effected policy could only receive a small participation.

The three practical systems for distributing special profits referred to in § 42 all come in for criticism, thus confirming our view that no one of them is entirely satisfactory. In applying system (a), the function k would be used to decide how much of the appreciation could be regarded as permanent. Once again a conservative estimate is desirable—as Mr Bayley remarked, no distribution would be justified if one could visualize the equity holdings as a whole falling below cost price. Although we share Mr Redington's reluctance to distribute capital appreciation when it is not possible to do the reverse if there is depreciation, we think it may be argued that, on the whole, system (a) does tend to distribute the profits roughly in proportion to the losses which individual policyholders would suffer from depreciation, assuming that this led to an immediate cut in the level of ordinary bonuses. The oldest policies would then suffer the biggest cash loss, especially under a compound system, just as they would get the biggest share of the profits under the special distribution. Failing this consideration, it might be argued that policies nearing maturity would tend to get too much under system (a) since their reserves for future bonus would be small.