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PROPOSALS FOR THE STATUTORY BASIS OF VALUATION OF THE LIABILITIES OF LINKED LONG-TERM INSURANCE BUSINESS

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1. INTRODUCTION

1.1 The background to the production of this paper is somewhat involved, but is necessary for an understanding of why it contains what it does. Readers who are familiar with recent developments in the valuation field may proceed straight to Section 2.

1.2 Statutory valuations of long-term insurance business under the Insurance Companies Act 1982 ('the Act', which superseded the 1974 and 1981 Acts) and the Insurance Companies Regulations 1981 ('the current Regulations') have now been prepared by actuaries for some years. Similarly the guidance issued by the profession to Appointed Actuaries, specifically GN1 and GN8, has also remained substantially unchanged over that period. The time was opportune for valuation practice to be reviewed in the light of recent experience.

1.3 In particular, in the recent past, considerable attention has been given to the need for actuaries to ensure that their reserves are resilient to financial (and other) changes. An informal note issued by the Government Actuary to Appointed Actuaries dated 13 November 1985 indicated the magnitude of fluctuations in asset values that he regarded as a reasonable test for this purpose. This test is described in Section 2 of the current paper.

1.4 Lastly, although the current Regulations in general apply to linked business as they do to non-linked, it was always the intention that they should be supplemented by more specific regulations for the valuation of linked business. The Government Actuary's Department (GAD) indicated that they now wished to formulate suitable requirements under such further regulations for consideration by the Department of Trade and Industry.

1.5 For all these reasons, therefore, late in 1985 the Institute and Faculty Joint Working Party with the GAD (the 'Joint Actuarial Working Party', or 'JAWP') was re-established to consider these issues. To assist the JAWP, in April 1986 the Institute and Faculty Councils set up a further Working Party, the Joint

Research Working Party on Valuation Regulations (the 'VRWP' or just the 'Working Party') to investigate topics within the broad areas described in §§ 1.2 to 1.4 above, as requested by the JAWP. It is the work of the VRWP that has led to the preparation of the current paper.

1.6 The VRWP has also been considering, among other things, the practical implications of the above mentioned resilience test for non-linked business, the possibility of devising a more soundly based test than the current one (which is recognised as being somewhat arbitrary), and methods of evolving a 'working rule' for determining a future expense inflation assumption for incorporating into statutory valuations. In an ideal world the Working Party might have preferred to present one comprehensive (but possibly incomprehensible) paper covering all these topics—a sort of 'grand plan' for statutory liability valuations. In practice it transpired that the work in respect of linked business was best presented first so that ideas could be discussed at a time when the views of the profession could still influence the Regulations and guidance that might emerge. Thus, with the strong encouragement of the JAWP and the two Councils, the current paper has been prepared covering proposals for Regulations and professional guidance for the liability valuation of linked long-term insurance business only. Perhaps it is just as well that we do not live in an ideal world!

1.7 The members of the Working Party (chaired by Mr D. E. Purchase) are the authors of this paper. However the bulk of the work of its preparation was undertaken by Mr C. M. Johnson assisted by Mr A. E. M. Fine and Mr P. J. L. O'Keeffe. The Working Party as a whole, while accepting full responsibility for the content of this paper, would like to acknowledge its gratitude to those three members for their major contribution. In addition we would thank Messrs S. Benjamin, C. S. S. Lyon and R. J. Squires for their valuable help during the preparation of the paper for publication. Finally, we should stress that the views put forward here are entirely our own, and not necessarily those of our firms.

1.8 In order to assist the Working Party in its work, and to establish the current views held by actuaries of linked companies, a questionnaire was sent in February 1987 to about a dozen such offices. The responses were most helpful to the Working Party and many of the ideas put forward have been used in the preparation of this paper.

1.9 The remainder of this paper is structured as follows:

Section 2 describes the GAD's resilience test (already mentioned) and mentions some practical aspects of its application.

Section 3 outlines the basic principles that the Working Party considers should underlie the system of regulation.

Section 4 describes in some detail the valuation bases considered suitable for linked business.

Section 5 deals specifically with the application of the resilience test to linked business.

Section 6 considers some practical points.

Section 7 summarizes our conclusions and recommendations.

1.10 Many of our proposals seem to us more suited to form part of guidance from the profession rather than formal regulation. However we do not see the precise dividing line as critical, and we welcome other views on this topic—as indeed we do on all the ideas we have put forward.

1.11 *Valuation Principles for Linked Business*

1.11.1 Some knowledge of the principles of linked business and its valuation is required and a brief summary is given below. For those unfamiliar with the subject, it is also recommended that the Actuarial Education Service monograph by Squires[5] and the paper by Brown, Ford, Seymour, Squires and Wales[2] be read.

1.11.2 In general, reserves for linked business consist of two parts, a 'unit reserve', which matches that part of the liabilities expressed in units of whatever link is appropriate (the unit fund), and a 'sterling reserve' (sometimes known as the 'non-unit reserve'), which is intended to cover the liabilities which are not linked to those units, such as mortality, morbidity and expense reserves.

1.11.3 The sterling reserve itself may have more than one component. The major component will be the Discounted Cash Flow (DCF) reserve, which is established by discounting future cash flows, both positive and negative, over the term of the policy. 'Other' components may consist (inter alia) of specific surrender charges, and the value of guaranteed insurability options and other rider benefits.

1.11.4 The unit reserve and the sterling reserve may not be, and indeed usually will not be, independent. In particular, an item of positive cash flow to the sterling reserve will very often be an annual management charge expressed as a percentage of the unit fund. In order to gauge this cash flow, some estimate has to be made of the anticipated rate of growth of the value of units. At the same time, some estimate has to be made of the rate of future inflation to be applied to current expense levels. As the fund management charges often provide for a significant part of the renewal expense costs, the relationship between the unit growth and inflation estimates is one of the key features of the valuation basis.

1.11.5 The reserve as a whole is subject to the constraints that negative liabilities should be eliminated to the extent that a policy should not be treated as an asset (neither should the total reserve be less than the surrender value), and that once established a sterling reserve should not require further capital injection from the shareholders (or the free assets of a mutual office).

2. RESILIENCE TESTING AND THE WORKING RULE

2.1 As already mentioned, in recent years considerable attention has been given, by GAD and by Appointed Actuaries, to the need to ensure that reserves are resilient to financial changes, as required under Regulation 55. At the First United Kingdom Actuarial Convention, in Birmingham, on 12 September 1985, Mr C. L. Cannon of GAD described the 'working rule' which was being used by

the Department when felt necessary.[3] Although there was some initial surprise, actuaries soon became more used to the idea of the test. After the market movements of October 1987 any remaining doubts as to the extent of the fall to be tested are surely academic!

2.2 The test was promulgated more widely through the Government Actuary's memorandum to Appointed Actuaries dated 13 November 1985, a copy of which is reproduced, with permission, as Appendix 1. In essence the test requires actuaries to consider the adequacy of their reserves in the context of immediate falls in asset values of 25% in equities (and similar investments, including property) and also the changes in values equivalent to a rise, or a fall, of 3% in the yields on gilt-edged and other fixed-interest stock. This memorandum was followed by Temporary Practice Note 2 to GN8, issued by the Institute and Faculty to members in May 1986 and contained in the Institute's current Members' Handbook on page D/67.

2.3 It should be noted at this point that 'mismatching' is here being used in the specific context of a difference between the effect of a change in market yields on the aggregate value of the assets and the effect of the same change on the aggregate value of the liabilities (to quote TPN2). This is sometimes described as 'big bang mismatching' to distinguish it from the 'cash flow (mis)matching' of traditional actuarial theory (the importance of which is also emphasized in the Government Actuary's memorandum). For this reason some have advocated phrases such as 'resilience testing' for the newer concept. Whilst this might be more apt, the 'mismatching' usage is already dominant. In this paper both phrases will be found but 'mismatching' is always used (unless specifically stated otherwise) in the context of an immediate change in asset values.

2.4 Whilst on terminology, the GAD test as a whole, including the numerical values set out in § 2.2 above, will normally be referred to in this paper as the 'working rule': the term 'benchmark' is sometimes used with a similar meaning. Phrases such as 'unit growth rate' will, unless clearly stated otherwise, be used in the sense of growth from all causes, both capital and reinvested income, but *before* deduction of any charges as a percentage of the fund. The growth rate is that of the underlying assets, not the unit price.

2.5 In the course of its investigations the Working Party has, as indicated in § 1.6, been considering both the philosophy and the detail of the working rule. It is hoped that these investigations will lead to publication of further work in due course. In the meantime, however, in the remainder of this section we touch on a few aspects in the interests of greater clarity, or where needed for later sections of this paper.

2.6 The rise or fall in gilt yields of 3% is unambiguous, since the dividend flows on a gilt are guaranteed. The meaning of a 25% fall in value for equities and properties is less clear: should one assume a rise in yields, a fall in earnings, or some combination of the two? At the end of TPN2 it is indicated that a rise in yields may be assumed when applying the current test, the earnings being unaffected. However, as a basis for the later development of mismatching

reserves for linked business, it is helpful to consider equity price falls in a little more detail.

2.7 *Yield and Earnings Effects*

2.7.1 The discussion in this paragraph is based on the simple model of Price = Earnings/Yield (where Earnings refers to Dividends or Rents as appropriate) used in the Maturity Guarantees Working Party report.[4] Other, more complex, models have been constructed, but the simple model has already found reasonable acceptance and is sufficient to illustrate the influences involved.

2.7.2 The market yield changes from day to day and can move quickly. However, it is not unreasonable to model the yield as if it has an underlying long-term level around which the actual yield at any point in time fluctuates. The further the actual yield is from the long-term level, the more likely it is to move back towards it. This is the approach adopted by the Maturity Guarantees Working Party, of course, and it accords with practical intuition.

2.7.3 Earnings change more slowly. Over time they have normally shown growth, but can reduce. Once a reduction occurs, it is less likely to be a short-term feature. Indeed a fall in earnings for any individual equity may well be the harbinger of further bad news. Thus, earnings changes are more 'permanent'—there is no 'long-term' level as there may be for yields. Again, this represents the approach adopted by the Maturity Guarantees Working Party.

2.7.4 From these considerations it is clear that a fall in value resulting from a fall in earnings should be regarded as having a longer term effect on asset income and asset values, whereas a fall in value caused by a rise in yield has no effect on asset income. The effect of a yield rise on asset values may or may not be long-term, depending upon where the yield after the change stands relative to the long-term yield level, but whatever the case, the yield rate has risen. Of the two changes, it is immediately clear that the fall in earnings is the more serious problem.

2.7.5 An important corollary to this is that the current -25% mismatching test is at the weak end of its possible range, operating as it does via yield and leaving earnings unchanged. However, in his remarks at the Birmingham Convention[3] Mr C. L. Cannon indicated that more extreme asset movements should also be tested. Giving $\pm 5\%/-40\%$ as an example, he mentioned that at that stage an actuary might reasonably have recourse to the margins contained in the minimum standards under Regulations 56 to 64 (and make provision for only a modest level of bonuses), whilst for even more extreme changes in conditions the actuary could rely on the explicit solvency margin in addition to margins in the reserves.

2.8 *Coherence*

2.8.1 Another area of some difficulty relates to problems of coherence. Should the test be modified if substantial changes in values have occurred just *before* the valuation date (or are known to have occurred just *after* it)? In testing for

resilience to the assumed benchmark changes, must the actuary assume a succession of such changes into the future?

2.8.2 In fact the answer to the second question above, as indicated in paragraph 8 of the Government Actuary's memorandum (Appendix 1) is 'no'—to the relief, no doubt, of actuaries generally. On the more general issue it should perhaps be noted here that the current test is not regarded as a 'scenario test' and it is not intended that it should become so. In other words, it does not represent a hypothesis about future economic events, but is a purely mechanical process for testing that Regulation 55 can be met. Thus, for example, recent movements in value are ignored. Other parameters are set to maintain the same 'severity' of test compared with the situation before the fall. However, as with yield and earnings effects, it may be helpful to consider coherence problems, from a more theoretical standpoint, in a little more detail.

2.8.3 Any mismatching test will, of course, be subject to some coherence problems. The objective should be to leave in the test the coherence risk which is actually present in real life and to reduce to a minimum any which is created artificially by the test.

2.8.4 Providing that the part of the test dealing with the possibility of an earnings fall is of reasonable weight, there should be no artificial coherence problem from this source. That is, if earnings have fallen just prior to the valuation, it is fully correct that the mismatching test in the valuation examine a further fall. As argued above, when earnings go down they are likely to have moved to a lower path more permanently. A further fall is not improbable.

2.8.5 Moving to look at the yield situation, an office's management will presumably monitor matching continuously, via immunization analyses and so on. Significant market movement should trigger readjustments to the matching position in appropriate areas—for example, a gilt portfolio may be restructured to re-base an immunization. To some extent then, the coherence problems may be reduced by timely management action. Nevertheless, where substantial movements occur very close to the valuation date and for asset holdings not driven by guarantee considerations, there will remain the problem of whether a further yield rise is likely and by how much.

2.8.6 One way to deal with this would be to establish a more flexible test in which the yield risk to be examined varies in extent according to the relationship of the yield on the valuation date with the long-term yield. A table might be used in which the higher the actual yields stand, the lower the additional asset weakening from further yield increase which must be tested. This would require further investigative statistical work, but should be achievable. The initial work could also establish what the long-term yield should be taken to be for equities and properties independently. The long-term yield should also be subject to periodic review. Perhaps every fifth year might be a sufficiently frequent interval for this.

2.9 In concluding this section, we return briefly to the severity of the current working rule. In terms of market fluctuations actually observed, it describes

movements which might be expected to occur (over fairly short periods) every decade or so. As such, it is probably perceived by the profession as a reasonable minimum 'external' standard to use in normal circumstances, and one which companies should be able to satisfy without difficulty. Its 'internal' effect is not, of course, equally stringent for all companies, and varies, for example, with the asset mix: for non-linked business the statutory net premium method of valuation can also introduce distortions. It is an open question (which we do not intend to answer here) whether the optimum test *should* be of this order of 'objective' severity, or whether a more stringent test would be desirable.

3. BASIC PRINCIPLES

If further Regulations are introduced to define more specifically the methods and parameters by which long-term business, and in particular linked business, is to be valued for statutory reporting purposes, those Regulations should meet the following basic principles.

3.1 Legislation should be well defined, and secure coherence of outcome from year to year.

3.2 The purpose of any margins created by the Regulations and any other legislative provisions should be clear, particularly in the current environment of statutory solvency requirements.

3.3 Unnecessary overlap of margins should be avoided. (Appendix 2 lists the current statutory position, which is seen by many as involving layering of margin on margin.)

3.4 Legislation should seek to regulate companies in a timely and effective way, in order to protect the interests of the consumer. However, it should not be so burdensome as to restrict companies' ability to provide service at competitive cost: it is the consumer who will pay for the expenses of compliance and for margins set up.

3.5 Evenhandedness is essential. This applies not only to different providers within the life insurance industry, but also to providers of similar services in the wider Financial Services environment.

4. VALUATION BASES FOR LINKED BUSINESS

4.1 *Introduction*

4.1.1 This subject has been explored before, notably by Brown *et al.* in their 1978 paper 'Valuation of Individual Investment-Linked Policies'.[2] Their conclusions are so important, and remain so relevant today, that we reproduce the summary of conclusions from their paper in Appendix 3. Conclusions (2), (5) & (10) have already been dealt with in Regulations, and the Working Party accepts and agrees with all the conclusions set out in the summary. (In particular, point (1)—that a gross premium cash flow approach to valuation is essential for

investment linked business—has been implicitly assumed as applying throughout the remainder of this paper.)

4.1.2 What follows draws on this earlier work. It seeks neither to reiterate old ground unnecessarily nor to cover every nuance of linked business. Our intention is that actuaries should have regard to the spirit of the proposals where they do not specifically deal with individual features of policies.

4.1.3 Paragraphs 4.2 to 4.10 below discuss the key unit-linked valuation parameters, their interrelationships and impact, together with other reserving issues. Suggestions are made as to how Regulations might approach the setting of valuation bases. It is important to stress right at the outset that these would be subordinate to Regulation 54. If prudence dictates that actual bases should be stronger for an office's particular circumstances, then the actuary should apply appropriately stronger parameters. Aspects which might more appropriately be dealt with in professional Guidance Notes are also covered.

4.2 *Unit Growth Rates and Renewal Expense Inflation*

4.2.1 The search for specific values to attach to the rates of unit growth and cost inflation is largely futile. Different time periods of observation will yield different results. Different offices' own unit performance and cost experience will vary widely. Any basis suggested will be capable of some criticism. Overall, it seems preferable to avoid specific parameters as far as possible and instead provide guidelines for acceptable relationships between growth, cost inflation and discounting rates.

4.2.2 In general the use of relationships like these, if soundly based, gives the flexibility to deal with a wider range of economic circumstances—in both the external world and an office's own situation. It also means that the discretion of actuaries is not unnecessarily hampered. Further, if used correctly, such an approach should ultimately lead to greater real coherence of reserves and more durable long term rules—circumstances can change to make any predetermined rates inappropriate.

4.2.3 The form of the guideline relationships has been considered. Two methods are possible, one which starts from a consideration of gross investment conditions and the other from conditions net of tax. These are described in §§ 4.2.5 and 4.2.6. In each case the approach is set out as a proposal. Whilst most members of the Working Party tend to favour the gross approach, the issue is not clear-cut and discussion is needed before deciding which form should ultimately be established in regulations or guidance—probably the latter.

4.2.4 After consideration, the Working Party believes that the proposed relationships should be seen as reasonably firm guidelines, but not as hard minima. Thus, whilst a weaker approach should only be used in the light of other important features of current economic conditions, an appointed actuary would be left with the discretion to use the basis of his choice—and must then be prepared to justify that to the regulatory authorities.

4.2.5 *The Gross Approach*

4.2.5.1 The gross unit growth rate before management charges is selected in the light of market conditions and longer term expectations.

4.2.5.2 The proposed guideline is then that renewal expense inflation is taken to be 2% p.a. below the gross unit growth rate (or at a higher level). This reflects the view that, in the long term, gross investments will produce real growth of 3% p.a. over RPI, earnings will grow 2% p.a. faster than RPI and renewal expense inflation (being a mixture of price and earnings inflation) will be 1% p.a. above RPI. 'Economies of scale' or improvements in efficiency may be expected, but should not be anticipated. Prudence dictates that these should only be taken into account when they have actually been achieved.

4.2.5.3 The net unit growth rate before management charges is the gross rate netted down at a long-term rate of tax which is reasonably cautious and appropriate to an office's linked business as a whole. A moderately cautious choice for this long-term tax rate will avoid too frequent changes. The selected rate may reflect the current levels of tax provision made from the linked funds, but it should be at least as conservative as the result based on the progress of the business on a closed fund basis. It would not be prudent, nor would it follow the current Regulation 61, for the tax provision to rely on the continuance of new business to maintain a net inflow position, with attendant longer deferral of actual realizations of capital gains.

4.2.5.4 In passing, it is observed that the long-term tax rate selected may well be different from the rate of relief applied to expenses.

4.2.5.5 In favour of the gross method it could be argued that some types of fund link are not suited to the net approach, and pensions business requires the gross method anyway. It may appear to the outside world to be a more straightforward and logical approach.

4.2.6 *The Net Growth Basis*

4.2.6.1 The proposed guideline is that the unit growth rate net of tax but before management charges be not greater than the renewal expense inflation rate. The gross rate before charges is then derived from the net rate using a long-term rate of tax selected as described above.

4.2.6.2 The net growth rate is arguably a better start point than the gross, because many investors in the market are net investors, often with higher tax rates than those applying to a life office. (In fact, the central premise underlying the net approach is that in practice these investors have a greater influence on the market than gross investors.) In the long term, net investors may not be willing providers of finance unless they achieve a real rate of return. (This is true also for the unit-linked policyholder, who will be more likely to surrender in the face of sustained negative real growth in his units.) For most of these net investors, a real rate is likely to be measured against RPI. If renewal expense inflation grows 1% p.a. faster than RPI in the long term, as described above, the use of a net unit growth rate equal to the renewal expense inflation assumption implicitly offsets

the real rate of return the net investor would seek, against the higher than RPI cost inflation the office may expect to suffer.

4.2.6.3 One of the attractions of the net method is that it reduces the need to define specific margins within a minimum basis, although of course the zero net real rate of return is implicit.

4.2.7 *A Comparison*

4.2.7.1 Three simple examples of these structures are shown. In these examples, long-term tax rates are assumed to be 30% (Franked), 35% (Unfranked) and 25% (internal fund deduction on Chargeable Gains). In each case expense inflation is significantly greater than the rate of capital growth (well over 1% greater), so to reflect the indexation allowance only a small part of the gains has been taken as chargeable. The 'net growth rate' in the gross approach is derived from the components of the total gross rate and the assumed rates of tax.

4.2.7.2 For the purposes of the comparison, the net growth rate components in the Net Approach are consistent with the gross components in the Gross Approach, subject to small roundings. The aggregate long term tax rate is shown prior to any increase being made to add an element of caution.

4.2.7.3 A comparison of the inflation rates in the examples shows the Net Approach to be more conservative at lower growth rates and the Gross

Gross Approach	A	B	C
Gross growth rate			
Franked income	2·8%	3·5%	4·5%
Unfranked income	·7%	1·5%	2·0%
Gains—chargeable	·5%	1·0%	1·5%
—non-chargeable	2·0%	4·0%	6·0%
Total	6·0%	10·0%	14·0%
Expense inflation	4·0%	8·0%	12·0%
Net growth rate	4·8%	8·2%	11·6%
Aggregate long term Tax rate	20·0%	18·0%	17·0%
Net Approach			
Net growth rate			
Franked income	1·9%	2·4%	3·2%
Unfranked income	·5%	1·0%	1·3%
Gains—chargeable	·4%	·8%	1·1%
—non-chargeable	2·0%	4·0%	6·0%
Total	4·8%	8·2%	11·6%
Expense inflation	4·8%	8·2%	11·6%
Gross growth rate	6·0%	10·0%	14·0%
Aggregate long term tax rate	20·0%	18·0%	17·0%

Approach at higher growth rates. This is the result of the 'gearing' effect of the fixed 2% differential in the Gross Approach. The exact cross-over point between the two methods depends upon the assumed mix of the taxable components and the tax rates applied.

4.3 *Discount Rate for the Sterling Reserve*

4.3.1 The discount rate used to calculate the present value of the Discounted Cash Flow (DCF) component of the sterling reserve should reflect the assets currently matching the reserve, the likely future pattern of the DCF reserve (i.e. how it will increase or decrease over time) and the rate at which the finance for any future net reserve increases can be invested.

4.3.2 The future investment rate for this purpose should not be subject to the '7.2% restriction'. This is a consistency point, in that the move to active growth and inflation rates in other parts of the basis should be followed through to this parameter too. In particular, within any mismatching test (see § 5.2) the actuary may well need to use a different rate. Where this is so, the revised rate to be used will be dictated by the nature of the matching assets and how their yield has moved under the mismatching test.

4.3.3 If the statutory 7·5% of yield margin in the current Regulation 59 continues to apply in any revised regulatory environment, then it should, of course, be applied before arriving at the final discounting rate for the valuation: thus, if the net rate being earned on matching assets is 8% p.a., the discounting rate would be at most $8\% \times \cdot 925 = 7 \cdot 4\%$.

4.3.4 This general approach to determining the discount rate correctly gives some implicit offset between the effect of higher growth and higher cost inflation in the calculation of the cashflows year by year, and the discount rate then used to capitalize them. Higher inflation rates will probably increase the net cash outflows, since they reduce the relative weight of fixed margins in a policy—such as the bid/offer spread on a fixed regular premium. However, those higher resulting cashflows will then be given a lower present value by the higher discounting rate.

4.4 *Renewal Expense Provision*

4.4.1 Within this section renewal expenses are primarily seen as being those an office will incur as a continuing entity. However, in accordance with current Regulation 61, the actuary should also have regard to the effect of the office ceasing to transact new business.

4.4.2 Renewal expenses can be related to a range of items, the most usual being the annualized premium, the unit fund, or the number of policies in force. In practice, it is undoubtedly true that a substantial part of the direct servicing expenses relates to number of policies. (Overhead expenses may be less related to numbers of policies, although some part will be.) The valuation basis most nearly reflecting the true incidence of costs is, therefore, one which has an opening

expense loading (on which the inflation assumption operates) which is on a per policy basis.

4.4.3 Some offices use such bases. Others load expenses in relation to the annualized premium or the unit fund. These latter methods, whilst incorporating a sufficient amount of renewal loading in total, lead to cross subsidy from the larger policies to the smaller. Our belief is that, in most normal circumstances, this cross subsidy has a more significant effect on the necessary sterling reserves than the relationship between unit growth and cost inflation. That said, the opening expense loading does of course apply in combination with the assumed unit growth and inflation rates, and moderate conservatism in each area can reinforce and lead to significant conservatism in the resulting reserves.

4.4.4 A purist must therefore conclude that expense loadings which are substantially on a per policy basis are the most appropriate for statutory valuation, because they avoid the risks inherent in cross subsidy situations. In this case the risk with other loading bases is that lapse and surrender rates will be highest amongst the larger policies, leading to inadequate loadings from smaller policies, with a consequent need to support reserves with further finance.

4.4.5 Those not using expense loadings related to contract count might well argue—perhaps very reasonably—that this risk is unlikely to be realized in practice. Indeed, intuition suggests that the reverse might be expected—that is, that the smaller contracts will experience the higher withdrawal rates.

4.4.6 The whole question is therefore one of forming a balanced judgement, within which prudence is fundamental. It seems unnecessary for Regulations to dictate the form in which provision for renewal expenses is made, but we suggest that professional guidance draw to the attention of Appointed Actuaries the potential for future loadings inadequacy if loadings are not primarily based on numbers of contracts.

4.5 *Mortality*

There is little need for comment on mortality bases, as the principles for linked and non-linked business are identical, and Regulation 60 applies to both with equal force. However, there are two aspects worthy of a brief mention. The first relates to options included in contracts, for example to vary the sum assured, which may involve potential changes in the mortality risk. Even where there is protection against future anti-selection, constraints can be imposed (e.g. by the rules for 'qualification') and the actuary may need to consider whether further reserves are needed. Secondly, although many modern linked contracts include a right to the office to vary the mortality table used for charging, its freedom to act may again be constrained, for example by a 'rate guarantee' or 'minimum period of cover', for marketing or administrative reasons, or by references to 'published tables'. Thus if experience becomes adverse, for reserving purposes it may not be adequate merely to rely on this right to increase the mortality deductions made. (We return briefly to this aspect in § 6.5.)

4.6 *Lapses and Surrenders*

4.6.1 Current legislation requires that lapses should be ignored, unless lapses increase reserve requirements, in which case they should be included.

4.6.2 *Pension Policies*

4.6.2.1 Many unit-linked pension plans require higher reserves on a paid up basis than an in force basis, especially at short durations. This is particularly true for those policies with initial units which are actuarially funded to the maximum extent. Unless there are other sources of charge (e.g. an expense charge taken by unit cancellation) these contracts require extra reserves when they move from 'in force' to 'paid up', as the potential future premium and unit management charge margins reduce, possibly to zero. Maintenance costs, on the other hand, may well reduce but they do not cease.

4.6.2.2 The strictest interpretation of the current Regulations is therefore that the valuation should assume that each policy is made paid up at the worst possible time from the point of view of the office. The DCF reserve required would then be the greatest reserve under the various possible futures, each future being projected using appropriate assumptions.

4.6.2.3 This approach would be extremely complex to apply on a policy by policy basis, and is very stringent. As the paid up reserve problem normally reduces with policy duration, an easier and only slightly weaker alternative is recommended, which is to assume that the policy is made paid up on the valuation date. The DCF reserve required would then be the greater of the 'in force' and 'paid up' approaches.

4.6.2.4 In accordance with the statutory requirement to write off commission advanced to agents but not yet earned, the paid up reserve should not include any credit for potentially recoupable advanced commission.

4.6.3 *Life Policies*

4.6.3.1 Withdrawals here normally reduce reserves, since most policies are surrendered for cash rather than made paid up, thereby releasing any existing DCF liability. Taken across a portfolio, the statutory approach of not permitting any allowance for lapses is generally one of the most stringent assumptions in the range of possible bases.

4.6.3.2 Whilst no change is recommended, life policies are covered here for completeness and because it is important to recognize that the current statutory approach of ignoring lapses incorporates a potentially significant margin in the reserves required. This should particularly be borne in mind when considering the relationship between unit growth and cost inflation (see §4.2), since lapse rates will interact with actually experienced real growth rates. That is, negative real growth and no lapses form an unrealistic and harsh combination, since it is unlikely that policyholders will watch negative real growth erode the value of their savings over the longer term—there are a wealth of advisors today ready to persuade them to change investment medium!

4.7 *Commissions*

The reserving process should include adequate allowance for any future initial and renewal commission payments. Where commissions have been advanced but are not yet earned, the DCF approach used should harmonize with the accounting treatment of the advanced commissions when establishing the surplus arising in a period.

4.8 *Regular Withdrawal Plans*

4.8.1 Both single premium and regular premium contracts can include the option to take regular 'income' by way of withdrawal. The regular withdrawals reduce projected unit funds and can therefore increase reserve requirements. Further, the making of the payments is likely to increase renewal expenses (although in practice this increase may not be particularly significant).

4.8.2 For contracts with regular withdrawal options which are currently in operation the valuation liabilities should reflect their impact. This can be done specifically by incorporating the withdrawals in the DCF projection. Alternatively, the actuary can apply approximate methods providing that these do not produce lower reserves: for example, by suitable reduction of the unit growth rate for contracts subject to withdrawals.

4.8.3 We discuss the problem of contracts including an option of withdrawal payments, but where no such payments are currently being made, in § 6.1.4.

4.9 *Variable Management Charges*

4.9.1 Some contracts give the office the right to increase management charges. There are two main situations. Firstly, where the management charge level is normally increased regularly and is so described in literature at the time of sale. Secondly, where the management charge level is normally expected to remain the same, but where it gives the office protection against possible future adverse circumstances.

4.9.2 An example of the first is an annual administration charge increased in line with RPI. An example of the second is a ·75% p.a. fund-related charge which the office has the right to increase at some future stage, perhaps subject to some overall ceiling, such as 1·5% p.a.

4.9.3 These two situations are, of course, fundamentally different. In the first case, policyholders' expectations are that the charge will increase. In the second, their expectation is that the charge will not normally be increased.

4.9.4 From this it follows that, in the first case, future increases in charge can readily be accepted in the valuation basis—perhaps subject to the caveat that these must be within reasonable bounds. For example, the assumed growth in the current actual level of charge should not exceed the RPI rate underlying the renewal expense inflation assumption.

4.9.5 The second case is less clear. On the one hand, policyholders' expectations imply that an increase above the current level should not be included when establishing liabilities. On the other, with the statutory valuation

viewed as a solvency test, there is an argument that inclusion should be permitted.

4.9.6 The approach which we recommend is to permit inclusion subject to the condition that the actuary state the extent and timing of any assumed increase. Further, guidance should remind the actuary that, when establishing reserves which take credit for an increase, he should take account of the ramifications of the increase, which could include:

(a) The effect of increasing the charge on lapse experience, including any necessary higher paid up reserves and the impact on renewal expense loadings of renewal overheads being spread over the fewer policies remaining in force.
(b) The effect of the increase on new business levels—in particular the impact of any reduction on the recoverability of new business overhead expenses.
(c) Any allowance necessary for the time delay before any increase can be put into effect.
(d) Any allowance necessary for the costs of introducing the increase—notifications, queries, processing costs, etc.—on the basis that these arise at the date from which the increase is assumed to take effect.
(e) The effect of the higher charges on any assumptions made in the calculation of the statutory solvency position. For example, if the increase is considered likely to stimulate sizeable withdrawals, any 'implicit' future profit margin might need to be reduced.

4.10 *Capital Gains Tax Reserves*

4.10.1 *Terminal Deduction Policies*

4.10.1.1 Certain linked contracts, generally of an older design, are directly linked to outside unit trusts and have a terminal deduction made from the benefits payable, to provide for Capital Gains Tax (CGT). Because the office may well be able to pass on units from terminated policies to new and continuing policyholders, the rate of terminal deduction for CGT is frequently less (sometimes significantly less) than the full rate if the units were actually sold back to the trust managers. Terminal deductions made are then generally accumulated in a separate 'account' and used to meet future CGT as actual realizations occur. The reserve for prospective CGT in a statutory valuation is often taken to be simply this accumulated account.

4.10.1.2 This reserve may be weak for statutory purposes, because it does not allow for the possibility of very high rates of surrender. This can be illustrated by taking the extreme event of 100% surrender. The maximum amount then available is the reserve (i.e. accumulated terminal deductions) together with any technical reserves released, such as DCF liabilities, and the maximum terminal deduction that could be made from the surrendering policies.

4.10.1.3 This latter amount must have regard to the prices ruling at the time units were reallocated to the surrendering policies, not the original base price for

CGT purposes. The actual additional tax payable, on the other hand, would be ascertained by following the effect of any necessary disposals through the office's entire tax computation. For this purpose the CGT payable by the office at the time of disposal will have regard to the original base price. This problem was aggravated by the introduction of indexation because the indexation offset is calculated by reference to the March 1982 price, whilst policyholders expect the indexation allowance on their policies to be by reference to the price ruling at the time units were 'reallocated' to their policies.

4.10.1.4 For prudence, offices should be required to provide statutory reserves for prospective CGT by reference to the principle of high levels of surrender, allowing for the potential increase in actual taxation, less released technical reserves and the maximum amount of tax that could be debited to policyholders' funds in the circumstances.

4.10.2 *Policies Linked to Internal Funds*

The majority of modern linked contracts do not involve terminal deductions. Instead they involve linking to an internal fund of the office with units at prices net of prospective CGT. In this situation there is normally no reserving problem because the CGT liability falls on the unit fund. (For internal funds which do not allow for prospective CGT in the unit price the situation is as described above in §4.10.1.)

4.10.3 *Non-Linked Policies*

Evenhandedness is important, and similar principles should be applied to non-linked business also. There is, though, a mitigating point here. Equities, for example, may be matching the non-linked liabilities. On surrender, the equities may have to be sold, creating a CGT liability. However, the surrender value could be significantly less than the actuarial reserve, and where the surrender value is not guaranteed, it could be reduced to compensate for any additional CGT liability.

5. MISMATCHING RESERVES FOR LINKED BUSINESS

5.1 *Introduction*

5.1.1 Just as the reserves of linked policies are calculated as the sum of two components, a unit reserve and a sterling reserve (see §1.11), it is sensible to approach the determination of mismatching reserves by reviewing the effect of changes in asset values on these two components separately.

5.1.2 In the event of a change in investment conditions as envisaged by the working rule, there should in general be an equivalent change in value of the unit fund and of the unit reserves and so any mismatch should be of a minor nature. This approach can be somewhat too sanguine in practice, and the implications for unit reserves are discussed further in §5.7. The sterling reserve and corresponding assets however will be directly subject to the mismatching test.

5.1.3 One important element in the consideration of mismatching reserves is the interaction between unit and sterling reserves. Depending on the product design a significant part of the positive cash flow to be measured by the sterling reserve, particularly in the later years of a contract, will be fund related management charges, usually expressed as a percentage of the value of the unit fund. In such circumstances any change in the anticipated growth of the unit reserve will have a direct bearing on the required level of sterling reserve.

5.1.4 If the fall in unit funds arises as the result of a fall in earnings there would be no increase in the expected growth of the unit fund and hence the contribution to the sterling reserve from future management charges would fall. This leads certainly to higher DCF reserves.

5.1.5 However if the fall arises from an increase in market yields, the effect will be reduced initial unit prices but there may well be correspondingly increased expected future unit growth. In Appendix 4 we demonstrate that for a 25% asset value fall the extent of this increase would be one third of the present running yield for the fund link where the future earnings stream is assumed to be unchanged.

5.1.6 In these circumstances it is possible for sterling reserves to fall since investments from future premiums will grow at a faster rate and even existing unit funds will recover, given sufficient time. The extent and direction of any change will depend upon the source of any reserves required. DCF reserves required to cover short-term outgo would need extra finance because future premiums have little impact and there would be insufficient time for the unit price to recover fully for existing unit funds. On the other hand, the DCF reserves may be necessary because of cash outflows many years into the future (from long-term renewal expense growth for example), so here the result may well be a reserve reduction. Equally an increase in asset values may demand greater reserves as a result of a correspondingly reduced future unit growth rate.

5.1.7 We understand that so far as the GAD's interpretation of the *current* working rule for linked business is concerned, the sterling reserves must be calculated at an unchanged growth rate and will accordingly increase. However in our view this approach is too rigid to be reasonable for linked business, and in this section we do not assume that the constraints of the current working rule are perpetuated.

5.2 *Discounting Rate*

5.2.1 The discounting rate used to calculate the DCF reserves may also be affected by the change in market conditions assumed in the mismatching test.

5.2.2 The revised discounting rate would be ascertained in the manner described in §4.3. That is, it would depend on the assets supporting the pre-change reserves, the further assets available to support any increase in DCF reserves required by the mismatching test and the likely future pattern of the revised DCF reserve.

5.3 *Renewal Expense Inflation*

5.3.1 If the test, by operating through yield rather than earnings, results in an increase in the unit price growth rate, the Appointed Actuary will need to consider the extent to which the renewal expense inflation assumption should change. Following through in full the guideline relationship described in §4.2 above would, of course, lead to an exactly parallel increase in assumed expense inflation. In many circumstances this would demand a substantial increase in sterling reserves (see §5.5.3 and Appendix 5). In turn this very significantly increases the overall stringency of the test, particularly when compared with the method of application described by TPN2 for non-linked business. (There, consequent changes in inflationary expectations are effectively ignored, primarily because the net premium method does not deal explicitly with inflation and further because the whole of the yield increase may be brought through into revised valuation interest rate assumptions. That is, no part of it need be deemed offset against the inherently higher expected future expense inflation implied by equivalence with our linked proposals.)

5.3.2 Beyond this stringency point, there are other potential objections:

— adjusting the inflation rate moves the position from simply an asset fluctuation mismatching test into the realms of inflation assumption fluctuation reserving.

— there are practical problems, with different asset mixes leading to different changes in inflation, according to the income content in the total investment return.

5.3.3 In the light of all these points, the Working Party believes that, whilst the guideline relationship between the unit growth and inflation rates should continue to be borne in mind, the relative firmness of that recommendation should be relaxed when applying the mismatching test.

5.4 *CGT Reserve Movements*

The amended asset values following the application of the mismatching test will lead to corresponding revisions to any CGT reserves. In turn this would either cushion the extent of the unit price change, where the CGT reserve was established within the unit pricing calculation, or lead to adjusted direct CGT reserves where the terminal deduction method applies.

5.5 *Mismatching Tests for Sterling Reserves*

5.5.1 It will be seen therefore that a thorough application of a mismatching test would involve the calculation of DCF reserves on a number of different bases; firstly on the assumption that the fall in equity prices leads to an increase in market yields, and testing for all combinations of changes in the valuation discounting and the renewal expense inflation rates, and secondly testing for the situation where the equity price fall is as a result of a drop in earnings with no unit growth rate changes.

5.5.2 Moreover the extent of any price fall or change in unit growth rate will depend on the nature of the assets in the unit fund and the CGT position, requiring separate tests for each individual link, a rather meaningless complication where cheap and ready switching between funds is available to policyholders. Finally the discounting rate may itself be affected by the mismatching test and any additional reserve requirement revealed.

5.5.3 *Examples*

Appendix 5 provides a range of examples which illustrates the possible reserving impact of parameter changes. For a simple annual premium policy and a single premium policy in turn, these include:

A. The start point, 'pre-test' example.
B. A post-test example with all the price fall taken via yield, but with no change to the valuation discounting rate.
C. A post-test example with all the price fall taken via yield and with the price fall also being assumed to result in a higher discounting rate.
D. and E. As B. and C. but with the renewal expense inflation rate increased in line with the increased gross unit fund rate of return.
F. A post-test example with all the price fall taken via earnings. (Hence there are no unit growth rate or renewal expense inflation rate changes.)

5.6 To avoid the multiplicity of (expensive) valuation projections which we have shown to be necessary to apply a mismatching test fully, the following simplification is suggested, that:

(a) For all linked life business taken together, and for all linked pensions business taken together, the ramifications of a 25% fall in asset values are followed through.
(b) For this purpose, the 25% value fall be also applied to gilt holdings.
(c) No fall need be included for cash and deposits with under one year to maturity, if these are placed with recognized financial institutions.
(d) The resulting average unit price fall, an average revised future unit growth rate and the average revised DCF discounting rate be applied uniformly across life and across pensions business respectively.
(e) This simpler test be applicable only to the computation of the mismatching reserve needed in respect of Discounted Cash Flow sterling reserves under linked policies. (This reflects the fact that for linked business any mismatching test outcome for these reserves is a 'second order' effect only.)

5.7 *Mismatching of Unit Reserves*

5.7.1 All the comments made so far are in the context of unit liabilities which have been fully matched by unit asset purchases. In practice, offices sometimes run 'over-funded' or 'under-funded' positions.

5.7.2 Where there is over-funding and the assets involved are not used to

match mathematical reserves, then the mismatching tests will not apply. However where over-funding is used to match policyholder liabilities beyond the corresponding linked liabilities, then the mismatching tests should, of course, be applied.

5.7.3 Generally speaking, under-funding is a higher risk practice than over-funding, particularly in the solvency test sense of the statutory valuation.

5.7.4 A fall in the linked assets is not really a problem in the under-funded situation, since the unit price falls and the office will normally benefit, as it can purchase units to move to a matched position at a lower cost. In this case then, the mismatching test is real and must be applied, but it is a $+25\%$ movement which should be tested. The test conditions need extension to $\pm 25\%$ to deal with this point.

5.7.5 Some argue that over-funding in one fund can reasonably be offset against under-funding elsewhere, providing that the links involved are sufficiently similar. For this to hold good in practice, the offsetting links would need to be very clearly similar. Defining 'similar' leads quickly to subjective judgement. Indeed, the question may be asked as to why the under/over-funding mismatch position is being run at all if the links are so similar.

5.7.6 Any permitted offsetting should therefore be strictly controlled, requiring clear similarity and perhaps subject to an over-riding offset limit, expressed as a percentage of the value of the underlying funds involved. Similar principles should apply to 'shadow funding' and funds linked to external indices.

5.8 *Temporary Under- and Over-Funding*

In some circumstances, under- and over-funding may result from very short-term timing differences between unit allocation to policies and unit creation in the unit funds. Some may feel that a full mismatching test represents a severe standard in this situation. However, we take the view that the risk is present whatever the cause, that the full mismatching test should be met and that the office can deal with any problem this produces via tightening unit control. In the normal course of events the differences should be small in relation to the funds as a whole, and the mismatching test therefore not too significant: if the differences are *not* small then they should not be disregarded.

5.9 *Overlapping of Margins*

5.9.1 Legislation should avoid unnecessary overlap of margin on margin. It is inappropriate that any amendments should simply create an additional layer of reserves under the roof of Regulation 55, whilst ignoring all the other existing protection set out in Appendix 2. A number of changes to the existing situation may be required.

5.9.2 Firstly, the 7·5% of yield margin may no longer be necessary. This is discussed further below. Next, the 7·2% p.a. maximum future yield on new investments fits badly with the specific rates for linked business proposed by the GAD from time to time in the past. Finally, Maturity Guarantee reserves

established using the methods recommended by the 1980 Working Party[4] already allow for mismatching against the guarantees. Indeed the recommended basis provides a severe test at the low ruin probabilities involved and such business should be excluded from any further test.

5.9.3 One possible way to address overlap is to draw up rules which divide a 25% total fall between earnings effects and yield effects, accompanied by the removal of the 7·5% of yield margin. This would be done on the basis that with mismatching specifically addressed—in a way which covered both yield and earnings—and solvency requirements providing the statutory financial cushion, there was no longer any justification for a yield margin.

5.9.4 Thus the following alternative suggestion is made: that the 7·5% of yield margin be viewed as reflecting the impact of an earnings reduction of 7·5%. It would then remain for the office to test the impact of a 25% fall in asset values under the assumption that the remaining 17·5% of that fall corresponds to a yield increase. Such a test fits in broadly with existing legislation and is unambiguous. It also seems a reasonable practical combination of the earnings and yield effects.

5.9.5 For a unit-linked contract the unit price would fall by 25% whilst the growth rate increase would reflect only the 17·5% component coming from the yield. Again this seems a reasonable overall test.

6. SOME PRACTICAL POINTS

6.1 *Evenhandedness*

6.1.1 As commented already, in considering valuation regulations it is important that the outcome is evenhanded as between non-linked business and the risk that involves, and linked business and the different risks it carries. This applies both to minimum reserving bases and to the likely burden of expense of compliance.

6.1.2 Under current legislation some differences already exist:

(a) Valuation bases for liabilities more specifically cover non-linked business. Linked business therefore currently enjoys more freedom, although actuaries are of course expected to value within the spirit of the Regulations.

(b) On some individual issues an inconsistent level of detail seems to be required. For example, linked offices are now obliged (by the D.T.I. Guidance Notes rather than by the Regulations) to supply full details of the undiscounted values of actuarially funded units. In the non-linked context, this is parallel to asking offices to provide details of the unzillmerized reserves.

(c) Linked business with maturity and surrender value guarantees is subject to the unofficial (but effective) standards set out in the report of the Maturity Guarantees Working Party.[4] The resulting reserves can be seen as 'shock proofing' the guarantee portfolio at a level which practical experience shows to be a severe standard to comply with. In practice, most non-linked

endowment contracts carry substantial maturity guarantees and the position of non-linked business has similarities with that for linked policies. Equivalence of practice would therefore lead to a requirement for non-linked offices to apply 'shock proofing' tests of corresponding strength to their guarantees.

Such inconsistencies of approach should be avoided, if possible, when drawing up further regulation or guidance. There are several areas for care in this context.

6.1.3 *Renewal Expenses*

6.1.3.1 As argued in §4.4 above, a reasonable proportion of renewal costs should be loaded on a per policy basis. Further, the whole thrust of debate on linked regulations is toward specifically loaded inflation of expenses.

6.1.3.2 These issues are valid for non-linked policy reserves as well as for linked reserves. It would therefore seem inappropriate to establish approaches which demanded that linked offices develop reserves including these features, whilst not requiring non-linked policy bases to address the same issues by way of explicit allowances.

6.1.3.3 As it currently stands, the net premium approach defined by Regulations tends to push towards reserves in which future expenses are covered by a flat, premium related loading. This would need modification to put non-linked policy reserves onto an equal footing.

6.1.4 *Regular Withdrawal Plans*

6.1.4.1 The subject of allowing for regular withdrawal plans in reserving was discussed in §4.8. There it is recommended that offices should properly reflect existing withdrawal plans in valuation bases.

6.1.4.2 Some have gone further, suggesting that all policies which contain the option to put a regular withdrawal plan into effect should be valued as if the option were exercised immediately. This would particularly affect unit-linked single premium bonds, of course. The suggestion seems to us unrealistic and unrepresentative, and should not be made a requirement. Not all policyholders invest for income and those who do normally establish a regular withdrawal plan from outset. Some policyholders may subsequently choose to start taking withdrawals, but others will cease to do so. A parallel can again be drawn with non-linked policies, where an equivalent suggestion might be that all policies containing a non-forfeiture provision must be valued by following through the long-term ramifications of all policyholders putting that facility into effect immediately, then taking the greater of that result and the 'in force' reserve.

6.1.4.3 Having made these comments, it is also important to state that the individual actuary should monitor the experience of his office. If this shows a rising proportion of policyholders taking withdrawals, then any necessary further reserves should be established.

6.1.5 *Valuation Systems*

6.1.5.1 Because the original linked offices were largely new entrants to the

market, they tended to develop computerized valuation methods which used the gross premium discounted cash flow approach, with future items of income and outgo separately identified, year by year.

6.1.5.2 Traditional valuation methods evolved before the days of computers when grouping and approximation were essential. Even though offices may now be carrying out valuations policy by policy, this evolution (as well as other influences) has left a situation where the net premium, formula-based approach is dominant for non-linked business.

6.1.5.3 To some extent, it can be seen as unfair if this evolutionary difference should lead to approaches for linked offices which are more stringent in effect and more costly to administer.

6.2 *Surrender Charges*

6.2.1 The Discounted Cash Flow component of the sterling reserve for a policy, calculated by examining the projected income and outgo in each future year, is normally constrained to be positive or zero. However, the total sterling reserve can be negative, for example where the office has the right to deduct a surrender charge from the policy on early termination. In order not to infringe Regulation 63, of course, the magnitude of the resulting negative sterling reserve must not exceed the unit value.

6.2.2 The consequence of this Regulation 63 restriction is that, when applying the mismatching test, it may be necessary (depending on the precise approach adopted) to restrict the amount of surrender charge for which credit may be taken. The surrender charge should be treated as an offset to the sterling reserve rather than directly against the unit reserve because the structure of policies is normally such that the unit liability must be matched in full by unit purchases. From all this it can be seen that the question of the allowance or disallowance of negative sterling reserves is one of whether the surrender charge can be appropriately matched, or not.

6.2.3 A fuller exposition of one possible approach, which may help to clarify the principles involved, is given in Appendix 6. However it is clear that in a valuation the actuary should examine the position, viewing the surrender charge as an illiquid asset. This examination will make clear the extent to which any part of the surrender charge should be excluded from account on matching grounds. That is, beyond that part excluded by virtue of not treating the policy carrying the charge as an overall asset in accordance with Regulation 63. From the point of view of regulation then, there is no particular need to introduce special consideration for negative sterling reserves resulting from surrender charges. However, it may perhaps be worth making some guiding comment that the actuary should have due regard to rates of interest and marketability when using surrender charges to offset other liabilities.

6.3 *Negative Units*

6.3.1 Many newer generation linked contracts involve negative unit balances

in their initial years, as mortality, expense and morbidity deductions begin before unit allocations from premiums start to be made.

6.3.2 Where this is the situation, the Regulations require that any overall negative liabilities must be eliminated, of course. That is, if DCF + Unit Reserve (UV) is negative, an additional sterling reserve is required to bring the total to zero.

6.3.3 For unit matching purposes, the office may offset negative unit balances against positive in the operation of its unit funds. Taken in the main this is an acceptable approach for practical, continuing management. However, some care is needed since offsetting negative units effectively results in under-funding of positive units in the statutory valuation. This leads to a direct mismatching risk, as unit price increases lead to higher sterling reserve requirements to zeroise the total reserve. That is, if Total Sterling Reserve + UV = 0 and UV becomes more negative because the unit price increases, then Total Sterling Reserve must become more positive to maintain the zero total.

6.3.4 There is no offset to this amongst the positive unit balance contracts, of course, since a contract with a positive unit balance needs all its unit growth to finance its own unit reserve increase.

6.3.5 The effect of all this is very similar to the under-funding position discussed in § 5.7, leading to the conclusion that where negative unit balances are offset against positives, the mismatching test may require relatively substantial mismatching reserves.

6.4 *Formula Reserving Methods and Grouping*

6.4.1 Many have expressed concern over the costs of establishing and maintaining DCF reserving calculation modules. These can be very demanding in both human and computer resources. Significant support therefore exists for the permitting of formula reserving methods and contract grouping which reduce the overhead involved in applying the full DCF approach on an individual contract basis.

6.4.2 The danger is that these approaches can understate reserves by implicitly permitting cross subsidy between contracts. Thus although practicality suggests that formula methods and grouping should be permitted, guidance should require that the results be soundly tested, be based on an adequate number of test points and such that the reserves established are not less than those which would be required by an individual policy DCF process.

6.4.3 A further proposal, to restrict the application of formula methods and grouping to a limited proportion of the business, such that the reserves for major products are calculated contract by contract, has some appeal, but the Working Party does not go so far as to recommend this. However, there is a strong case for requiring individual policy calculations to support any *negative* sterling reserves being set up.

6.5 *Highly Flexible Contracts*

6.5.1 Modern policy design has reached a stage where the policyholder may,

in effect, have a very wide range of options open to him, perhaps continuously over time. An example is the facility to select a sum assured level within widely separated upper and lower bounds, under contracts where mortality is paid for by monthly deductions from units.

6.5.2 It may not be possible for the statutory valuation to deal with all of the possible options and option patterns because of the enormous complexity involved. This practical point must be recognized. Nevertheless, the actuary should deal with all significant discrete options and have regard to actual experience for others which may have an impact on the reserving position.

6.5.3 To continue the example given, if the mortality charging basis produces a significant profit margin, then the actuary should monitor the volume of increases and reductions in sum assured. If a pattern of net reductions revealed itself, the actuary should make appropriate allowance in the cash flow projections. One way to achieve this, of course, would be to take no credit for any mortality profits in the DCF projections.

7. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

The following is a brief summary of the conclusions and recommendations we put forward in this paper.

7.1 The problem of coherence should be addressed via a more flexible test rule which has regard to current market yields. (See § 2.8.6.)

7.2 Specific parameters should be avoided by legislation as far as possible. (See § 4.2.)

7.3 Guidelines should be established for the general relationships between unit growth (before deduction of charges), renewal expense inflation and price inflation. (See § 4.2.)

7.4 The purpose of any margins created by legislative provisions should be clear and unnecessary overlap of margins should be avoided.

Particular points following from this are:

(a) The '7·2% restriction' should be removed to fit in with both a more active approach to parameters and the mismatching test. (See §§ 4.3.2 and 5.9.)

(b) The statutory 7·5% of yield margin is unnecessary once detailed mismatching reserve bases are introduced and should be removed or incorporated into the test itself. (See § 5.9.)

(c) The Asset Regulation limitations should be reviewed. Either shareholders' assets should be excluded from the effects of the limitations or they should be included when calculating the limits themselves.

(d) Mismatching reserves should not overlap with Maturity Guarantee reserves. (See § 5.9.)

7.5 An appropriate proportion of renewal costs should be loaded on a per policy basis. (See §§ 4.4.6 and 6.1.3.)

7.6 Pensions reserves should be calculated on both an 'in force' and a 'paid up' basis and the higher reserve held. (See § 4.6.2.)

7.7 The Discounted Cash Flow reserving process should include adequate

allowance for future initial and renewal commission payments. (See § 4.7.)

7.8 Regular withdrawal plans should be properly incorporated into both single and annual premium policy reserves. (See § 4.8.)

7.9 If credit is taken in the valuation for the exercise of a right to increase renewal charges and this is not in line with policyholders' normal expectations, the effect of exercising the right must be properly followed through all aspects of the valuation. (See § 4.9.)

7.10 For prudence in the statutory valuation, prospective CGT reserves for terminal deduction type policies should be established against a high lapse rate assumption. (See § 4.10.)

7.11 The mismatching test may lead to higher unit growth rates and (possibly) higher valuation discount rates as a result of assumed asset value falls. (See §§ 5.1 and 5.2.)

7.12 For linked business where the mismatching test is being followed through to the secondary effect on Discounted Cash Flow sterling reserves, there is practical justification for a simplified mismatching test. (See § 5.6.)

7.13 The mismatching test needs to include the effect of a +25% movement in equity and property values to be complete. This particularly applies in the context of under-funding of unit liabilities, but could apply more generally to any under-matching situation. (See § 5.7.)

7.14 Over- and under-funding offsetting should be restricted only to very similar links and even there a conservative maximum fund percentage should be permitted for offset. (See § 5.7.)

7.15 Surrender charge matching requires particular care. (See § 6.2.)

7.16 'Negative unit' reserves are a special case of under-funding. (See § 6.3.)

7.17 Formula methods and grouping should be permitted, subject to adequate testing. (See § 6.4.)

7.18 For high flexibility contracts, caution should be exercised in taking credit for margins which policyholders have the ability to influence. (See § 6.5.)

To ensure evenhandedness and avoid any anti-competitive impact, the above recommendations should, where appropriate, be followed through into non-linked business reserving. In our view it would be inequitable to introduce these requirements for linked business alone.

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(4) Report of the Maturity Guarantees Working Party (1980) *J.I.A.* **107,** 103.

(5) SQUIRES, R. J. (1987) Unit-Linked Business (A Life Assurance Monograph published by the Actuarial Education Service).

Fuller lists of references relating to unit-linked products and their valuation, and to valuation principles in general, will be found in the above papers, especially (1), (2) and (5).

APPENDIX 1

MEMORANDUM TO APPOINTED ACTUARIES FROM THE GOVERNMENT ACTUARY

VALUATION RETURNS IN RELATION TO SOLVENCY MARGINS

1. It is apparent from my Department's scrutiny of companies' 1984 returns that many actuaries have not appreciated the full impact of the changes in the Accounts and Statements Regulations which came into force in March 1984 to give effect to the solvency margin requirements. Many companies have received letters drawing attention to aspects of their 1984 returns which do not appear to meet the new requirements, and the DTI with GAD is considering these on a company by company basis. Many of the points which are causing difficulty are in fact mentioned in the guidance notes on the preparation of annual returns issued by DTI in September 1984. My purpose in writing to you, in common with all other Appointed Actuaries to U.K. authorised companies, is to draw your attention to these guidance notes and also to explain rather more fully the background to and the nature of the changes in the regulations. I hope that any misunderstandings can be cleared up in time for the preparation of the next set of returns, which for most companies will be as at 31 December 1985.
2. The problems seem to arise from the interaction of several factors:
   (i) The solvency margin requirement itself which means that a clear distinction must be drawn between the actuary's reserves and any free reserves in the life fund available for solvency margin.
   (ii) The market value basis laid down for the valuation of assets. The balance sheet and statement of solvency in the Accounts and Statements Regulations are constructed around this concept.
   (iii) Many companies prefer to maintain their life assurance funds at book value, rather than writing the fund up or down to market value each year. It is not intended to whittle away this facility, but there is no doubt that it adds to the complications.
3. The valuation regulations require actuarial reserves to be calculated on a prudent basis. Regulation 55 covers mismatching reserves, which ensure that the company can continue to maintain reserves meeting the minimum criteria in the face of changing investment conditions.
4. Although, in Schedule 4, an actuary may set his reserves in the context of the book value of the life assurance fund, for the purposes of the balance sheet and the statement of solvency (Forms 9, 10 and 14) the reserves have to be set in the context of the assets broadly at market value, as required by the asset valuation regulations. In other words the Schedule 4 valuation has to be justifiable by reference to market values, or additional reserves will need to be set up. In concept there are two sets of mathematical reserves, relating to book and market values respectively. Only the excess

over the total 'market' reserves, which have to be sufficient to cover all foreseeable liabilities including contingencies arising from mismatching, can be counted towards the solvency margin. In practice the main elements of a 'book' valuation basis, such as interest and mortality, are likely to be appropriate for both valuations, but additional provision may be needed for, e.g., mismatching or capital gains tax liabilities, in order to move from a 'book' to a 'market' basis. If any of these items have been set against the margin between market and book values of assets, it is necessary to know how much of this margin has been so used, as only the remainder can count towards the solvency margin. This addition to the Schedule 4 mathematical reserves has to be mentioned in the Actuary's Certificate and shown in a note to Form 14.

5. Thus, in order that GAD can examine valuations in the usual way, the nature and extent of the provision for mismatching and CGT liabilities needs to be stated in the Fourth Schedule. Only then can a view be taken about the cover for the solvency margin shown in the returns. This is the background to paragraphs 7.7.6–7.7.7 and 12.6–12.8 of the DTI guidance notes.
6. Neither the valuation regulations nor the Institute and Faculty guidance notes lay down a specific basis for the calculation of mismatching reserves, so this is left to the professional judgement of the actuary. GAD's function is to advise the DTI how each company stands having regard to the DTI's responsibilities under the Act. While GAD applies its professional judgement in formulating such advice, we need some rule against which to assess the adequacy of mismatching reserves. Obviously this becomes more crucial the smaller is the excess of free assets over the required solvency margin, but it would be untenable for DTI to operate the regulations on the basis that specific mismatching reserves need be set up only where the cover for the solvency margin is low, but that stronger companies need not bother and may thus overstate the cover for their solvency margins.
7. In general it is GAD's longstanding practice to formulate its own internal working rules after looking at the way in which established companies have treated the question, which thus needs to be set out in their Fourth Schedules, and after considering any Institute, Faculty or other papers on the subject and discussions thereon.
8. As regards mismatching reserves, the present working rule has regard to current investment conditions and to the tempo and scale of past changes. The present rule was stated at the Birmingham Convention; very briefly we would compare the company's reserves with the ability to meet the requirements of the Regulations (other than Regulation 55) given an immediate rise or fall of 3% in the rate of interest and fall of 25% in equity prices.
9. Naturally companies should also look at their mismatching provisions on

the basis of cash flow matching, over a wide range of investment conditions, but this would be in the context of a gross premium valuation rather than the net premium valuation required by the regulations. These tests need not be fully described in the Fourth Schedule as a matter of routine, the amount of information to be shown would depend on their significance for the company concerned.

10. The essential point, however, is that Fourth Schedule returns will in future need to give greater detail as to the manner of assessment of mismatching reserves and provision for Capital Gains Tax.
11. Before the valuation regulations and guidance notes were written, there were extensive discussions in the Joint Actuarial Working Party comprising representatives of DTI, GAD and the Institute and Faculty. It is now intended to reconvene the Group to consider problems arising. This note is not intended to pre-empt the Joint Working Party in any way. I am writing to you now because it seems necessary to clarify as soon as possible what we will be looking for in the forthcoming returns. I hope this will be helpful.

13 November 1985

APPENDIX 2

STATUTORY POSITION: EXISTING MARGINS AND PROTECTIONS

1. Future yield limitation for net new investment of 7·2% gross (after 3 years).
2. 7·5% compulsory margin in yield on existing asset holdings.
3. Asset Regulation limits to prevent 'too many eggs in one basket' or taking credit for certain trading assets (e.g. loans to agents).
4. Regulation 54 on prudence.
5. Regulation 55 on 'nature and term' and 'appropriate provision against the effects of possible future changes in the value of the assets'.
6. Solvency Requirements.
7. Maturity Guarantee Reserves (unofficial standards).
8. Policyholders' Protection Act.
9. The working rule for mismatching test requirements, as an expansion of Regulation 55.

APPENDIX 3

SUMMARY OF 'CONCLUSIONS AND RECOMMENDATIONS' FROM 'VALUATION OF INDIVIDUAL INVESTMENT-LINKED POLICIES' (1978)

By Brown, Ford, Seymour, Squires and Wales (Ref. 2)

1. A gross premium cash flow approach to valuation is essential for investment-linked business.
2. Total reserves should be separated into two main constituents, namely, the unit reserve and the sterling reserve.
3. A matched position should normally be maintained and the unit reserve taken as the value of the matched units. If a matched position is not maintained a mismatching reserve is required.
4. Sterling reserves should be calculated policy by policy so that future cash flows are covered without recourse to additional finance.
5. The sum of the unit reserve and the sterling reserve must not be less than the current surrender value.
6. The sterling reserve should be such as to ensure that the conditions in 4 and 5 above can be satisfied in the future on the valuation assumptions and, subject to this, the sterling reserve may be negative.
7. Approximate methods of performing the valuation, such as the grouping of similar policies or the derivation of a formula, are permissible provided they can be shown to produce overall reserves at least as great as those produced by the cash flow approach applied to individual policies.
8. Certain reserves, such as maturity guarantee and capital gains tax reserves, may be determined on an aggregate basis with appropriate allowance for withdrawals.
9. The actuary should state clearly his chosen assumptions which should have been consistent with the standard of adequacy implicit in the proposed valuation rules.
10. Modifications to the form of the Department of Trade Returns are required for investment-linked business.

APPENDIX 4

UNIT PRICE GROWTH RATE FOLLOWING A YIELD INCREASE

This appendix discusses how a price fall arising from a yield increase would feed through into the future growth rate. The logic does not explicitly deal with tax, but the symbols can be read as being net, where appropriate.

An equity has price P and has just paid a dividend $D/(1+G)$. The Income is expected to grow at rate G per annum (so the next dividend is expected to be D).

If all market conditions are stable and the dividend is as expected, the value of the equity in 1 year's time will thus be $P\cdot(1+G)$.

Suppose now that the current market yield increases such that the equity is repriced at $\cdot 75P$, with dividend and dividend growth rate unchanged. If again all future conditions follow through as expected, the value of the equity in 1 year's time will be $\cdot 75P\cdot(1+G)$.

An internal unit link into this equity would simply look like the equity itself, together with a roll up of dividend receipts.

So, in the initial case, the opening unit price would be based on P and the closing unit price on $D+P\cdot(1+G)$.

The unit growth rate is then found from $[D+P\cdot(1+G)]/P=[D/P]+1+G$.

That is, the growth rate is $[D/P]+G$.

Similarly, in the second case we have:

Opening price from $\cdot 75P$

Closing price from $D+\cdot 75P\cdot(1+G)$

Growth rate from $[D+\cdot 75P\cdot(1+G)]/\cdot 75P=[D/\cdot 75P]+1+G$

Growth rate $=[D/\cdot 75P]+G$

The unit price growth rate therefore rises by

$$D/\cdot 75P-D/P=(1/\cdot 75-1)\cdot D/P=D/3P$$

Put into words, the unit growth rate rises by a third of the pre-change running yield.

Although the logic looks at just one equity, it can be seen to generalize fairly readily to any asset portfolio.

APPENDIX 5

UNIT-LINKED POLICY CASH FLOW PROJECTIONS

SUMMARY OF RESULTS

Key features of the cashflow projection

Appendix number	Premium frequency	Test	Increased income yield rates	Increased DCF discount rate	Increased renewal expense inflation	Resulting DCF reserve (£)
5.1.1	Annual	Pre-fall position				156·30
5.1.2	Annual	Fall via Yield	Yes	No	No	71·37
5.1.3	Annual	Fall via Yield	Yes	Yes	No	60·08
5.1.4	Annual	Fall via Yield	Yes	No	Yes	569·87
5.1.5	Annual	Fall via Yield	Yes	Yes	Yes	466·50
5.1.6	Annual	Fall via Earnings	No	No	No	247·98
5.2.1	Single	Pre-fall position				·00
5.2.2	Single	Fall via Yield	Yes	No	No	27·69
5.2.3	Single	Fall via Yield	Yes	Yes	No	26·04
5.2.4	Single	Fall via Yield	Yes	No	Yes	331·40
5.2.5	Single	Fall via Yield	Yes	Yes	Yes	274·58
5.2.6	Single	Fall via Earnings	No	No	No	176·50

Note: In each of the above cases the policy projection period was restricted to 40 years. The detail of the individual results is shown under Appendix 5.1.1 to 5.2.6.

UNIT LINKED POLICY CASH FLOW PROJECTION

APPENDIX 5.1.1

PARAMETER	VALUE
SEX	MALE
VALUATION AGE	35
ANNUAL PREMIUM (£)	100
PREMIUM FREQUENCY	ANNUAL
SUM ASSURED (£)	3,000
INITIAL UNIT VALUE (£)	600
RENEWAL MANAGEMENT CHARGE	0.75%
ALLOCATION + BID/OFFER SPREAD	14.00%
RENEWAL EXPENSE (NET) (£)	15
MORTALITY	A67/70 ULT
UNIT GROWTH (AFTER CHARGES & TAXES)	8.73%
RENEWAL EXPENSE INFLATION	9.00%
VALUATION DISCOUNT RATE	4.50%

COMMENTS

BREAKDOWN OF UNIT GROWTH RATE : (PRE-RENEWAL CHARGE)

ITEM	GROSS GROWTH	TAX RATE	NET GROWTH
FRANKED INCOME	3.00%	27.00%	2.19%
UNFRANKED INCOME	1.50%	35.00%	0.98%
CHARGEABLE GAIN	0.75%	25.00%	0.56%
NON-CHARGEABLE GAIN	5.75%	0.00%	5.75%
TOTAL	11.00%	13.84%	9.48%

INITIAL POSITION.

PROJECTION

UNITS £s

Proj'n Year	Unit Value Opening	Unit Value Closing	Unit Value Mean	Renewal M'gement Charge	Alloc'n + Bid/Offer Spread	Total Income	Mean Death Strain	q	Mort-ality Cost	Net Renewal Expense	Total Outgo	Cash Flow in Year	DCF Reserve	Proj'n Year
1	600	742	671	5.03	14.00	19.03	2,329	0.00086	1.99	15.00	16.99	2.04	156.30	1
2	742	896	819	6.14	14.00	20.14	2,181	0.00094	2.04	16.35	18.39	1.75		2
3	896	1,064	980	7.35	14.00	21.35	2,020	0.00103	2.09	17.82	19.91	1.44		3
4	1,064	1,247	1,156	8.67	14.00	22.67	1,844	0.00115	2.12	19.43	21.55	1.12		4
5	1,247	1,445	1,346	10.10	14.00	24.10	1,654	0.00129	2.13	21.17	23.30	0.80		5
6	1,445	1,661	1,553	11.65	14.00	25.65	1,447	0.00144	2.09	23.08	25.17	0.48		6
7	1,661	1,896	1,779	13.34	14.00	27.34	1,221	0.00162	1.98	25.16	27.14	0.20		7
8	1,896	2,151	2,024	15.18	14.00	29.18	976	0.00183	1.79	27.42	29.21	(0.03)		8
9	2,151	2,429	2,290	17.17	14.00	31.17	710	0.00207	1.47	29.89	31.36	(0.18)		9
10	2,429	2,730	2,579	19.34	14.00	33.34	421	0.00234	0.98	32.58	33.56	(0.22)		10
11	2,730	3,058	2,894	21.71	14.00	35.71	106	0.00264	0.28	35.51	35.79	(0.08)		11
12	3,058	3,415	3,236	24.27	14.00	38.27	0	0.00298	0.00	38.71	38.71	(0.43)		12
13	3,415	3,802	3,608	27.06	14.00	41.06	0	0.00336	0.00	42.19	42.19	(1.13)		13
14	3,802	4,224	4,013	30.10	14.00	44.10	0	0.00378	0.00	45.99	45.99	(1.89)		14
15	4,224	4,682	4,453	33.40	14.00	47.40	0	0.00426	0.00	50.13	50.13	(2.73)		15
16	4,682	5,180	4,931	36.98	14.00	50.98	0	0.00479	0.00	54.64	54.64	(3.65)		16
17	5,180	5,722	5,451	40.89	14.00	54.89	0	0.00538	0.00	59.55	59.55	(4.67)		17
18	5,722	6,311	6,017	45.13	14.00	59.13	0	0.00603	0.00	64.91	64.91	(5.79)		18
19	6,311	6,952	6,632	49.74	14.00	63.74	0	0.00675	0.00	70.76	70.76	(7.02)		19
20	6,952	7,648	7,300	54.75	14.00	68.75	0	0.00756	0.00	77.12	77.12	(8.37)		20
21	7,648	8,405	8,027	60.20	14.00	74.20	0	0.00844	0.00	84.07	84.07	(9.86)		21
22	8,405	9,229	8,817	66.13	14.00	80.13	0	0.00942	0.00	91.63	91.63	(11.50)		22
23	9,229	10,124	9,676	72.57	14.00	86.57	0	0.01050	0.00	99.88	99.88	(13.31)		23
24	10,124	11,097	10,610	79.58	14.00	93.58	0	0.01169	0.00	108.87	108.87	(15.29)		24
25	11,097	12,155	11,626	87.20	14.00	101.20	0	0.01299	0.00	118.67	118.67	(17.47)		25
26	12,155	13,306	12,730	95.48	14.00	109.48	0	0.01443	0.00	129.35	129.35	(19.87)		26
27	13,306	14,557	13,931	104.48	14.00	118.48	0	0.01601	0.00	140.99	140.99	(22.50)		27
28	14,557	15,917	15,237	114.28	14.00	128.28	0	0.01775	0.00	153.68	153.68	(25.40)		28
29	15,917	17,396	16,656	124.92	14.00	138.92	0	0.01965	0.00	167.51	167.51	(28.59)		29
30	17,396	19,003	18,199	136.50	14.00	150.50	0	0.02174	0.00	182.58	182.58	(32.09)		30
31	19,003	20,752	19,878	149.08	14.00	163.08	0	0.02403	0.00	199.02	199.02	(35.93)		31
32	20,752	22,652	21,702	162.77	14.00	176.77	0	0.02654	0.00	216.93	216.93	(40.16)		32
33	22,652	24,719	23,686	177.64	14.00	191.64	0	0.02927	0.00	236.45	236.45	(44.81)		33
34	24,719	26,966	25,843	193.82	14.00	207.82	0	0.03227	0.00	257.73	257.73	(49.91)		34
35	26,966	29,409	28,188	211.41	14.00	225.41	0	0.03554	0.00	280.93	280.93	(55.52)		35
36	29,409	32,066	30,737	230.53	14.00	244.53	0	0.03911	0.00	306.21	306.21	(61.68)		36
37	32,066	34,954	33,510	251.32	14.00	265.32	0	0.04300	0.00	333.77	333.77	(68.45)		37
38	34,954	38,094	36,524	273.93	14.00	287.93	0	0.04723	0.00	363.81	363.81	(75.88)		38
39	38,094	41,508	39,801	298.51	14.00	312.51	0	0.05184	0.00	396.55	396.55	(84.04)		39
40	41,508	45,221	43,365	325.23	14.00	339.23	0	0.05685	0.00	432.24	432.24	(93.01)		40

UNIT LINKED POLICY CASH FLOW PROJECTION

APPENDIX 5.1.2

PARAMETER	VALUE
SEX	MALE
VALUATION AGE	35
ANNUAL PREMIUM (£)	100
PREMIUM FREQUENCY	ANNUAL
SUM ASSURED (£)	3,000
INITIAL UNIT VALUE (£)	460
RENEWAL MANAGEMENT CHARGE	0.75%
ALLOCATION + BID/OFFER SPREAD	14.00%
RENEWAL EXPENSE (NET) (£)	15
MORTALITY	A67/70 ULT
UNIT GROWTH (AFTER CHARGES & TAXES)	9.78%
RENEWAL EXPENSE INFLATION	9.00%
VALUATION DISCOUNT RATE	4.50%

COMMENTS

BREAKDOWN OF UNIT GROWTH RATE : (PRE-RENEWAL CHARGE)

ITEM	GROSS GROWTH	TAX RATE	NET GROWTH
FRANKED INCOME	4.00%	27.00%	2.92%
UNFRANKED INCOME	2.00%	35.00%	1.30%
CHARGEABLE GAIN	0.75%	25.00%	0.56%
NON-CHARGEABLE GAIN	5.75%	0.00%	5.75%
TOTAL	12.50%	15.74%	10.53%

MATCHING TEST "ALL VIA YIELD" POSITION.
FRANKED AND UNFRANKED YIELD RATES UP A THIRD.
INITIAL UNIT FUND FALLS A QUARTER LESS A CGT RESERVE RELEASE OF 10. (I.E.TO 600-150+10 = 460.)
NO CHANGE IN DCF LIABILITY DISCOUNTING RATE.
NO CHANGE IN RENEWAL EXPENSE INFLATION RATE.

PROJECTION UNITS £s

Proj'n Year	Unit Value Opening	Unit Value Closing	Unit Value Mean	Renewal M'gement Charge	Alloc'n + Bid/Offer Spread	Total Income	Mean Death Strain	q	Mort-ality Cost	Net Renewal Expense	Total Outgo	Cash Flow in Year	DCF Reserve	Proj'n Year
1	460	595	528	3.96	14.00	17.96	2,472	0.00086	2.12	15.00	17.12	0.84	71.37	1
2	595	743	669	5.02	14.00	19.02	2,331	0.00094	2.18	16.35	18.53	0.49		2
3	743	906	825	6.19	14.00	20.19	2,175	0.00103	2.25	17.82	20.07	0.12		3
4	906	1,085	996	7.47	14.00	21.47	2,004	0.00115	2.30	19.43	21.73	(0.26)		4
5	1,085	1,281	1,183	8.87	14.00	22.87	1,817	0.00129	2.34	21.17	23.51	(0.64)		5
6	1,281	1,497	1,389	10.42	14.00	24.42	1,611	0.00144	2.32	23.08	25.40	(0.99)		6
7	1,497	1,733	1,615	12.11	14.00	26.11	1,385	0.00162	2.25	25.16	27.41	(1.29)		7
8	1,733	1,993	1,863	13.97	14.00	27.97	1,137	0.00183	2.08	27.42	29.50	(1.53)		8
9	1,993	2,278	2,135	16.02	14.00	30.02	865	0.00207	1.79	29.89	31.68	(1.66)		9
10	2,278	2,591	2,434	18.26	14.00	32.26	566	0.00234	1.32	32.58	33.90	(1.64)		10
11	2,591	2,935	2,763	20.72	14.00	34.72	237	0.00264	0.63	35.51	36.14	(1.42)		11
12	2,935	3,312	3,123	23.42	14.00	37.42	0	0.00298	0.00	38.71	38.71	(1.28)		12
13	3,312	3,726	3,519	26.39	14.00	40.39	0	0.00336	0.00	42.19	42.19	(1.80)		13
14	3,726	4,180	3,953	29.65	14.00	43.65	0	0.00378	0.00	45.99	45.99	(2.34)		14
15	4,180	4,679	4,430	33.22	14.00	47.22	0	0.00426	0.00	50.13	50.13	(2.90)		15
16	4,679	5,227	4,953	37.15	14.00	51.15	0	0.00479	0.00	54.64	54.64	(3.49)		16
17	5,227	5,829	5,528	41.46	14.00	55.46	0	0.00538	0.00	59.55	59.55	(4.09)		17
18	5,829	6,489	6,159	46.19	14.00	60.19	0	0.00603	0.00	64.91	64.91	(4.72)		18
19	6,489	7,214	6,851	51.39	14.00	65.39	0	0.00675	0.00	70.76	70.76	(5.37)		19
20	7,214	8,010	7,612	57.09	14.00	71.09	0	0.00756	0.00	77.12	77.12	(6.04)		20
21	8,010	8,883	8,447	63.35	14.00	77.35	0	0.00844	0.00	84.07	84.07	(6.72)		21
22	8,883	9,843	9,363	70.22	14.00	84.22	0	0.00942	0.00	91.63	91.63	(7.41)		22
23	9,843	10,895	10,369	77.77	14.00	91.77	0	0.01050	0.00	99.88	99.88	(8.11)		23
24	10,895	12,051	11,473	86.05	14.00	100.05	0	0.01169	0.00	108.87	108.87	(8.82)		24
25	12,051	13,320	12,686	95.14	14.00	109.14	0	0.01299	0.00	118.67	118.67	(9.52)		25
26	13,320	14,714	14,017	105.13	14.00	119.13	0	0.01443	0.00	129.35	129.35	(10.22)		26
27	14,714	16,243	15,478	116.09	14.00	130.09	0	0.01601	0.00	140.99	140.99	(10.90)		27
28	16,243	17,922	17,083	128.12	14.00	142.12	0	0.01775	0.00	153.68	153.68	(11.56)		28
29	17,922	19,766	18,844	141.33	14.00	155.33	0	0.01965	0.00	167.51	167.51	(12.18)		29
30	19,766	21,789	20,777	155.83	14.00	169.83	0	0.02174	0.00	182.58	182.58	(12.75)		30
31	21,789	24,011	22,900	171.75	14.00	185.75	0	0.02403	0.00	199.02	199.02	(13.26)		31
32	24,011	26,450	25,230	189.23	14.00	203.23	0	0.02654	0.00	216.93	216.93	(13.70)		32
33	26,450	29,127	27,789	208.41	14.00	222.41	0	0.02927	0.00	236.45	236.45	(14.04)		33
34	29,127	32,067	30,597	229.48	14.00	243.48	0	0.03227	0.00	257.73	257.73	(14.25)		34
35	32,067	35,294	33,680	252.60	14.00	266.60	0	0.03554	0.00	280.93	280.93	(14.32)		35
36	35,294	38,837	37,065	277.99	14.00	291.99	0	0.03911	0.00	306.21	306.21	(14.22)		36
37	38,837	42,726	40,781	305.86	14.00	319.86	0	0.04300	0.00	333.77	333.77	(13.91)		37
38	42,726	46,996	44,861	336.46	14.00	350.46	0	0.04723	0.00	363.81	363.81	(13.35)		38
39	46,996	51,683	49,340	370.05	14.00	384.05	0	0.05184	0.00	396.55	396.55	(12.50)		39
40	51,683	56,829	54,256	406.92	14.00	420.92	0	0.05685	0.00	432.24	432.24	(11.32)		40

UNIT LINKED POLICY CASH FLOW PROJECTION

APPENDIX 5.1.3

PARAMETER	VALUE
SEX	MALE
VALUATION AGE	35
ANNUAL PREMIUM (£)	100
PREMIUM FREQUENCY	ANNUAL
SUM ASSURED (£)	3,000
INITIAL UNIT VALUE (£)	460
RENEWAL MANAGEMENT CHARGE	0.75%
ALLOCATION + BID/OFFER SPREAD	14.00%
RENEWAL EXPENSE (NET) (£)	15
MORTALITY	A67/70 ULT
UNIT GROWTH (AFTER CHARGES & TAXES)	9.78%
RENEWAL EXPENSE INFLATION	9.00%
VALUATION DISCOUNT RATE	5.25%

COMMENTS

BREAKDOWN OF UNIT GROWTH RATE : (PRE-RENEWAL CHARGE)

ITEM	GROSS GROWTH	TAX RATE	NET GROWTH
FRANKED INCOME	4.00%	27.00%	2.92%
UNFRANKED INCOME	2.00%	35.00%	1.30%
CHARGEABLE GAIN	0.75%	25.00%	0.56%
NON-CHARGEABLE GAIN	5.75%	0.00%	5.75%
TOTAL	12.50%	15.74%	10.53%

MATCHING TEST "ALL VIA YIELD" POSITION.
FRANKED AND UNFRANKED YIELD RATES UP A THIRD.
INITIAL UNIT FUND FALLS A QUARTER LESS A CGT RESERVE
RELEASE OF 10. (I.E.TO 600-150+10 = 460.)
WITH INCREASE IN DCF LIABILITY DISCOUNTING RATE.
NO CHANGE IN RENEWAL EXPENSE INFLATION RATE.

PROJECTION

UNITS £s

Proj'n Year	Unit Value: Opening	Unit Value: Closing	Unit Value: Mean	Renewal M'gement Charge	Alloc'n + Bid/Offer Spread	Total Income	Mean Death Strain	q	Mort-ality Cost	Net Renewal Expense	Total Outgo	Cash Flow in Year	DCF Reserve	Proj'n Year
1	460	595	528	3.96	14.00	17.96	2,472	0.00086	2.12	15.00	17.12	0.84	60.08	1
2	595	743	669	5.02	14.00	19.02	2,331	0.00094	2.18	16.35	18.53	0.49		2
3	743	906	825	6.19	14.00	20.19	2,175	0.00103	2.25	17.82	20.07	0.12		3
4	906	1,085	996	7.47	14.00	21.47	2,004	0.00115	2.30	19.43	21.73	(0.26)		4
5	1,085	1,281	1,183	8.87	14.00	22.87	1,817	0.00129	2.34	21.17	23.51	(0.64)		5
6	1,281	1,497	1,389	10.42	14.00	24.42	1,611	0.00144	2.32	23.08	25.40	(0.99)		6
7	1,497	1,733	1,615	12.11	14.00	26.11	1,385	0.00162	2.25	25.16	27.41	(1.29)		7
8	1,733	1,993	1,863	13.97	14.00	27.97	1,137	0.00183	2.08	27.42	29.50	(1.53)		8
9	1,993	2,278	2,135	16.02	14.00	30.02	865	0.00207	1.79	29.89	31.68	(1.66)		9
10	2,278	2,591	2,434	18.26	14.00	32.26	566	0.00234	1.32	32.58	33.90	(1.64)		10
11	2,591	2,935	2,763	20.72	14.00	34.72	237	0.00264	0.63	35.51	36.14	(1.42)		11
12	2,935	3,312	3,123	23.42	14.00	37.42	0	0.00298	0.00	38.71	38.71	(1.28)		12
13	3,312	3,726	3,519	26.39	14.00	40.39	0	0.00336	0.00	42.19	42.19	(1.80)		13
14	3,726	4,180	3,953	29.65	14.00	43.65	0	0.00378	0.00	45.99	45.99	(2.34)		14
15	4,180	4,679	4,430	33.22	14.00	47.22	0	0.00426	0.00	50.13	50.13	(2.90)		15
16	4,679	5,227	4,953	37.15	14.00	51.15	0	0.00479	0.00	54.64	54.64	(3.49)		16
17	5,227	5,829	5,528	41.46	14.00	55.46	0	0.00538	0.00	59.55	59.55	(4.09)		17
18	5,829	6,489	6,159	46.19	14.00	60.19	0	0.00603	0.00	64.91	64.91	(4.72)		18
19	6,489	7,214	6,851	51.39	14.00	65.39	0	0.00675	0.00	70.76	70.76	(5.37)		19
20	7,214	8,010	7,612	57.09	14.00	71.09	0	0.00756	0.00	77.12	77.12	(6.04)		20
21	8,010	8,883	8,447	63.35	14.00	77.35	0	0.00844	0.00	84.07	84.07	(6.72)		21
22	8,883	9,843	9,363	70.22	14.00	84.22	0	0.00942	0.00	91.63	91.63	(7.41)		22
23	9,843	10,895	10,369	77.77	14.00	91.77	0	0.01050	0.00	99.88	99.88	(8.11)		23
24	10,895	12,051	11,473	86.05	14.00	100.05	0	0.01169	0.00	108.87	108.87	(8.82)		24
25	12,051	13,320	12,686	95.14	14.00	109.14	0	0.01299	0.00	118.67	118.67	(9.52)		25
26	13,320	14,714	14,017	105.13	14.00	119.13	0	0.01443	0.00	129.35	129.35	(10.22)		26
27	14,714	16,243	15,478	116.09	14.00	130.09	0	0.01601	0.00	140.99	140.99	(10.90)		27
28	16,243	17,922	17,083	128.12	14.00	142.12	0	0.01775	0.00	153.68	153.68	(11.56)		28
29	17,922	19,766	18,844	141.33	14.00	155.33	0	0.01965	0.00	167.51	167.51	(12.18)		29
30	19,766	21,789	20,777	155.83	14.00	169.83	0	0.02174	0.00	182.58	182.58	(12.75)		30
31	21,789	24,011	22,900	171.75	14.00	185.75	0	0.02403	0.00	199.02	199.02	(13.26)		31
32	24,011	26,450	25,230	189.23	14.00	203.23	0	0.02654	0.00	216.93	216.93	(13.70)		32
33	26,450	29,127	27,789	208.41	14.00	222.41	0	0.02927	0.00	236.45	236.45	(14.04)		33
34	29,127	32,067	30,597	229.48	14.00	243.48	0	0.03227	0.00	257.73	257.73	(14.25)		34
35	32,067	35,294	33,680	252.60	14.00	266.60	0	0.03554	0.00	280.93	280.93	(14.32)		35
36	35,294	38,837	37,065	277.99	14.00	291.99	0	0.03911	0.00	306.21	306.21	(14.22)		36
37	38,837	42,726	40,781	305.86	14.00	319.86	0	0.04300	0.00	333.77	333.77	(13.91)		37
38	42,726	46,996	44,861	336.46	14.00	350.46	0	0.04723	0.00	363.81	363.81	(13.35)		38
39	46,996	51,683	49,340	370.05	14.00	384.05	0	0.05184	0.00	396.55	396.55	(12.50)		39
40	51,683	56,829	54,256	406.92	14.00	420.92	0	0.05685	0.00	432.24	432.24	(11.32)		40

UNIT LINKED POLICY CASH FLOW PROJECTION

APPENDIX 5.1.4

PARAMETER	VALUE
SEX	MALE
VALUATION AGE	35
ANNUAL PREMIUM (£)	100
PREMIUM FREQUENCY	ANNUAL
SUM ASSURED (£)	3,000
INITIAL UNIT VALUE (£)	460
RENEWAL MANAGEMENT CHARGE	0.75%
ALLOCATION + BID/OFFER SPREAD	14.00%
RENEWAL EXPENSE (NET) (£)	15
MORTALITY	A67/70 ULT
UNIT GROWTH (AFTER CHARGES & TAXES)	9.78%
RENEWAL EXPENSE INFLATION	10.50%
VALUATION DISCOUNT RATE	4.50%

COMMENTS

BREAKDOWN OF UNIT GROWTH RATE : (PRE-RENEWAL CHARGE)

ITEM	GROSS GROWTH	TAX RATE	NET GROWTH
FRANKED INCOME	4.00%	27.00%	2.92%
UNFRANKED INCOME	2.00%	35.00%	1.30%
CHARGEABLE GAIN	0.75%	25.00%	0.56%
NON-CHARGEABLE GAIN	5.75%	0.00%	5.75%
TOTAL	12.50%	15.74%	10.53%

MATCHING TEST "ALL VIA YIELD" POSITION.
FRANKED AND UNFRANKED YIELD RATES UP A THIRD.
INITIAL UNIT FUND FALLS A QUARTER LESS A CGT RESERVE
RELEASE OF 10. (I.E.TO 600-150+10 = 460.)
NO CHANGE IN DCF LIABILITY DISCOUNTING RATE.
WITH INCREASE IN RENEWAL EXPENSE INFLATION RATE.

PROJECTION

UNITS £s

Proj'n Year	Unit Value Opening	Unit Value Closing	Unit Value Mean	Renewal M'gement Charge	Alloc'n + Bid/Offer Spread	Total Income	Mean Death Strain	q	Mort-ality Cost	Net Renewal Expense	Total Outgo	Cash Flow in Year	DCF Reserve	Proj'n Year
1	460	595	528	3.96	14.00	17.96	2,472	0.00086	2.12	15.00	17.12	0.84	569.87	1
2	595	743	669	5.02	14.00	19.02	2,331	0.00094	2.18	16.58	18.76	0.26		2
3	743	906	825	6.19	14.00	20.19	2,175	0.00103	2.25	18.32	20.56	(0.38)		3
4	906	1,085	996	7.47	14.00	21.47	2,004	0.00115	2.30	20.24	22.54	(1.08)		4
5	1,085	1,281	1,183	8.87	14.00	22.87	1,817	0.00129	2.34	22.36	24.70	(1.83)		5
6	1,281	1,497	1,389	10.42	14.00	24.42	1,611	0.00144	2.32	24.71	27.04	(2.62)		6
7	1,497	1,733	1,615	12.11	14.00	26.11	1,385	0.00162	2.25	27.31	29.56	(3.44)		7
8	1,733	1,993	1,863	13.97	14.00	27.97	1,137	0.00183	2.08	30.17	32.26	(4.28)		8
9	1,993	2,278	2,135	16.02	14.00	30.02	865	0.00207	1.79	33.34	35.13	(5.11)		9
10	2,278	2,591	2,434	18.26	14.00	32.26	566	0.00234	1.32	36.84	38.16	(5.90)		10
11	2,591	2,935	2,763	20.72	14.00	34.72	237	0.00264	0.63	40.71	41.34	(6.62)		11
12	2,935	3,312	3,123	23.42	14.00	37.42	0	0.00298	0.00	44.99	44.99	(7.56)		12
13	3,312	3,726	3,519	26.39	14.00	40.39	0	0.00336	0.00	49.71	49.71	(9.32)		13
14	3,726	4,180	3,953	29.65	14.00	43.65	0	0.00378	0.00	54.93	54.93	(11.28)		14
15	4,180	4,679	4,430	33.22	14.00	47.22	0	0.00426	0.00	60.70	60.70	(13.47)		15
16	4,679	5,227	4,953	37.15	14.00	51.15	0	0.00479	0.00	67.07	67.07	(15.92)		16
17	5,227	5,829	5,528	41.46	14.00	55.46	0	0.00538	0.00	74.11	74.11	(18.65)		17
18	5,829	6,489	6,159	46.19	14.00	60.19	0	0.00603	0.00	81.89	81.89	(21.70)		18
19	6,489	7,214	6,851	51.39	14.00	65.39	0	0.00675	0.00	90.49	90.49	(25.11)		19
20	7,214	8,010	7,612	57.09	14.00	71.09	0	0.00756	0.00	99.99	99.99	(28.91)		20
21	8,010	8,883	8,447	63.35	14.00	77.35	0	0.00844	0.00	110.49	110.49	(33.14)		21
22	8,883	9,843	9,363	70.22	14.00	84.22	0	0.00942	0.00	122.10	122.10	(37.87)		22
23	9,843	10,895	10,369	77.77	14.00	91.77	0	0.01050	0.00	134.92	134.92	(43.15)		23
24	10,895	12,051	11,473	86.05	14.00	100.05	0	0.01169	0.00	149.08	149.08	(49.03)		24
25	12,051	13,320	12,686	95.14	14.00	109.14	0	0.01299	0.00	164.74	164.74	(55.59)		25
26	13,320	14,714	14,017	105.13	14.00	119.13	0	0.01443	0.00	182.03	182.03	(62.90)		26
27	14,714	16,243	15,478	116.09	14.00	130.09	0	0.01601	0.00	201.15	201.15	(71.06)		27
28	16,243	17,922	17,083	128.12	14.00	142.12	0	0.01775	0.00	222.27	222.27	(80.15)		28
29	17,922	19,766	18,844	141.33	14.00	155.33	0	0.01965	0.00	245.60	245.60	(90.27)		29
30	19,766	21,789	20,777	155.83	14.00	169.83	0	0.02174	0.00	271.39	271.39	(101.56)		30
31	21,789	24,011	22,900	171.75	14.00	185.75	0	0.02403	0.00	299.89	299.89	(114.14)		31
32	24,011	26,450	25,230	189.23	14.00	203.23	0	0.02654	0.00	331.38	331.38	(128.15)		32
33	26,450	29,127	27,789	208.41	14.00	222.41	0	0.02927	0.00	366.17	366.17	(143.76)		33
34	29,127	32,067	30,597	229.48	14.00	243.48	0	0.03227	0.00	404.62	404.62	(161.14)		34
35	32,067	35,294	33,680	252.60	14.00	266.60	0	0.03554	0.00	447.10	447.10	(180.50)		35
36	35,294	38,837	37,065	277.99	14.00	291.99	0	0.03911	0.00	494.05	494.05	(202.06)		36
37	38,837	42,726	40,781	305.86	14.00	319.86	0	0.04300	0.00	545.93	545.93	(226.06)		37
38	42,726	46,996	44,861	336.46	14.00	350.46	0	0.04723	0.00	603.25	603.25	(252.79)		38
39	46,996	51,683	49,340	370.05	14.00	384.05	0	0.05184	0.00	666.59	666.59	(282.54)		39
40	51,683	56,829	54,256	406.92	14.00	420.92	0	0.05685	0.00	736.58	736.58	(315.66)		40

UNIT LINKED POLICY CASH FLOW PROJECTION

APPENDIX 5.1.5

PARAMETER	VALUE
SEX	MALE
VALUATION AGE	35
ANNUAL PREMIUM (£)	100
PREMIUM FREQUENCY	ANNUAL
SUM ASSURED (£)	3,000
INITIAL UNIT VALUE (£)	460
RENEWAL MANAGEMENT CHARGE	0.75%
ALLOCATION + BID/OFFER SPREAD	14.00%
RENEWAL EXPENSE (NET) (£)	15
MORTALITY	A67/70 ULT
UNIT GROWTH (AFTER CHARGES & TAXES)	9.78%
RENEWAL EXPENSE INFLATION	10.50%
VALUATION DISCOUNT RATE	5.25%

COMMENTS

BREAKDOWN OF UNIT GROWTH RATE : (PRE-RENEWAL CHARGE)

ITEM	GROSS GROWTH	TAX RATE	NET GROWTH
FRANKED INCOME	4.00%	27.00%	2.92%
UNFRANKED INCOME	2.00%	35.00%	1.30%
CHARGEABLE GAIN	0.75%	25.00%	0.56%
NON-CHARGEABLE GAIN	5.75%	0.00%	5.75%
TOTAL	12.50%	15.74%	10.53%

MATCHING TEST "ALL VIA YIELD" POSITION.
FRANKED AND UNFRANKED YIELD RATES UP A THIRD.
INITIAL UNIT FUND FALLS A QUARTER LESS A CGT RESERVE RELEASE OF 10. (I.E.TO 600-150+10 = 460.)
WITH INCREASE IN DCF LIABILITY DISCOUNTING RATE.
WITH INCREASE IN RENEWAL EXPENSE INFLATION RATE.

PROJECTION

UNITS £s

Proj'n Year	Unit Value			Renewal M'gement Charge	Alloc'n + Bid/Offer Spread	Total Income	Mean Death Strain	q	Mort-ality Cost	Net Renewal Expense	Total Outgo	Cash Flow in Year	DCF Reserve	Proj'n Year
	Opening	Closing	Mean											
1	460	595	528	3.96	14.00	17.96	2,472	0.00086	2.12	15.00	17.12	0.84	466.50	1
2	595	743	669	5.02	14.00	19.02	2,331	0.00094	2.18	16.58	18.76	0.26		2
3	743	906	825	6.19	14.00	20.19	2,175	0.00103	2.25	18.32	20.56	(0.38)		3
4	906	1,085	996	7.47	14.00	21.47	2,004	0.00115	2.30	20.24	22.54	(1.08)		4
5	1,085	1,281	1,183	8.87	14.00	22.87	1,817	0.00129	2.34	22.36	24.70	(1.83)		5
6	1,281	1,497	1,389	10.42	14.00	24.42	1,611	0.00144	2.32	24.71	27.04	(2.62)		6
7	1,497	1,733	1,615	12.11	14.00	26.11	1,385	0.00162	2.25	27.31	29.56	(3.44)		7
8	1,733	1,993	1,863	13.97	14.00	27.97	1,137	0.00183	2.08	30.17	32.26	(4.28)		8
9	1,993	2,278	2,135	16.02	14.00	30.02	865	0.00207	1.79	33.34	35.13	(5.11)		9
10	2,278	2,591	2,434	18.26	14.00	32.26	566	0.00234	1.32	36.84	38.16	(5.90)		10
11	2,591	2,935	2,763	20.72	14.00	34.72	237	0.00264	0.63	40.71	41.34	(6.62)		11
12	2,935	3,312	3,123	23.42	14.00	37.42	0	0.00298	0.00	44.99	44.99	(7.56)		12
13	3,312	3,726	3,519	26.39	14.00	40.39	0	0.00336	0.00	49.71	49.71	(9.32)		13
14	3,726	4,180	3,953	29.65	14.00	43.65	0	0.00378	0.00	54.93	54.93	(11.28)		14
15	4,180	4,679	4,430	33.22	14.00	47.22	0	0.00426	0.00	60.70	60.70	(13.47)		15
16	4,679	5,227	4,953	37.15	14.00	51.15	0	0.00479	0.00	67.07	67.07	(15.92)		16
17	5,227	5,829	5,528	41.46	14.00	55.46	0	0.00538	0.00	74.11	74.11	(18.65)		17
18	5,829	6,489	6,159	46.19	14.00	60.19	0	0.00603	0.00	81.89	81.89	(21.70)		18
19	6,489	7,214	6,851	51.39	14.00	65.39	0	0.00675	0.00	90.49	90.49	(25.11)		19
20	7,214	8,010	7,612	57.09	14.00	71.09	0	0.00756	0.00	99.99	99.99	(28.91)		20
21	8,010	8,883	8,447	63.35	14.00	77.35	0	0.00844	0.00	110.49	110.49	(33.14)		21
22	8,883	9,843	9,363	70.22	14.00	84.22	0	0.00942	0.00	122.10	122.10	(37.87)		22
23	9,843	10,895	10,369	77.77	14.00	91.77	0	0.01050	0.00	134.92	134.92	(43.15)		23
24	10,895	12,051	11,473	86.05	14.00	100.05	0	0.01169	0.00	149.08	149.08	(49.03)		24
25	12,051	13,320	12,686	95.14	14.00	109.14	0	0.01299	0.00	164.74	164.74	(55.59)		25
26	13,320	14,714	14,017	105.13	14.00	119.13	0	0.01443	0.00	182.03	182.03	(62.90)		26
27	14,714	16,243	15,478	116.09	14.00	130.09	0	0.01601	0.00	201.15	201.15	(71.06)		27
28	16,243	17,922	17,083	128.12	14.00	142.12	0	0.01775	0.00	222.27	222.27	(80.15)		28
29	17,922	19,766	18,844	141.33	14.00	155.33	0	0.01965	0.00	245.60	245.60	(90.27)		29
30	19,766	21,789	20,777	155.83	14.00	169.83	0	0.02174	0.00	271.39	271.39	(101.56)		30
31	21,789	24,011	22,900	171.75	14.00	185.75	0	0.02403	0.00	299.89	299.89	(114.14)		31
32	24,011	26,450	25,230	189.23	14.00	203.23	0	0.02654	0.00	331.38	331.38	(128.15)		32
33	26,450	29,127	27,789	208.41	14.00	222.41	0	0.02927	0.00	366.17	366.17	(143.76)		33
34	29,127	32,067	30,597	229.48	14.00	243.48	0	0.03227	0.00	404.62	404.62	(161.14)		34
35	32,067	35,294	33,680	252.60	14.00	266.60	0	0.03554	0.00	447.10	447.10	(180.50)		35
36	35,294	38,837	37,065	277.99	14.00	291.99	0	0.03911	0.00	494.05	494.05	(202.06)		36
37	38,837	42,726	40,781	305.86	14.00	319.86	0	0.04300	0.00	545.93	545.93	(226.06)		37
38	42,726	46,996	44,861	336.46	14.00	350.46	0	0.04723	0.00	603.25	603.25	(252.79)		38
39	46,996	51,683	49,340	370.05	14.00	384.05	0	0.05184	0.00	666.59	666.59	(282.54)		39
40	51,683	56,829	54,256	406.92	14.00	420.92	0	0.05685	0.00	736.58	736.58	(315.66)		40

UNIT LINKED POLICY CASH FLOW PROJECTION

APPENDIX 5.1.6

PARAMETER	VALUE
SEX	MALE
VALUATION AGE	35
ANNUAL PREMIUM (£)	100
PREMIUM FREQUENCY	ANNUAL
SUM ASSURED (£)	3,000
INITIAL UNIT VALUE (£)	460
RENEWAL MANAGEMENT CHARGE	0.75%
ALLOCATION + BID/OFFER SPREAD	14.00%
RENEWAL EXPENSE (NET) (£)	15
MORTALITY	A67/70 ULT
UNIT GROWTH (AFTER CHARGES & TAXES)	8.73%
RENEWAL EXPENSE INFLATION	9.00%
VALUATION DISCOUNT RATE	4.50%

COMMENTS

BREAKDOWN OF UNIT GROWTH RATE : (PRE-RENEWAL CHARGE)

ITEM	GROSS GROWTH	TAX RATE	NET GROWTH
FRANKED INCOME	3.00%	27.00%	2.19%
UNFRANKED INCOME	1.50%	35.00%	0.98%
CHARGEABLE GAIN	0.75%	25.00%	0.56%
NON-CHARGEABLE GAIN	5.75%	0.00%	5.75%
TOTAL	11.00%	13.84%	9.48%

MATCHING TEST "ALL VIA EARNINGS" POSITION.
FRANKED AND UNFRANKED YIELD RATES DO NOT CHANGE.
INITIAL UNIT FUND FALLS A QUARTER LESS A CGT RESERVE RELEASE OF 10. (I.E.TO 600-150+10 = 460.)
DCF LIABILITY DISCOUNTING RATE AND RENEWAL EXPENSE INFLATION RATE DO NOT CHANGE.

PROJECTION UNITS £s

Proj'n Year	Unit Value Opening	Unit Value Closing	Unit Value Mean	Renewal M'gement Charge	Alloc'n + Bid/Offer Spread	Total Income	Mean Death Strain	q	Mort-ality Cost	Net Renewal Expense	Total Outgo	Cash Flow in Year	DCF Reserve	Proj'n Year
1	460	590	525	3.94	14.00	17.94	2,475	0.00086	2.12	15.00	17.12	0.82	247.98	1
2	590	731	660	4.95	14.00	18.95	2,340	0.00094	2.19	16.35	18.54	0.41		2
3	731	884	808	6.06	14.00	20.06	2,192	0.00103	2.27	17.82	20.09	(0.03)		3
4	884	1,051	968	7.26	14.00	21.26	2,032	0.00115	2.34	19.43	21.76	(0.50)		4
5	1,051	1,233	1,142	8.57	14.00	22.57	1,858	0.00129	2.39	21.17	23.56	(1.00)		5
6	1,233	1,430	1,331	9.99	14.00	23.99	1,669	0.00144	2.41	23.08	25.49	(1.50)		6
7	1,430	1,644	1,537	11.53	14.00	25.53	1,463	0.00162	2.38	25.16	27.53	(2.00)		7
8	1,644	1,878	1,761	13.21	14.00	27.21	1,239	0.00183	2.27	27.42	29.69	(2.48)		8
9	1,878	2,131	2,004	15.03	14.00	29.03	996	0.00207	2.06	29.89	31.95	(2.91)		9
10	2,131	2,407	2,269	17.02	14.00	31.02	731	0.00234	1.71	32.58	34.29	(3.27)		10
11	2,407	2,707	2,557	19.18	14.00	33.18	443	0.00264	1.17	35.51	36.68	(3.50)		11
12	2,707	3,033	2,870	21.52	14.00	35.52	130	0.00298	0.39	38.71	39.09	(3.57)		12
13	3,033	3,387	3,210	24.07	14.00	38.07	0	0.00336	0.00	42.19	42.19	(4.12)		13
14	3,387	3,772	3,579	26.85	14.00	40.85	0	0.00378	0.00	45.99	45.99	(5.14)		14
15	3,772	4,191	3,982	29.86	14.00	43.86	0	0.00426	0.00	50.13	50.13	(6.26)		15
16	4,191	4,646	4,419	33.14	14.00	47.14	0	0.00479	0.00	54.64	54.64	(7.50)		16
17	4,646	5,142	4,894	36.71	14.00	50.71	0	0.00538	0.00	59.55	59.55	(8.85)		17
18	5,142	5,680	5,411	40.58	14.00	54.58	0	0.00603	0.00	64.91	64.91	(10.33)		18
19	5,680	6,265	5,973	44.80	14.00	58.80	0	0.00675	0.00	70.76	70.76	(11.96)		19
20	6,265	6,902	6,584	49.38	14.00	63.38	0	0.00756	0.00	77.12	77.12	(13.75)		20
21	6,902	7,594	7,248	54.36	14.00	68.36	0	0.00844	0.00	84.07	84.07	(15.71)		21
22	7,594	8,346	7,970	59.78	14.00	73.78	0	0.00942	0.00	91.63	91.63	(17.86)		22
23	8,346	9,165	8,755	65.67	14.00	79.67	0	0.01050	0.00	99.88	99.88	(20.21)		23
24	9,165	10,054	9,609	72.07	14.00	86.07	0	0.01169	0.00	108.87	108.87	(22.80)		24
25	10,054	11,021	10,538	79.03	14.00	93.03	0	0.01299	0.00	118.67	118.67	(25.63)		25
26	11,021	12,073	11,547	86.60	14.00	100.60	0	0.01443	0.00	129.35	129.35	(28.74)		26
27	12,073	13,216	12,644	94.83	14.00	108.83	0	0.01601	0.00	140.99	140.99	(32.15)		27
28	13,216	14,459	13,838	103.78	14.00	117.78	0	0.01775	0.00	153.68	153.68	(35.89)		28
29	14,459	15,811	15,135	113.51	14.00	127.51	0	0.01965	0.00	167.51	167.51	(39.99)		29
30	15,811	17,280	16,546	124.09	14.00	138.09	0	0.02174	0.00	182.58	182.58	(44.49)		30
31	17,280	18,878	18,079	135.59	14.00	149.59	0	0.02403	0.00	199.02	199.02	(49.42)		31
32	18,878	20,615	19,747	148.10	14.00	162.10	0	0.02654	0.00	216.93	216.93	(54.83)		32
33	20,615	22,504	21,560	161.70	14.00	175.70	0	0.02927	0.00	236.45	236.45	(60.75)		33
34	22,504	24,558	23,531	176.48	14.00	190.48	0	0.03227	0.00	257.73	257.73	(67.25)		34
35	24,558	26,791	25,675	192.56	14.00	206.56	0	0.03554	0.00	280.93	280.93	(74.37)		35
36	26,791	29,219	28,005	210.04	14.00	224.04	0	0.03911	0.00	306.21	306.21	(82.17)		36
37	29,219	31,859	30,539	229.04	14.00	243.04	0	0.04300	0.00	333.77	333.77	(90.73)		37
38	31,859	34,729	33,294	249.70	14.00	263.70	0	0.04723	0.00	363.81	363.81	(100.10)		38
39	34,729	37,849	36,289	272.17	14.00	286.17	0	0.05184	0.00	396.55	396.55	(110.38)		39
40	37,849	41,242	39,546	296.59	14.00	310.59	0	0.05685	0.00	432.24	432.24	(121.65)		40

UNIT LINKED POLICY CASH FLOW PROJECTION

APPENDIX 5.2.1

PARAMETER	VALUE
SEX	MALE
VALUATION AGE	35
ANNUAL PREMIUM (£)	0
PREMIUM FREQUENCY	SINGLE
SUM ASSURED (£)	1,500
INITIAL UNIT VALUE (£)	1,400
RENEWAL MANAGEMENT CHARGE	0.75%
ALLOCATION + BID/OFFER SPREAD	0.00%
RENEWAL EXPENSE (NET) (£)	10
MORTALITY	A67/70 ULT
UNIT GROWTH (AFTER CHARGES & TAXES)	8.73%
RENEWAL EXPENSE INFLATION	9.00%
VALUATION DISCOUNT RATE	4.50%

COMMENTS

BREAKDOWN OF UNIT GROWTH RATE : (PRE-RENEWAL CHARGE)

ITEM	GROSS GROWTH	TAX RATE	NET GROWTH
FRANKED INCOME	3.00%	27.00%	2.19%
UNFRANKED INCOME	1.50%	35.00%	0.98%
CHARGEABLE GAIN	0.75%	25.00%	0.56%
NON-CHARGEABLE GAIN	5.75%	0.00%	5.75%
TOTAL	11.00%	13.84%	9.48%

INITIAL POSITION.

PROJECTION

UNITS £s

Proj'n Year	Unit Value Opening	Unit Value Closing	Unit Value Mean	Renewal M'gement Charge	Alloc'n + Bid/Offer Spread	Total Income	Mean Death Strain	q	Mort-ality Cost	Net Renewal Expense	Total Outgo	Cash Flow in Year	DCF Reserve	Proj'n Year
1	1,400	1,522	1,461	10.96	0.00	10.96	39	0.00086	0.03	10.00	10.03	0.92	0.00	1
2	1,522	1,655	1,589	11.91	0.00	11.91	0	0.00094	0.00	10.90	10.90	1.01		2
3	1,655	1,799	1,727	12.95	0.00	12.95	0	0.00103	0.00	11.88	11.88	1.07		3
4	1,799	1,957	1,878	14.09	0.00	14.09	0	0.00115	0.00	12.95	12.95	1.13		4
5	1,957	2,127	2,042	15.31	0.00	15.31	0	0.00129	0.00	14.12	14.12	1.20		5
6	2,127	2,313	2,220	16.65	0.00	16.65	0	0.00144	0.00	15.39	15.39	1.26		6
7	2,313	2,515	2,414	18.10	0.00	18.10	0	0.00162	0.00	16.77	16.77	1.33		7
8	2,515	2,734	2,625	19.68	0.00	19.68	0	0.00183	0.00	18.28	18.28	1.40		8
9	2,734	2,973	2,854	21.40	0.00	21.40	0	0.00207	0.00	19.93	19.93	1.48		9
10	2,973	3,232	3,103	23.27	0.00	23.27	0	0.00234	0.00	21.72	21.72	1.55		10
11	3,232	3,514	3,373	25.30	0.00	25.30	0	0.00264	0.00	23.67	23.67	1.63		11
12	3,514	3,821	3,668	27.51	0.00	27.51	0	0.00298	0.00	25.80	25.80	1.70		12
13	3,821	4,155	3,988	29.91	0.00	29.91	0	0.00336	0.00	28.13	28.13	1.78		13
14	4,155	4,517	4,336	32.52	0.00	32.52	0	0.00378	0.00	30.66	30.66	1.86		14
15	4,517	4,912	4,714	35.36	0.00	35.36	0	0.00426	0.00	33.42	33.42	1.94		15
16	4,912	5,340	5,126	38.44	0.00	38.44	0	0.00479	0.00	36.42	36.42	2.02		16
17	5,340	5,806	5,573	41.80	0.00	41.80	0	0.00538	0.00	39.70	39.70	2.10		17
18	5,806	6,313	6,060	45.45	0.00	45.45	0	0.00603	0.00	43.28	43.28	2.17		18
19	6,313	6,864	6,589	49.41	0.00	49.41	0	0.00675	0.00	47.17	47.17	2.24		19
20	6,864	7,463	7,164	53.73	0.00	53.73	0	0.00756	0.00	51.42	51.42	2.31		20
21	7,463	8,114	7,789	58.42	0.00	58.42	0	0.00844	0.00	56.04	56.04	2.37		21
22	8,114	8,823	8,468	63.51	0.00	63.51	0	0.00942	0.00	61.09	61.09	2.43		22
23	8,823	9,593	9,208	69.06	0.00	69.06	0	0.01050	0.00	66.59	66.59	2.47		23
24	9,593	10,430	10,011	75.08	0.00	75.08	0	0.01169	0.00	72.58	72.58	2.50		24
25	10,430	11,340	10,885	81.64	0.00	81.64	0	0.01299	0.00	79.11	79.11	2.53		25
26	11,340	12,330	11,835	88.76	0.00	88.76	0	0.01443	0.00	86.23	86.23	2.53		26
27	12,330	13,406	12,868	96.51	0.00	96.51	0	0.01601	0.00	93.99	93.99	2.52		27
28	13,406	14,576	13,991	104.93	0.00	104.93	0	0.01775	0.00	102.45	102.45	2.48		28
29	14,576	15,848	15,212	114.09	0.00	114.09	0	0.01965	0.00	111.67	111.67	2.42		29
30	15,848	17,231	16,539	124.05	0.00	124.05	0	0.02174	0.00	121.72	121.72	2.32		30
31	17,231	18,735	17,983	134.87	0.00	134.87	0	0.02403	0.00	132.68	132.68	2.19		31
32	18,735	20,370	19,552	146.64	0.00	146.64	0	0.02654	0.00	144.62	144.62	2.03		32
33	20,370	22,148	21,259	159.44	0.00	159.44	0	0.02927	0.00	157.63	157.63	1.81		33
34	22,148	24,081	23,114	173.36	0.00	173.36	0	0.03227	0.00	171.82	171.82	1.54		34
35	24,081	26,182	25,131	188.49	0.00	188.49	0	0.03554	0.00	187.28	187.28	1.20		35
36	26,182	28,467	27,325	204.94	0.00	204.94	0	0.03911	0.00	204.14	204.14	0.80		36
37	28,467	30,952	29,710	222.82	0.00	222.82	0	0.04300	0.00	222.51	222.51	0.31		37
38	30,952	33,653	32,302	242.27	0.00	242.27	0	0.04723	0.00	242.54	242.54	(0.27)		38
39	33,653	36,590	35,122	263.41	0.00	263.41	0	0.05184	0.00	264.37	264.37	(0.95)		39
40	36,590	39,784	38,187	286.40	0.00	286.40	0	0.05685	0.00	288.16	288.16	(1.76)		40

UNIT LINKED POLICY CASH FLOW PROJECTION

APPENDIX 5.2.2

PARAMETER	VALUE
SEX	MALE
VALUATION AGE	35
ANNUAL PREMIUM (£)	0
PREMIUM FREQUENCY	SINGLE
SUM ASSURED (£)	1,500
INITIAL UNIT VALUE (£)	1,075
RENEWAL MANAGEMENT CHARGE	0.75%
ALLOCATION + BID/OFFER SPREAD	0.00%
RENEWAL EXPENSE (NET) (£)	10
MORTALITY	A67/70 ULT
UNIT GROWTH (AFTER CHARGES & TAXES)	9.78%
RENEWAL EXPENSE INFLATION	9.00%
VALUATION DISCOUNT RATE	4.50%

COMMENTS

BREAKDOWN OF UNIT GROWTH RATE : (PRE-RENEWAL CHARGE)

ITEM	GROSS GROWTH	TAX RATE	NET GROWTH
FRANKED INCOME	4.00%	27.00%	2.92%
UNFRANKED INCOME	2.00%	35.00%	1.30%
CHARGEABLE GAIN	0.75%	25.00%	0.56%
NON-CHARGEABLE GAIN	5.75%	0.00%	5.75%
TOTAL	12.50%	15.74%	10.53%

MATCHING TEST "ALL VIA YIELD" POSITION.
FRANKED AND UNFRANKED YIELD RATES UP A THIRD.
INITIAL UNIT FUND FALLS A QUARTER LESS A CBT RESERVE RELEASE OF 25. (I.E.TO 1400-350+25 = 1075.)
NO CHANGE IN DCF LIABILITY DISCOUNTING RATE.
NO CHANGE IN RENEWAL EXPENSE INFLATION RATE.

PROJECTION

UNITS £s

Proj'n Year	Unit Value			Renewal M'gement Charge	Alloc'n + Bid/Offer Spread	Total Income	Mean Death Strain	q	Mort-ality Cost	Net Renewal Expense	Total Outgo	Cash Flow in Year	DCF Reserve	Proj'n Year
	Opening	Closing	Mean											
1	1,075	1,180	1,128	8.46	0.00	8.46	372	0.00086	0.32	10.00	10.32	(1.86)	27.69	1
2	1,180	1,296	1,238	9.28	0.00	9.28	262	0.00094	0.25	10.90	11.15	(1.86)		2
3	1,296	1,422	1,359	10.19	0.00	10.19	141	0.00103	0.15	11.88	12.03	(1.83)		3
4	1,422	1,561	1,492	11.19	0.00	11.19	8	0.00115	0.01	12.95	12.96	(1.77)		4
5	1,561	1,714	1,638	12.28	0.00	12.28	0	0.00129	0.00	14.12	14.12	(1.83)		5
6	1,714	1,882	1,798	13.49	0.00	13.49	0	0.00144	0.00	15.39	15.39	(1.90)		6
7	1,882	2,066	1,974	14.80	0.00	14.80	0	0.00162	0.00	16.77	16.77	(1.97)		7
8	2,066	2,268	2,167	16.25	0.00	16.25	0	0.00183	0.00	18.28	18.28	(2.03)		8
9	2,268	2,490	2,379	17.84	0.00	17.84	0	0.00207	0.00	19.93	19.93	(2.08)		9
10	2,490	2,734	2,612	19.59	0.00	19.59	0	0.00234	0.00	21.72	21.72	(2.13)		10
11	2,734	3,001	2,867	21.51	0.00	21.51	0	0.00264	0.00	23.67	23.67	(2.17)		11
12	3,001	3,295	3,148	23.61	0.00	23.61	0	0.00298	0.00	25.80	25.80	(2.20)		12
13	3,295	3,617	3,456	25.92	0.00	25.92	0	0.00336	0.00	28.13	28.13	(2.21)		13
14	3,617	3,971	3,794	28.45	0.00	28.45	0	0.00378	0.00	30.66	30.66	(2.20)		14
15	3,971	4,359	4,165	31.24	0.00	31.24	0	0.00426	0.00	33.42	33.42	(2.18)		15
16	4,359	4,786	4,572	34.29	0.00	34.29	0	0.00479	0.00	36.42	36.42	(2.13)		16
17	4,786	5,254	5,020	37.65	0.00	37.65	0	0.00538	0.00	39.70	39.70	(2.06)		17
18	5,254	5,768	5,511	41.33	0.00	41.33	0	0.00603	0.00	43.28	43.28	(1.95)		18
19	5,768	6,332	6,050	45.37	0.00	45.37	0	0.00675	0.00	47.17	47.17	(1.80)		19
20	6,332	6,951	6,642	49.81	0.00	49.81	0	0.00756	0.00	51.42	51.42	(1.60)		20
21	6,951	7,631	7,291	54.69	0.00	54.69	0	0.00844	0.00	56.04	56.04	(1.36)		21
22	7,631	8,378	8,005	60.03	0.00	60.03	0	0.00942	0.00	61.09	61.09	(1.05)		22
23	8,378	9,198	8,788	65.91	0.00	65.91	0	0.01050	0.00	66.59	66.59	(0.68)		23
24	9,198	10,097	9,647	72.36	0.00	72.36	0	0.01169	0.00	72.58	72.58	(0.22)		24
25	10,097	11,085	10,591	79.43	0.00	79.43	0	0.01299	0.00	79.11	79.11	0.32		25
26	11,085	12,169	11,627	87.20	0.00	87.20	0	0.01443	0.00	86.23	86.23	0.97		26
27	12,169	13,360	12,765	95.73	0.00	95.73	0	0.01601	0.00	93.99	93.99	1.74		27
28	13,360	14,667	14,013	105.10	0.00	105.10	0	0.01775	0.00	102.45	102.45	2.65		28
29	14,667	16,102	15,384	115.38	0.00	115.38	0	0.01965	0.00	111.67	111.67	3.71		29
30	16,102	17,677	16,889	126.67	0.00	126.67	0	0.02174	0.00	121.72	121.72	4.95		30
31	17,677	19,406	18,541	139.06	0.00	139.06	0	0.02403	0.00	132.68	132.68	6.38		31
32	19,406	21,304	20,355	152.66	0.00	152.66	0	0.02654	0.00	144.62	144.62	8.05		32
33	21,304	23,388	22,346	167.60	0.00	167.60	0	0.02927	0.00	157.63	157.63	9.96		33
34	23,388	25,676	24,532	183.99	0.00	183.99	0	0.03227	0.00	171.82	171.82	12.17		34
35	25,676	28,188	26,932	201.99	0.00	201.99	0	0.03554	0.00	187.28	187.28	14.71		35
36	28,188	30,946	29,567	221.75	0.00	221.75	0	0.03911	0.00	204.14	204.14	17.61		36
37	30,946	33,973	32,459	243.45	0.00	243.45	0	0.04300	0.00	222.51	222.51	20.93		37
38	33,973	37,296	35,635	267.26	0.00	267.26	0	0.04723	0.00	242.54	242.54	24.72		38
39	37,296	40,945	39,121	293.40	0.00	293.40	0	0.05184	0.00	264.37	264.37	29.04		39
40	40,945	44,950	42,948	322.11	0.00	322.11	0	0.05685	0.00	288.16	288.16	33.95		40

UNIT LINKED POLICY CASH FLOW PROJECTION — APPENDIX 5.2.3

PARAMETER	VALUE
SEX	MALE
VALUATION AGE	35
ANNUAL PREMIUM (£)	0
PREMIUM FREQUENCY	SINGLE
SUM ASSURED (£)	1,500
INITIAL UNIT VALUE (£)	1,075
RENEWAL MANAGEMENT CHARGE	0.75%
ALLOCATION + BID/OFFER SPREAD	0.00%
RENEWAL EXPENSE (NET) (£)	10
MORTALITY	A67/70 ULT
UNIT GROWTH (AFTER CHARGES & TAXES)	9.78%
RENEWAL EXPENSE INFLATION	9.00%
VALUATION DISCOUNT RATE	5.25%

COMMENTS

BREAKDOWN OF UNIT GROWTH RATE : (PRE-RENEWAL CHARGE)

ITEM	GROSS GROWTH	TAX RATE	NET GROWTH
FRANKED INCOME	4.00%	27.00%	2.92%
UNFRANKED INCOME	2.00%	35.00%	1.30%
CHARGEABLE GAIN	0.75%	25.00%	0.56%
NON-CHARGEABLE GAIN	5.75%	0.00%	5.75%
TOTAL	12.50%	15.74%	10.53%

MATCHING TEST "ALL VIA YIELD" POSITION.
FRANKED AND UNFRANKED YIELD RATES UP A THIRD.
INITIAL UNIT FUND FALLS A QUARTER LESS A CGT RESERVE
RELEASE OF 25. (I.E.TO 1400-350+25 = 1075.)
WITH INCREASE IN DCF LIABILITY DISCOUNTING RATE.
NO CHANGE IN RENEWAL EXPENSE INFLATION RATE.

PROJECTION

UNITS £s

Proj'n Year	Unit Value			Renewal M'gement Charge	Alloc'n + Bid/Offer Spread	Total Income	Mean Death Strain	q	Mort-ality Cost	Net Renewal Expense	Total Outgo	Cash Flow in Year	DCF Reserve	Proj'n Year
	Opening	Closing	Mean											
1	1,075	1,180	1,128	8.46	0.00	8.46	372	0.00086	0.32	10.00	10.32	(1.86)	26.04	1
2	1,180	1,296	1,238	9.28	0.00	9.28	262	0.00094	0.25	10.90	11.15	(1.86)		2
3	1,296	1,422	1,359	10.19	0.00	10.19	141	0.00103	0.15	11.88	12.03	(1.83)		3
4	1,422	1,561	1,492	11.19	0.00	11.19	8	0.00115	0.01	12.95	12.96	(1.77)		4
5	1,561	1,714	1,638	12.28	0.00	12.28	0	0.00129	0.00	14.12	14.12	(1.83)		5
6	1,714	1,882	1,798	13.49	0.00	13.49	0	0.00144	0.00	15.39	15.39	(1.90)		6
7	1,882	2,066	1,974	14.80	0.00	14.80	0	0.00162	0.00	16.77	16.77	(1.97)		7
8	2,066	2,268	2,167	16.25	0.00	16.25	0	0.00183	0.00	18.28	18.28	(2.03)		8
9	2,268	2,490	2,379	17.84	0.00	17.84	0	0.00207	0.00	19.93	19.93	(2.08)		9
10	2,490	2,734	2,612	19.59	0.00	19.59	0	0.00234	0.00	21.72	21.72	(2.13)		10
11	2,734	3,001	2,867	21.51	0.00	21.51	0	0.00264	0.00	23.67	23.67	(2.17)		11
12	3,001	3,295	3,148	23.61	0.00	23.61	0	0.00298	0.00	25.80	25.80	(2.20)		12
13	3,295	3,617	3,456	25.92	0.00	25.92	0	0.00336	0.00	28.13	28.13	(2.21)		13
14	3,617	3,971	3,794	28.45	0.00	28.45	0	0.00378	0.00	30.66	30.66	(2.20)		14
15	3,971	4,359	4,165	31.24	0.00	31.24	0	0.00426	0.00	33.42	33.42	(2.18)		15
16	4,359	4,786	4,572	34.29	0.00	34.29	0	0.00479	0.00	36.42	36.42	(2.13)		16
17	4,786	5,254	5,020	37.65	0.00	37.65	0	0.00538	0.00	39.70	39.70	(2.06)		17
18	5,254	5,768	5,511	41.33	0.00	41.33	0	0.00603	0.00	43.28	43.28	(1.95)		18
19	5,768	6,332	6,050	45.37	0.00	45.37	0	0.00675	0.00	47.17	47.17	(1.80)		19
20	6,332	6,951	6,642	49.81	0.00	49.81	0	0.00756	0.00	51.42	51.42	(1.60)		20
21	6,951	7,631	7,291	54.69	0.00	54.69	0	0.00844	0.00	56.04	56.04	(1.36)		21
22	7,631	8,378	8,005	60.03	0.00	60.03	0	0.00942	0.00	61.09	61.09	(1.05)		22
23	8,378	9,198	8,788	65.91	0.00	65.91	0	0.01050	0.00	66.59	66.59	(0.68)		23
24	9,198	10,097	9,647	72.36	0.00	72.36	0	0.01169	0.00	72.58	72.58	(0.22)		24
25	10,097	11,085	10,591	79.43	0.00	79.43	0	0.01299	0.00	79.11	79.11	0.32		25
26	11,085	12,169	11,627	87.20	0.00	87.20	0	0.01443	0.00	86.23	86.23	0.97		26
27	12,169	13,360	12,765	95.73	0.00	95.73	0	0.01601	0.00	93.99	93.99	1.74		27
28	13,360	14,667	14,013	105.10	0.00	105.10	0	0.01775	0.00	102.45	102.45	2.65		28
29	14,667	16,102	15,384	115.38	0.00	115.38	0	0.01965	0.00	111.67	111.67	3.71		29
30	16,102	17,677	16,889	126.67	0.00	126.67	0	0.02174	0.00	121.72	121.72	4.95		30
31	17,677	19,406	18,541	139.06	0.00	139.06	0	0.02403	0.00	132.68	132.68	6.38		31
32	19,406	21,304	20,355	152.66	0.00	152.66	0	0.02654	0.00	144.62	144.62	8.05		32
33	21,304	23,388	22,346	167.60	0.00	167.60	0	0.02927	0.00	157.63	157.63	9.96		33
34	23,388	25,676	24,532	183.99	0.00	183.99	0	0.03227	0.00	171.82	171.82	12.17		34
35	25,676	28,188	26,932	201.99	0.00	201.99	0	0.03554	0.00	187.28	187.28	14.71		35
36	28,188	30,946	29,567	221.75	0.00	221.75	0	0.03911	0.00	204.14	204.14	17.61		36
37	30,946	33,973	32,459	243.45	0.00	243.45	0	0.04300	0.00	222.51	222.51	20.93		37
38	33,973	37,296	35,635	267.26	0.00	267.26	0	0.04723	0.00	242.54	242.54	24.72		38
39	37,296	40,945	39,121	293.40	0.00	293.40	0	0.05184	0.00	264.37	264.37	29.04		39
40	40,945	44,950	42,948	322.11	0.00	322.11	0	0.05685	0.00	288.16	288.16	33.95		40

UNIT LINKED POLICY CASH FLOW PROJECTION — **APPENDIX 5.2.4**

PARAMETER	VALUE
SEX	MALE
VALUATION AGE	35
ANNUAL PREMIUM (£)	0
PREMIUM FREQUENCY	SINGLE
SUM ASSURED (£)	1,500
INITIAL UNIT VALUE (£)	1,075
RENEWAL MANAGEMENT CHARGE	0.75%
ALLOCATION + BID/OFFER SPREAD	0.00%
RENEWAL EXPENSE (NET) (£)	10
MORTALITY	A67/70 ULT
UNIT GROWTH (AFTER CHARGES & TAXES)	9.78%
RENEWAL EXPENSE INFLATION	10.50%
VALUATION DISCOUNT RATE	4.50%

COMMENTS

BREAKDOWN OF UNIT GROWTH RATE : (PRE-RENEWAL CHARGE)

ITEM	GROSS GROWTH	TAX RATE	NET GROWTH
FRANKED INCOME	4.00%	27.00%	2.92%
UNFRANKED INCOME	2.00%	35.00%	1.30%
CHARGEABLE GAIN	0.75%	25.00%	0.56%
NON-CHARGEABLE GAIN	5.75%	0.00%	5.75%
TOTAL	12.50%	15.74%	10.53%

MATCHING TEST "ALL VIA YIELD" POSITION.
FRANKED AND UNFRANKED YIELD RATES UP A THIRD.
INITIAL UNIT FUND FALLS A QUARTER LESS A CGT RESERVE
RELEASE OF 25. (I.E.TO 1400-350+25 = 1075.)
NO CHANGE IN DCF LIABILITY DISCOUNTING RATE.
WITH INCREASE IN RENEWAL EXPENSE INFLATION RATE.

PROJECTION

UNITS £s

Proj'n Year	Unit Value: Opening	Unit Value: Closing	Unit Value: Mean	Renewal M'gement Charge	Alloc'n + Bid/Offer Spread	Total Income	Mean Death Strain	q	Mort-ality Cost	Net Renewal Expense	Total Outgo	Cash Flow in Year	DCF Reserve	Proj'n Year
1	1,075	1,180	1,128	8.46	0.00	8.46	372	0.00086	0.32	10.00	10.32	(1.86)	331.40	1
2	1,180	1,296	1,238	9.28	0.00	9.28	262	0.00094	0.25	11.05	11.30	(2.01)		2
3	1,296	1,422	1,359	10.19	0.00	10.19	141	0.00103	0.15	12.21	12.36	(2.16)		3
4	1,422	1,561	1,492	11.19	0.00	11.19	8	0.00115	0.01	13.49	13.50	(2.31)		4
5	1,561	1,714	1,638	12.28	0.00	12.28	0	0.00129	0.00	14.91	14.91	(2.62)		5
6	1,714	1,882	1,798	13.49	0.00	13.49	0	0.00144	0.00	16.47	16.47	(2.99)		6
7	1,882	2,066	1,974	14.80	0.00	14.80	0	0.00162	0.00	18.20	18.20	(3.40)		7
8	2,066	2,268	2,167	16.25	0.00	16.25	0	0.00183	0.00	20.12	20.12	(3.86)		8
9	2,268	2,490	2,379	17.84	0.00	17.84	0	0.00207	0.00	22.23	22.23	(4.38)		9
10	2,490	2,734	2,612	19.59	0.00	19.59	0	0.00234	0.00	24.56	24.56	(4.97)		10
11	2,734	3,001	2,867	21.51	0.00	21.51	0	0.00264	0.00	27.14	27.14	(5.64)		11
12	3,001	3,295	3,148	23.61	0.00	23.61	0	0.00298	0.00	29.99	29.99	(6.38)		12
13	3,295	3,617	3,456	25.92	0.00	25.92	0	0.00336	0.00	33.14	33.14	(7.22)		13
14	3,617	3,971	3,794	28.45	0.00	28.45	0	0.00378	0.00	36.62	36.62	(8.17)		14
15	3,971	4,359	4,165	31.24	0.00	31.24	0	0.00426	0.00	40.46	40.46	(9.23)		15
16	4,359	4,786	4,572	34.29	0.00	34.29	0	0.00479	0.00	44.71	44.71	(10.42)		16
17	4,786	5,254	5,020	37.65	0.00	37.65	0	0.00538	0.00	49.41	49.41	(11.76)		17
18	5,254	5,768	5,511	41.33	0.00	41.33	0	0.00603	0.00	54.60	54.60	(13.27)		18
19	5,768	6,332	6,050	45.37	0.00	45.37	0	0.00675	0.00	60.33	60.33	(14.95)		19
20	6,332	6,951	6,642	49.81	0.00	49.81	0	0.00756	0.00	66.66	66.66	(16.85)		20
21	6,951	7,631	7,291	54.69	0.00	54.69	0	0.00844	0.00	73.66	73.66	(18.98)		21
22	7,631	8,378	8,005	60.03	0.00	60.03	0	0.00942	0.00	81.40	81.40	(21.36)		22
23	8,378	9,198	8,788	65.91	0.00	65.91	0	0.01050	0.00	89.94	89.94	(24.04)		23
24	9,198	10,097	9,647	72.36	0.00	72.36	0	0.01169	0.00	99.39	99.39	(27.03)		24
25	10,097	11,085	10,591	79.43	0.00	79.43	0	0.01299	0.00	109.82	109.82	(30.39)		25
26	11,085	12,169	11,627	87.20	0.00	87.20	0	0.01443	0.00	121.35	121.35	(34.15)		26
27	12,169	13,360	12,765	95.73	0.00	95.73	0	0.01601	0.00	134.10	134.10	(38.36)		27
28	13,360	14,667	14,013	105.10	0.00	105.10	0	0.01775	0.00	148.18	148.18	(43.08)		28
29	14,667	16,102	15,384	115.38	0.00	115.38	0	0.01965	0.00	163.74	163.74	(48.35)		29
30	16,102	17,677	16,889	126.67	0.00	126.67	0	0.02174	0.00	180.93	180.93	(54.26)		30
31	17,677	19,406	18,541	139.06	0.00	139.06	0	0.02403	0.00	199.93	199.93	(60.87)		31
32	19,406	21,304	20,355	152.66	0.00	152.66	0	0.02654	0.00	220.92	220.92	(68.25)		32
33	21,304	23,388	22,346	167.60	0.00	167.60	0	0.02927	0.00	244.11	244.11	(76.52)		33
34	23,388	25,676	24,532	183.99	0.00	183.99	0	0.03227	0.00	269.75	269.75	(85.75)		34
35	25,676	28,188	26,932	201.99	0.00	201.99	0	0.03554	0.00	298.07	298.07	(96.08)		35
36	28,188	30,946	29,567	221.75	0.00	221.75	0	0.03911	0.00	329.37	329.37	(107.61)		36
37	30,946	33,973	32,459	243.45	0.00	243.45	0	0.04300	0.00	363.95	363.95	(120.51)		37
38	33,973	37,296	35,635	267.26	0.00	267.26	0	0.04723	0.00	402.17	402.17	(134.90)		38
39	37,296	40,945	39,121	293.40	0.00	293.40	0	0.05184	0.00	444.39	444.39	(150.99)		39
40	40,945	44,950	42,948	322.11	0.00	322.11	0	0.05685	0.00	491.05	491.05	(168.95)		40

UNIT LINKED POLICY CASH FLOW PROJECTION

APPENDIX 5.2.5

PARAMETER	VALUE
SEX	MALE
VALUATION AGE	35
ANNUAL PREMIUM (£)	0
PREMIUM FREQUENCY	SINGLE
SUM ASSURED (£)	1,500
INITIAL UNIT VALUE (£)	1,075
RENEWAL MANAGEMENT CHARGE	0.75%
ALLOCATION + BID/OFFER SPREAD	0.00%
RENEWAL EXPENSE (NET) (£)	10
MORTALITY	A67/70 ULT
UNIT GROWTH (AFTER CHARGES & TAXES)	9.78%
RENEWAL EXPENSE INFLATION	10.50%
VALUATION DISCOUNT RATE	5.25%

COMMENTS

BREAKDOWN OF UNIT GROWTH RATE : (PRE-RENEWAL CHARGE)

ITEM	GROSS GROWTH	TAX RATE	NET GROWTH
FRANKED INCOME	4.00%	27.00%	2.92%
UNFRANKED INCOME	2.00%	35.00%	1.30%
CHARGEABLE GAIN	0.75%	25.00%	0.56%
NON-CHARGEABLE GAIN	5.75%	0.00%	5.75%
TOTAL	12.50%	15.74%	10.53%

MATCHING TEST "ALL VIA YIELD" POSITION.
FRANKED AND UNFRANKED YIELD RATES UP A THIRD.
INITIAL UNIT FUND FALLS A QUARTER LESS A CGT RESERVE RELEASE OF 25. (I.E.TO 1400-350+25 = 1075.)
WITH INCREASE IN DCF LIABILITY DISCOUNTING RATE.
WITH INCREASE IN RENEWAL EXPENSE INFLATION RATE.

PROJECTION UNITS £s

Proj'n Year	Opening	Unit Value Closing	Unit Value Mean	Renewal M'gement Charge	Alloc'n + Bid/Offer Spread	Total Income	Mean Death Strain	q	Mort-ality Cost	Net Renewal Expense	Total Outgo	Cash Flow in Year	DCF Reserve	Proj'n Year
1	1,075	1,180	1,128	8.46	0.00	8.46	372	0.00086	0.32	10.00	10.32	(1.86)	274.58	1
2	1,180	1,296	1,238	9.28	0.00	9.28	262	0.00094	0.25	11.05	11.30	(2.01)		2
3	1,296	1,422	1,359	10.19	0.00	10.19	141	0.00103	0.15	12.21	12.36	(2.16)		3
4	1,422	1,561	1,492	11.19	0.00	11.19	8	0.00115	0.01	13.49	13.50	(2.31)		4
5	1,561	1,714	1,638	12.28	0.00	12.28	0	0.00129	0.00	14.91	14.91	(2.62)		5
6	1,714	1,882	1,798	13.49	0.00	13.49	0	0.00144	0.00	16.47	16.47	(2.99)		6
7	1,882	2,066	1,974	14.80	0.00	14.80	0	0.00162	0.00	18.20	18.20	(3.40)		7
8	2,066	2,268	2,167	16.25	0.00	16.25	0	0.00183	0.00	20.12	20.12	(3.86)		8
9	2,268	2,490	2,379	17.84	0.00	17.84	0	0.00207	0.00	22.23	22.23	(4.38)		9
10	2,490	2,734	2,612	19.59	0.00	19.59	0	0.00234	0.00	24.56	24.56	(4.97)		10
11	2,734	3,001	2,867	21.51	0.00	21.51	0	0.00264	0.00	27.14	27.14	(5.64)		11
12	3,001	3,295	3,148	23.61	0.00	23.61	0	0.00298	0.00	29.99	29.99	(6.38)		12
13	3,295	3,617	3,456	25.92	0.00	25.92	0	0.00336	0.00	33.14	33.14	(7.22)		13
14	3,617	3,971	3,794	28.45	0.00	28.45	0	0.00378	0.00	36.62	36.62	(8.17)		14
15	3,971	4,359	4,165	31.24	0.00	31.24	0	0.00426	0.00	40.46	40.46	(9.23)		15
16	4,359	4,786	4,572	34.29	0.00	34.29	0	0.00479	0.00	44.71	44.71	(10.42)		16
17	4,786	5,254	5,020	37.65	0.00	37.65	0	0.00538	0.00	49.41	49.41	(11.76)		17
18	5,254	5,768	5,511	41.33	0.00	41.33	0	0.00603	0.00	54.60	54.60	(13.27)		18
19	5,768	6,332	6,050	45.37	0.00	45.37	0	0.00675	0.00	60.33	60.33	(14.95)		19
20	6,332	6,951	6,642	49.81	0.00	49.81	0	0.00756	0.00	66.66	66.66	(16.85)		20
21	6,951	7,631	7,291	54.69	0.00	54.69	0	0.00844	0.00	73.66	73.66	(18.98)		21
22	7,631	8,378	8,005	60.03	0.00	60.03	0	0.00942	0.00	81.40	81.40	(21.36)		22
23	8,378	9,198	8,788	65.91	0.00	65.91	0	0.01050	0.00	89.94	89.94	(24.04)		23
24	9,198	10,097	9,647	72.36	0.00	72.36	0	0.01169	0.00	99.39	99.39	(27.03)		24
25	10,097	11,085	10,591	79.43	0.00	79.43	0	0.01299	0.00	109.82	109.82	(30.39)		25
26	11,085	12,169	11,627	87.20	0.00	87.20	0	0.01443	0.00	121.35	121.35	(34.15)		26
27	12,169	13,360	12,765	95.73	0.00	95.73	0	0.01601	0.00	134.10	134.10	(38.36)		27
28	13,360	14,667	14,013	105.10	0.00	105.10	0	0.01775	0.00	148.18	148.18	(43.08)		28
29	14,667	16,102	15,384	115.38	0.00	115.38	0	0.01965	0.00	163.74	163.74	(48.35)		29
30	16,102	17,677	16,889	126.67	0.00	126.67	0	0.02174	0.00	180.93	180.93	(54.26)		30
31	17,677	19,406	18,541	139.06	0.00	139.06	0	0.02403	0.00	199.93	199.93	(60.87)		31
32	19,406	21,304	20,355	152.66	0.00	152.66	0	0.02654	0.00	220.92	220.92	(68.25)		32
33	21,304	23,388	22,346	167.60	0.00	167.60	0	0.02927	0.00	244.11	244.11	(76.52)		33
34	23,388	25,676	24,532	183.99	0.00	183.99	0	0.03227	0.00	269.75	269.75	(85.75)		34
35	25,676	28,188	26,932	201.99	0.00	201.99	0	0.03554	0.00	298.07	298.07	(96.08)		35
36	28,188	30,946	29,567	221.75	0.00	221.75	0	0.03911	0.00	329.37	329.37	(107.61)		36
37	30,946	33,973	32,459	243.45	0.00	243.45	0	0.04300	0.00	363.95	363.95	(120.51)		37
38	33,973	37,296	35,635	267.26	0.00	267.26	0	0.04723	0.00	402.17	402.17	(134.90)		38
39	37,296	40,945	39,121	293.40	0.00	293.40	0	0.05184	0.00	444.39	444.39	(150.99)		39
40	40,945	44,950	42,948	322.11	0.00	322.11	0	0.05685	0.00	491.05	491.05	(168.95)		40

UNIT LINKED POLICY CASH FLOW PROJECTION

APPENDIX 5.2.6

PARAMETER	VALUE
SEX	MALE
VALUATION AGE	35
ANNUAL PREMIUM (£)	0
PREMIUM FREQUENCY	SINGLE
SUM ASSURED (£)	1,500
INITIAL UNIT VALUE (£)	1,075
RENEWAL MANAGEMENT CHARGE	0.75%
ALLOCATION + BID/OFFER SPREAD	0.00%
RENEWAL EXPENSE (NET) (£)	10
MORTALITY	A67/70 ULT
UNIT GROWTH (AFTER CHARGES & TAXES)	8.73%
RENEWAL EXPENSE INFLATION	9.00%
VALUATION DISCOUNT RATE	4.50%

COMMENTS

BREAKDOWN OF UNIT GROWTH RATE : (PRE-RENEWAL CHARGE)

ITEM	GROSS GROWTH	TAX RATE	NET GROWTH
FRANKED INCOME	3.00%	27.00%	2.19%
UNFRANKED INCOME	1.50%	35.00%	0.98%
CHARGEABLE GAIN	0.75%	25.00%	0.56%
NON-CHARGEABLE GAIN	5.75%	0.00%	5.75%
TOTAL	11.00%	13.84%	9.48%

MATCHING TEST "ALL VIA EARNINGS" POSITION.
FRANKED AND UNFRANKED YIELD RATES DO NOT CHANGE.
INITIAL UNIT FUND FALLS A QUARTER LESS A CGT RESERVE RELEASE OF 25. (I.E.TO 1400-350+25 = 1075.)
DCF LIABILITY DISCOUNTING RATE AND RENEWAL EXPENSE *INFLATION RATE DO NOT CHANGE.*

PROJECTION UNITS £s

Proj'n Year	Unit Value Opening	Unit Value Closing	Unit Value Mean	Renewal M'gement Charge	Alloc'n + Bid/Offer Spread	Total Income	Mean Death Strain	q	Mort-ality Cost	Net Renewal Expense	Total Outgo	Cash Flow in Year	DCF Reserve	Proj'n Year
1	1,075	1,169	1,122	8.41	0.00	8.41	378	0.00086	0.32	10.00	10.32	(1.91)	176.50	1
2	1,169	1,271	1,220	9.15	0.00	9.15	280	0.00094	0.26	10.90	11.16	(2.01)		2
3	1,271	1,382	1,326	9.95	0.00	9.95	174	0.00103	0.18	11.88	12.06	(2.11)		3
4	1,382	1,502	1,442	10.82	0.00	10.82	58	0.00115	0.07	12.95	13.02	(2.20)		4
5	1,502	1,633	1,568	11.76	0.00	11.76	0	0.00129	0.00	14.12	14.12	(2.36)		5
6	1,633	1,776	1,705	12.79	0.00	12.79	0	0.00144	0.00	15.39	15.39	(2.60)		6
7	1,776	1,931	1,854	13.90	0.00	13.90	0	0.00162	0.00	16.77	16.77	(2.87)		7
8	1,931	2,100	2,015	15.11	0.00	15.11	0	0.00183	0.00	18.28	18.28	(3.17)		8
9	2,100	2,283	2,191	16.43	0.00	16.43	0	0.00207	0.00	19.93	19.93	(3.49)		9
10	2,283	2,482	2,382	17.87	0.00	17.87	0	0.00234	0.00	21.72	21.72	(3.85)		10
11	2,482	2,699	2,590	19.43	0.00	19.43	0	0.00264	0.00	23.67	23.67	(4.25)		11
12	2,699	2,934	2,816	21.12	0.00	21.12	0	0.00298	0.00	25.80	25.80	(4.68)		12
13	2,934	3,190	3,062	22.97	0.00	22.97	0	0.00336	0.00	28.13	28.13	(5.16)		13
14	3,190	3,469	3,329	24.97	0.00	24.97	0	0.00378	0.00	30.66	30.66	(5.69)		14
15	3,469	3,771	3,620	27.15	0.00	27.15	0	0.00426	0.00	33.42	33.42	(6.27)		15
16	3,771	4,101	3,936	29.52	0.00	29.52	0	0.00479	0.00	36.42	36.42	(6.91)		16
17	4,101	4,458	4,279	32.10	0.00	32.10	0	0.00538	0.00	39.70	39.70	(7.61)		17
18	4,458	4,847	4,653	34.90	0.00	34.90	0	0.00603	0.00	43.28	43.28	(8.38)		18
19	4,847	5,271	5,059	37.94	0.00	37.94	0	0.00675	0.00	47.17	47.17	(9.23)		19
20	5,271	5,731	5,501	41.25	0.00	41.25	0	0.00756	0.00	51.42	51.42	(10.16)		20
21	5,731	6,231	5,981	44.85	0.00	44.85	0	0.00844	0.00	56.04	56.04	(11.19)		21
22	6,231	6,774	6,503	48.77	0.00	48.77	0	0.00942	0.00	61.09	61.09	(12.32)		22
23	6,774	7,366	7,070	53.03	0.00	53.03	0	0.01050	0.00	66.59	66.59	(13.56)		23
24	7,366	8,009	7,687	57.65	0.00	57.65	0	0.01169	0.00	72.58	72.58	(14.93)		24
25	8,009	8,708	8,358	62.69	0.00	62.69	0	0.01299	0.00	79.11	79.11	(16.43)		25
26	8,708	9,467	9,087	68.16	0.00	68.16	0	0.01443	0.00	86.23	86.23	(18.07)		26
27	9,467	10,294	9,881	74.10	0.00	74.10	0	0.01601	0.00	93.99	93.99	(19.89)		27
28	10,294	11,192	10,743	80.57	0.00	80.57	0	0.01775	0.00	102.45	102.45	(21.88)		28
29	11,192	12,169	11,680	87.60	0.00	87.60	0	0.01965	0.00	111.67	111.67	(24.07)		29
30	12,169	13,231	12,700	95.25	0.00	95.25	0	0.02174	0.00	121.72	121.72	(26.47)		30
31	13,231	14,386	13,808	103.56	0.00	103.56	0	0.02403	0.00	132.68	132.68	(29.11)		31
32	14,386	15,641	15,013	112.60	0.00	112.60	0	0.02654	0.00	144.62	144.62	(32.02)		32
33	15,641	17,006	16,324	122.43	0.00	122.43	0	0.02927	0.00	157.63	157.63	(35.21)		33
34	17,006	18,490	17,748	133.11	0.00	133.11	0	0.03227	0.00	171.82	171.82	(38.71)		34
35	18,490	20,104	19,297	144.73	0.00	144.73	0	0.03554	0.00	187.28	187.28	(42.55)		35
36	20,104	21,859	20,982	157.36	0.00	157.36	0	0.03911	0.00	204.14	204.14	(46.78)		36
37	21,859	23,767	22,813	171.10	0.00	171.10	0	0.04300	0.00	222.51	222.51	(51.42)		37
38	23,767	25,841	24,804	186.03	0.00	186.03	0	0.04723	0.00	242.54	242.54	(56.51)		38
39	25,841	28,096	26,968	202.26	0.00	202.26	0	0.05184	0.00	264.37	264.37	(62.10)		39
40	28,096	30,548	29,322	219.92	0.00	219.92	0	0.05685	0.00	288.16	288.16	(68.24)		40

APPENDIX 6

SURRENDER CHARGES

(Note: this Appendix expands on the general description of surrender charges in § 6.2 of the paper.)

The total sterling reserve for a policy will include a Discounted Cash Flow ('DCF') component, calculated by examining the projected Income and Outgo under the policy in each future year from the valuation date.

Negative sterling reserves are not produced by the DCF process, since it should eliminate negatives automatically,

$$\text{e.g. DCF} = \text{Max}\,(0, \sum_{t=1}^{S} \text{CF}_t \cdot V^{t-1})$$

where S runs successively from 1 to some ultimate projection year, W say, and CF_t is the cash flow in year t, with positive values of CF representing outflows and negatives inflows, and V includes a survival probability.

However, the total sterling reserve can be negative, for example, where the office has the right to deduct a surrender charge from policies in the event of early termination. The resulting negative reserves present an interesting special case from the matching viewpoint. There are several variations on how such a situation might be dealt with. What follows is only one possible approach, but it should serve to illustrate the principles involved and the key points to bear in mind.

If the unit reserve is denoted UV and the surrender charge at the valuation date SC_0, a typical approach is that the sterling reserve is set

$$= \text{DCF} - \text{Min}\,(\text{UV} + \text{DCF}, \text{SC}_0)$$

This ensures that the total liability, including the unit reserve, is not less than zero.

An immediate point for the mismatching test is therefore that if UV falls with a price fall, the left hand argument of the Minimum function reduces, possibly reducing the surrender charge for which credit may be taken. It is also important to note that in the calculation of the CF_t elements of DCF, one of the projected items of outgo in each year is the reduction in SC in the year. That is, an outflow of $\text{SC}_{t-1} - \text{SC}_t$.

The surrender charge should be treated as an offset to the sterling reserve rather than directly against the unit reserve because the structure of policies is normally such that the unit liability must be matched in full by unit purchases. (If full unit purchases are not made in these circumstances, this amounts to under-funding, with the ramifications outlined in § 5.7.)

From all this it can be seen that the question of the allowance or disallowance of negative sterling reserves is one of whether the surrender charge can be appropriately matched, or not.

Moving on to consider this, it is first of all important to notice that the surrender charge, as described so far, is effectively a non-interest bearing asset. There is therefore an initial problem in using it to offset the DCF reserve, as may be the case above, since the DCF reserve is discounted.

This problem can be overcome by introducing to the DCF calculation the further element of a 'rate of interest' on the surrender charge. That is, including in year t an outflow of $i \cdot (SC_{t-1} + SC_t)/2$, say. Although this may increase the DCF reserve itself, it modifies the surrender charge into an asset (presented as a negative liability) which bears interest at rate i, but which has very low marketability.

However, although marketability is extremely low, the interest bearing surrender charge provides an appropriate matching asset for the DCF reserve, providing $i \geqslant$ (DCF discounting rate)/·925.

As a further example, it is also a suitable match for a non profit temporary assurance, where there is no surrender value and the technical reserve is released on lapse. Again,

$i \geqslant$ (valuation rate used to calculate the term assurance reserve)/·925.

Beyond product matching of this type, the matching strategy might involve, for example, unappropriated surplus or shareholders' funds.

(A feature of the interest bearing surrender charge is that its value is 'static'. It does not have a fluctuating yield and it is not subject to market forces.)

In a valuation, and with the form of treatment described above, the actuary should examine the overall position viewing the surrender charge as an illiquid asset. This examination will make clear the extent to which any part of the surrender charge should be excluded from account on matching grounds. That is, beyond that part excluded by virtue of not treating the policy carrying the charge as an overall asset in accordance with Regulation 63.

From the point of view of regulation then, there is no particular need to introduce special consideration for negative sterling reserves resulting from surrender charges. However, it may perhaps be worth making some guiding comment that the actuary should have due regard to rate of interest and marketability when using surrender charges to offset other liabilities.

NOTE BY THE GOVERNMENT ACTUARY'S DEPARTMENT ON THE PROPOSALS IN THE VALUATION RESEARCH WORKING PARTY'S PAPER

1. Although the valuation regulations contained in the Insurance Companies Regulations 1981 apply in general to all long-term insurance contracts it has always been envisaged that more specific regulations would be made for investment linked contracts. To this end the Joint Actuarial Working Party (JAWP) was reconvened in order to provide assistance to the supervisory authorities on the technical issues to be considered. The paper to be discussed at the Faculty on 17th October 1988 arises from work undertaken at the request of the JAWP and constitutes a valuable contribution to the consideration of the issues arising in setting standards for the valuation of linked business. It was considered that it might assist the discussion on the paper if comments on the proposals from a supervisory standpoint were circulated in advance of the meeting and this note by GAD has been prepared to this end. The comments in the note, however, should not be taken as committing DTI in any way in regard to the content of any further regulations.

2. It seems essential for a statutory minimum basis to prescribe a specific method of valuation and the method recommended by the earlier Working Party in 1978 and endorsed by the VRWP seems appropriate. That is the total reserve should comprise a unit reserve in respect of unit liabilities and a sterling reserve determined on DCF principles for each individual contract in respect of non-unit liabilities. It would, of course, be open to an Appointed Actuary to use valuation methods based on formulae or grouping of contracts, subject to a demonstration in Schedule 4 that the resulting reserves were at least as strong as the minimum basis prescribed. This is similar to the present requirement for a demonstration that a published bonus reserve valuation for non-linked contracts is at least as strong as a net premium valuation on the minimum basis.

3. With the differences in the taxation basis for the various classes of business and types of investment and the variability of tax rates over time there would appear to be considerable problems about prescribing a limit to the assumed real rate of return on investment over the rate of inflation of expenses other than in gross terms. The proposed guideline of 2% is broadly in line with the views of GAD and the JAWP, but GAD has major reservations about the proposal that the margin should not be laid down in regulations. Like the 7.2% limitation on new money yields in Regulation 59(7) this is an essentially arbitrary limit to the assumption about the performance of an economic parameter over the long-term future. Since different views can

legitimately be taken about the outlook for this parameter it seems preferable for any arbitrary limit set on grounds of prudence to be prescribed in regulations rather than guidance notes. Only in this way could a uniform standard be achieved throughout the industry for this parameter which is a major factor in testing the adequacy of the sterling reserves. Similar considerations would arise in regard to the flexibility suggested in the paper, unless very specific criteria were prescribed for justifying any departure from the standard 2% differential.

4. An assumption about the absolute rate of inflation of expenses cannot be avoided altogether as some contracts have fixed management charges expressed, for example, as a percentage of future premiums. Consideration has been given in the JAWP to the use of a formula representing the weighted average of the annual rate of inflation over past years for determining the inflation assumption for the future or alternatively to deriving this from the yield differential between conventional and index-linked gilts but there are practical difficulties with both methods. An alternative approach would be for the inflation rate to be used to be promulgated from time to time as a Government Actuary's Working Rule as in the case of the mismatching test. On this alternative the aim would be to announce the rate in the autumn, but hopefully it would be necessary to change it only infrequently.

5. It is recognised in the case of non-linked contracts that the provision for expenses should be tested against a prudent assumption for the rate of inflation (see GN8 paragraph 3.4.1), with the choice of assumption not restricted to rates of inflation consistent with the 7.2% limitation on the rate of interest. This and the other limits in Regulation 59 would not apply for this purpose and higher future investment yields may be used consistent with the rate of inflation assumed to which the 2% limit on the differential would apply instead. A similar situation could arise with linked contracts with testing being required in theory on both high/high and low/low assumptions for growth and inflation rates with the 7.2% restriction applying only to the latter, but in practice it would rarely be necessary to carry out the second calculation.

6. The paper contains an interesting analysis of the alternative economic scenarios that might be postulated in conjunction with a 25% fall in the market values of equities and property for the purpose of a Regulation 55 mismatching test. However an approach which has the effect of releasing reserves when market values fall does not appear to be credible as a suitable basis for testing resilience as part of a prudent reserving standard. Moreover the proposals for the mismatching test appear to be inconsistent with the proposed guidelines for testing expense reserves. The resilience test is designed to check whether

the reserves are adequate to meet the minimum basis in the regulations in changed conditions and it is not satisfactory if the test does not produce the extra reserves that would be required if the market had fallen as assumed at a valuation date. If a 2% margin of asset growth over inflation combined with asset values reflecting a 25% fall is thought to be too stringent, then a valuation standard that requires a similar assumption with assets at current market values to be used for assessing sterling reserves might also be too stringent. However the Working Party has not suggested any modification of the latter standard other than a suggestion for some flexibility in the application of the 2% margin.

7. A possible way of reducing the stringency of the standard, if that were felt to be desirable, would be to permit assets to be taken at other than current market values for the purpose of calculating sterling reserves with a 2% margin. Before adopting any such modification, however, consideration would have to be given both to the adequacy of the resulting standard for reserving purposes and to the need for consistency with the application of the regulations to other classes of business.

8. It is agreed that the present mismatching test is not appropriate where there is underfunding of unit reserves as it was not intended for that purpose. In particular, it would normally be a wholly inadequate method of dealing with a case where the units allocated to contracts and the assets actually held were fundamentally different by type and/or currency.

26th February 1988

DISCUSSION

Mr C. M. Johnson, introducing the paper, said: As you will know, the Institute meeting on 28 March has already provided some feedback on tonight's paper, so at the risk of pre-empting any remarks you have prepared for this evening—and if I do, I apologise—I would like to begin with some brief comments on what was the most common theme in March's discussion.

In place of the market value price method the paper recommends, several speakers that night supported the use of trend line or smoothed prices as the base for calculating sterling reserves—although often with the caveat that if the market value price was below the trend line, then prudence suggested that the lower price be used. However, theWorking Party's aim in the paper was to propose a minimum standard for statutory valuation. For that purpose we continue to prefer our recommendation of a market value price, supported by a mismatching test which covers the effect of a reasonably substantial price fall. This would give maximum simplicity to any legislation and does not rule out the possibility of using trend line approaches or other methods of smoothing in practice. It simply means that where such methods are used the resulting reserves should not be less than the recommended minimum. In that sense the proposed basis fits in with the "market value if less" caveat that a number of the trend line supporters added. In addition it was recognised in the paper that the benchmark mismatching test might be refined to deal with extreme market conditions in a better way. Further work is being done in that area.

Changing tack now to look at the Working Party itself, the group included representatives from all sides of our industry. This stimulated interesting and extensive debate, particularly on the topic of even-handedness between linked and non-linked business. In saying this I should make it clear that during the debate we ran into no real areas of disagreement. On the contrary we were and are at one on the recommendations made in the paper.

Finally, to close these introductory remarks, perhaps I should confess that for myself and several other members of the Working Party, this is our first Faculty meeting. However, I hasten to add that the explanation for this lies entirely in a well-developed awareness of overhead expenses. In spite of the past tardiness of which some of us are guilty, it is very much our pleasure and privilege to be here tonight. We look forward with interest to hearing your views on our paper.

Mr T. G. McKinlay, opening the discussion, said: As tonight's paper shows, unit-linked policies still offer an interesting area of study for the actuary. As time has passed the actuarial complexities of what was once thought a fairly simple concept have been revealed. The authors have certainly broadened my own understanding of the risks associated with linked business and I look forward to reading the results of the further work which they are currently undertaking—and which they outline in the paper.

The idea that sterling reserves for unit-linked contracts should be determined by discounting cash flow is central to tonight's paper. Given the complex interaction between the different elements in the valuation basis and the need to take account of the timing of emerging positive and negative cash flows, I would agree with the authors. A disadvantage, however, of such a valuation is its sensitivity to both the parameters in the basis and to current market conditions. One of the aims of the discounted cash flow approach is to set up sufficient sterling reserves to avoid the need for injections of capital in the future if the valuation assumptions are met, but, if changes occur in current conditions or in the valuation basis and these result in higher sterling reserves, capital injections in future will be required. Thus future solvency may be at risk.

Control of the volatility of reserves begins at the product design stage. Good product design is essential if volatility of reserves is to be minimised and particular attention must be paid to the effect of economic changes or "resilience testing" as the authors refer to it. A large part of the paper is concerned with resilience testing and with the current working rule put forward by the Government Actuary's Department. In the context of a gross premium valuation the working rule should aim to set reasonable limits for the high and low valuation bases and thus give a measure of mismatching in the traditional sense. For this to be meaningful the working rule should give parameters that are consistent. Unlike the Government Actuary's Department I do not see it as unacceptable that sterling reserves may fall when asset values fall if this is the result of the fund's matching position or of good product design.

As the authors point out the current working rule is not totally satisfactory—even for a net

premium valuation. The Working Party are currently considering possible modifications to the rule. Their idea of an asset model based on an assumed long-term yield about which current yield fluctuates seems to offer a more coherent and logical approach to resilience testing. As the authors note some element of coherence would be introduced if account was taken of the current yield position relative to the assumed long-term yield when deciding what further yield change is reasonable in the high and low valuation bases. An alternative approach, however, would be to use the long-term yield to determine an initial fund value when calculating the sterling reserve. Using current market value when market values are low may lead to the use of a high unit growth rate. Over the long term it is unlikely that such a high growth rate would be experienced as market values could be expected to recover. The use of an initial fund value consistent with the long-term yield would lead to greater consistency in valuations from year to year. However, as the authors point out, further statistical investigation is required to establish a suitable asset model before such methods could be adopted.

In considering fluctuations in the market values of equities the authors point out the need to distinguish between changes in yield and changes in earnings. Yield changes are likely to be short term but earnings changes may be more permanent. The current working rule for conventional business tests the effect of yield variations and this, I suggest, is required in a discounted cash flow valuation to assess the matching position. On the other hand it would be prudent in a long-term valuation to take account of the possibility of future earnings cuts. To assume that a 25% fall in equity values results from a reduction in earnings alone is too extreme in the light of experience and I agree with the authors that the 7·5% margin imposed by current valuation regulations is more reasonable. The extent to which a change in yield should then be superimposed would depend on the results of the statistical analysis referred to earlier.

The authors note the importance of the relationship between the unit growth rate and the rate of expenses inflation in unit-linked valuations. Consistency in these parameters is important if some stability in the valuation is to be hoped for. Of the two methods proposed for setting guidelines in this area my preference is for the gross approach. The central assumption in the gross method is the real rate of return on investments before tax. This is a parameter which can be based on historic data, has an expectation of stability over a reasonable period and is likely to obtain broad agreement within the profession. The net method, on the other hand, requires assumptions to be made about the expectations of a hypothetical average investor, as well as his tax position relative to that of a life office—assumptions less easy to verify objectively. The gross approach seems a more appropriate basis for regulations or guidance.

The proposed guidelines of a 2% differential between the rate of expenses inflation and the gross unit growth rate would seem to offer an acceptable general guideline with a margin of safety built in by not taking credit for future productivity increases. The arguments leading to this 2% differential, however, assume that the fund is broadly invested and will follow general investment trends relative to the rate of inflation. Where the link is to a specialised or high risk fund, a further margin may be required. Given the riskier nature of the investments the returns from such a fund will be more volatile. The possibility of fund charges being inadequate to cover expenses then increases. It can be argued that a higher long-term return may be expected to compensate for the increased risk but it would be prudent, in a solvency situation, not to take account of profits from this source until they arose but to cover the possibility of loss by a larger differential between expense inflation and unit growth. It would seem reasonable that higher sterling reserves should be held in such a situation to reflect the greater risks involved.

The authors' recommendation is that renewal expenses be allowed for in the valuation largely by a per-policy expense charge. In my view this is too severe and will result, in many situations, in unnecessarily large sterling reserves being held. I agree that the largest element of renewal expense will be related to the number of policies and that reflecting this in the valuation avoids the dangers of cross-subsidy from larger to smaller policies. However, in setting premium bases some element of cross-subsidy is almost certainly implied. To ignore this in the valuation will result in underfunding of the expenses of low premium policies giving rise to positive expenses reserves which are not offset by the resulting negative reserves on larger premium policies. While it would be prudent to make some allowance for the danger of cross-subsidy and higher withdrawal rates from larger policies, to ignore the cross-subsidy totally seems too extreme. The initial renewal expense charge could be set related to annual premium or to fund size for single

premium policies. In the analysis of expenses the danger of selective withdrawal could be recognised by giving less weight to larger policies. The resulting loading would contain a margin taking account of the risk of selective withdrawal but lower sterling reserves would be required. Also, a margin will generally exist in the valuation basis in that releases on surrender would normally not be anticipated and taken credit for. If selective withdrawal does occur, therefore, there may already be a margin in the surrender releases to help offset the expenses risk.

With regard to an office's right to increase management charges the authors identify two situations. The first is where charges increase regularly and this is described in the company's literature. That is, the policyholder's expectation is that charges will increase. The second is where the office retains the right to protect itself against future adverse circumstances by increasing the management charge. I agree with the authors that in the first case it would be acceptable to allow for increases in charges in the valuation. In fact, as increasing charges will have been a feature taken into account at the product design stage, if this is not allowed for in the valuation significant strains will arise. With regard to the second case, however, my view is that potential increases in management charges should not be taken credit for. I disagree then with the authors' recommendation that the actuary should be permitted to include increases provided he takes account of the ramifications of the increase. On a practical point I think it is difficult to quantify the likely effects of such a change occuring in the future. More importantly, however, I believe it is reasonable for regulations or guidance to take into account in this situation the policyholder's expectation as well as absolute guarantees.

Where an office reserves the right to increase charges in adverse circumstances, the office should be protecting itself against the unexpected and should not be contemplating an increase within the range of economic conditions that would normally be tested in carrying out a gross premium valuation. At the policy design stage the contract will have been tested against a wide range of economic scenarios and the actuary should be satisfied that the charging structure is sufficiently robust. If in the actuary's view there is a significant possibility that management charges may increase, the charging structure should be modified or adequate warning should be given in the literature and policy wording. It would then be reasonable to take account of management charge increases in the valuation as this would not be out of line with policyholder expectations.

Little consideration is given in the paper to procedures for determining a mismatching reserve for the unit fund. It is assumed in practice that offices will aim to totally match their unit liabilities although it is acknowledged that the timing of the creation and cancellation of units will require some allowance for mismatching to be made. A more significant cause of mismatching for some funds, however, is bulk switching by brokers and investment advisers. Unless an office is prepared to switch assets when a bulk switch is received, (passing the cost of moving to a bid basis, if necessary, to those policies switched), significant mismatching will arise.

In the paper on the Valuation of Individual Investment-Linked Policies, by Brown, Ford, Seymour, Squires and Wales, it is suggested that the problem of how to calculate a mismatching reserve is not dissimilar to the problem of how to determine the reserve for a maturity guarantee. Further research in this area is required. It may be, however, that, like maturity guarantees, offices will be reluctant to offer such a facility once the full actuarial implications are known.

I would agree with the authors that legislation should aim to be even-handed, both between different classes of life assurance business and more widely between providers of similar financial services. Because of the different types of risk involved this will not be easy to achieve. An obvious example, however, of where even-handedness should be possible is between unit-linked business and unit trusts, given the similarity of the products. The paper lists a number of areas of unequal treatment between non-linked and linked business. If even-handedness is to be achieved between these two classes of business it seems to me that an essential first step would be to value them using the same valuation techniques. Given that a discounted cash flow method is considered essential for unit-linked business this would require statutory valuations of non-linked business to be on a gross premium basis.

Finally, the authors ask for views as to whether their proposals should form part of guidance from the profession or be incorporated in formal regulations. Given the range of unit-linked contracts and the risks associated with them it is difficult to see how regulations alone can cover such a complex area. Also, circumstances change, so there is a need for flexibility, especially in

the context of gross premium valuations. I would suggest that regulations should deal only with broad valuation principles. Guidance should cover the detail, point out areas that require special consideration by the actuary and indicate reasonable parameter relationships which the actuary should move away from only with very good reasons related to the circumstances of the specific fund being valued.

The regulatory authorities will, quite correctly, require to be satisfied where guidance is not closely followed, but with margins in the valuation basis provided by adequate resilience testing the authorities will have time to respond to such situations and solvency should not be at risk.

Mr A. K. Gupta said: The Working Party has put a great deal of work into this paper and has come up with a lot of detailed recommendations and must be commended for their efforts. I have, however, some reservations about the principles underlying the basis which they recommend.

If the method recommended by the Working Party is adopted by the profession and the regulatory authorities it will undoubtedly be translated into some form of regulations to be adopted as a minimum valuation basis. I think it is necessary to consider what is required from a minimum statutory valuation basis. My view is that a minimum statutory valuation basis should be robust. So, if it is adopted by an actuary, the profession and the regulatory authorities should feel reasonably comfortable that the actuary's company is solvent and will continue to be so in the future.

My concern is that the basis suggested by the Working Party is not robust. The basis suggested is based upon the company's current experience and explicit margins are then included. In other words, the valuation basis focuses upon the market value of the assets or units, current interest and growth rates and current expenses. Explicit margins are then included through a 25% fall in unit values, a reduction in interest rates, etc. Since current experience will fluctuate from year to year my concern is that the basis suggested by the committee will then produce reserves which could fluctuate from year to year and I do not think that such a basis is appropriate if a robust basis is required as a minimum basis.

I would like to illustrate this by considering a simple example of a unit-linked company which only writes single premium unit-linked bonds and which has high expenses. The bulk of the reserves will comprise unit reserves equal to the current value of the units. In addition, the actuary will need to set up sterling reserves and in considering these the only income he must take into account in this simple example is the annual fees from the units and the only outgo he must take into account is the maintenance expenses of managing the policies. In this example I assume that the maintenance expenses exceed the unit income. Consequently he must hold a sterling reserve equal to a capitalised value of the excess of the expenses over the unit fees. In addition, he must set up what I call a market movement reserve to allow for the 25% fall in market values and this market movement reserve is in effect the discounted value of 25% of the unit fees. This is another sterling reserve.

Let us assume that this is the position on 1 October 1987 and that the actuary is so concerned about the solvency position of the company that he is doing monthly valuations. On the 31 October 1987 units have fallen by 25%. He then repeats his valuation. He still has a unit reserve equal to the value of units. He must also set up a sterling reserve and since units have fallen by 25% his income, i.e. the annual management fees, is reduced whilst his outgo, i.e. the expenses, has remained the same. Consequently to set up the sterling reserve necessary he needs to release his market movement reserve. However, he then needs to set up a further market movement reserve which requires further capital, at which point the company could be insolvent. This capital strain arises partly as a result of the mismatch between unit income and sterling expenses.

My preference would be for a passive basis determined using cash flow techniques. Whereas the Working Party have produced what I would call a gross premium bonus reserve cash flow valuation basis, the approach I would prefer would be similar to a net premium cash flow valuation basis. The basis which I am referring to is one adopted by many unit-linked companies throughout the late seventies and early eighties. I would, however, modify it to allow for the 25% fall in market values. Under this basis the actuary calculates using passive conservative assumptions, the value of a hypothetical portfolio of units, i.e. what the unit value would have been had the units grown at a low conservative rate. The modification I would include is to assume that this hypothetical portfolio of units then drops by 25%. Sterling reserves would be calculated using this

reduced hypothetical portfolio and not the actual unit values and using conservative passive assumptions regarding inflation, future unit growth, mortality, expenses, etc. This would then produce sterling reserves which would not fluctuate radically from year to year.

The actuary should of course compare the actual unit values to 75% of his hypothetical units. If the actual units are less than 75% of the hypothetical units, the actuary could continue to use his hypothetical value of units after allowing for the 25% drop providing he was happy that (within a 95% confidence level) the deficit was temporary. Similarly, if the actual unit values were considerably greater than 75% of the hypothetical units, the actuary could only take into account the excess to the extent that it fell within a 95% confidence level. The 95%, or whatever other values deemed appropriate, could be set down in regulation or in guidance notes.

The sterling reserves under this basis can be calculated using this zeroisation approach, which is already included in the Institute and Faculty examination syllabus. This produced the same valuation reserves as the successive summation approach adopted by the 1978 Working Party which set out recommendations for the valuation of unit-linked policies. The zeroisation approach is, however, stricter in so far as it ensures that the company can pay future cash values at all times, which the successive summation approach does not. This I feel is an improvement to the successive summation approach. The practical mechanics for this valuation approach are certainly manageable and no worse than the method suggested by the Working Party.

The end result would be a far more robust but passive valuation basis which would be in my opinion far more appropriate as a minimum valuation basis. Under the active approach recommended by the Working Party, there is a 50% probability of valuation strain and I do not think that a basis with a 50% probability of valuation strain is appropriate as a minimum statutory valuation basis.

Mr J. R. Gibb said: I know little and understand less about the bulk of this subject under discussion tonight but I do have a pennyworth to contribute on the subject of yield about which I think I do know something. I am slightly surprised at some of the figures that have already been mentioned and which appear in the paper. Surely the usual figure that is wanted is 5% and not 3% and the 5% is quite simply the average yield on the average share over a long period of time. It is really a very well-established figure and it does seem to me that for example in 4.2.5.2, which has already been talked about, the figure of 3% is misplaced.

Mr G. Wells said: One point possibly in favour of the gross premium approach is that given the complexity of unit-linked products today the trend line approach would have great difficulty in actually producing a unit reserve as at the valuation date which catered for all the changes that could have taken place in the past, be they increase in premiums, rider benefit additions, etc. With the gross premium approach you should know at the valuation date the true position of each policy and its unit fund, thereby providing a sensible starting point from which to value. The trend line approach whilst generally being conservative could be a long way away from the actual position of the unit fund thereby producing potentially unrealistic sterling reserves.

Another point which perhaps has not been considered relates to unit fees. If all the unit fees are funded out on the unit valuation side the sterling reserve would be more or less immune to unit value movements. Clearly, this method of unit valuation should only be considered if the product design so permits.

Mr H. Smith said: I would like to take issue with the opening speaker on one of the subjects he raised, the question of variable management charges. In section 4.9.3 of the paper the authors quote two situations and state that they are fundamentally different. In one situation the policyholder or prospective policyholder is informed that charges will increase and he is told exactly how they will increase and at what rate. Obviously in that situation he must expect future increases. In the other situation he is told that charges are variable. The charges are not guaranteed but he is not told at what rate they will increase or what index they might be tied to. That cannot give him any expectation that they will remain constant. Such an attitude is frankly not commercial. If I buy a car and I ask the garage how much will it cost me to have this car serviced, the garage will tell me the price for each service. They will not relate that to any index; they will not tell me it will increase with the RPI; they will quote me the cost at present. If I were to work

out my finances on the assumption that this would remain a fixed monetary amount for the next 3 or 4 years, or however long I have the car, then I would be likely to end up losing money. Perhaps we actuaries are too used to conventional contracts where we have given this sort of guarantee. This is not relevant in the case of unit-linked contracts where the guarantee does not exist. We must in the end fall back on the prudence of the actuary. Obviously we cannot take account of unreasonable increases or increases that could not possibly be implemented in any commercial environment but to say that zero is the only reasonable rate of increase is not reasonable.

Mr W. M. Morrison, President, said: I must say that I have watched the growth of professional Guidance Notes from their beginnings in 1975 with some misgivings, believing it undesirable to fetter that professional judgement which we have been trying so hard to develop. When, however, as we are discussing this evening, the alternative is more Government regulation, I have no difficulty in choosing Guidance Notes. The authors have set out five basic principles which any further valuation regulations ought to meet; I must say I commend these and the clarity of thinking which lies behind them to the authorities. Earlier they ask for views about where the dividing line between Regulations and Guidance should fall. Perhaps some speakers might like to comment further on this. I rather like the authors' own stance, which comes through clearly in the summary at the end of their paper.

I must say it seems to me that it would be quite inequitable to introduce these proposals for linked business alone and I feel that they ought to be followed through into the regulations for non-linked business. I am thinking particularly of improving the flexibility of the rule which seeks to test coherence (where regard should certainly be had to the current market yield), of avoiding the incorporation of specific parameters in legislation, and certainly of ensuring that margins do not overlap. If it is to be done properly this would certainly require some recasting of the dividing line between Regulations and Guidance and I am sure that both the Faculty and Institute are very ready and willing to co-operate with the authorities in this.

I notice that, in closing the discussion of the paper that has already been referred to on the Valuation of Individual Investment Linked Policies in 1979, my predecessor Mr Robert Macdonald commented that the nature of the discussion then and the fact that no Fellow of the Faculty had served on that Working Party said something about the extent of the involvement of the Scottish offices in this type of business, but that cannot be said today. I am sure we can have a further discussion.

Mr A. U. Lyburn said: With regards to the main point of this subject I know even less than Mr Gibb without being rude about Mr Gibb. However I take up the point the President has made about Regulations versus Guidance Notes and having some part to play just now in trying to see that Guidance Notes comply with Regulations I wholeheartedly support his advice that we should press as strongly as we can for the widest possible use of Guidance Notes, thereby enabling the regulations to be drawn more simply than they might otherwise be.

Mr E. A. Johnston said: Everything that has been said this evening will be carefully studied in GAD. As a general comment on the dividing line between Regulations and Guidance Notes, each has their proper function to perform. A Regulation has to be precise and bears upon everybody, but there are things that the Guidance Notes can do better. We should certainly have Guidance Notes, if only to encourage a sense of responsibility on the part of the Appointed Actuary.

I would like to call the meeting's attention to various developments in other countries. For example, Canada has abandoned detailed valuation regulations of the type which we have here. The Canadian Institute put out what we would call a Guidance Note, but this turned out not to be specific enough. They are now preparing and publishing papers which give quite specific instructions for the choice of bases and methods for valuing various types of policy. It will be interesting to see how this works out. To my mind, rules such as " thou shalt use such and such a rate of interest" should be in Regulations which bind the company, whereas Guidance Notes or other material issued by the professional body are binding only on the actuary.

Certain Regulations recently issued by the New York State Insurance Commissioner are also interesting. For certain types of policy he now requires a form of scenario testing on eight specified scenarios. Others in the U.S. are proposing scenario testing on a stochastic basis, but

there seems to me to be problems in applying the result of stochastic modelling directly to a practical valuation. There is a great deal of research going on in the U.S.A. in this area.

Coming back to our own resilience test, I would point out that it is intended to deal purely with market fluctuations. Rates of interest and equity prices can change dramatically in the course of only a few months. The rule is meant to ensure (as far as one can reasonably do so) that an office does not lose its solvency margin by reason only of such a fluctuation. Since it was first introduced, the test has provided for a 25% fall in equity prices. It has been said that this figure should have been reduced following the stock market falls of October 1987. However, markets had risen during 1987, and had they not fallen there would have been a case for increasing the 25% to some higher figure. At the end of that year prices were at much the same level as at the beginning, so the figure was left unaltered. When devising the resilience test we bear in mind that companies hold a solvency margin in addition to their mathematical reserves.

I must make it quite clear that satisfying the GAD resilience test does not necessarily satisfy all professional requirements. In particular the Working Party makes various suggestions which go beyond the resilience test, and it may well be right on occasion for actuaries to hold greater reserves than our requirements would lead to. I hope that the Working Party will develop their ideas on mismatching reserves generally so that actuaries can have some guidance on these wider objectives.

Mr C. M. Johnson said: I have talked about trend line approaches in the introductory remarks and I am prompted now to say a few more words about them. I think the comments that Mr Gupta made about the basis from the late seventies with updating to the current situation was the sort of basis Jeremy Goford outlined in considerable detail at the Institute discussion. So, it may be worthwhile if I run through the response we gave in writing to the comments at the Institute.

The particular basis described is one which we feel sure would normally be more than sound —but we do not really view it as an appropriate basis for a statutory minimum. To begin with there are two substantial problems with this type of basis. First that it is quite stringent and second that it is very complex to apply in practice.

One of the other speakers tonight mentioned the complexity. The foundation of the approach — the use of the current and a future unit fund calculated by growing unit allocations less deductions from the outset of the policy at an assumed unit growth rate — is very difficult to follow through, because modern contracts incorporate unit cancellation monthly for mortality, expenses and morbidity on unit-linked permanent health insurance contracts and on occasions cancellations for other reasons, for example, charges to policyholders for unit switches. Some contracts have the further complications of joint-life status and yet others have units that are allocated on the receipt of premiums, not on the due date of premiums. To reconstruct policy history to obtain the current unit fund, using a trend line growth which is in any case different to the real growth actually experienced, seems an extremely complex and rather unnecessary activity to turn into a statutory requirement. Such complexity we would find difficult to put forward as a recommendation for a minimum. What we like about the market value approach is that it is direct and it starts in a basis in fact, you know what the market value is on the valuation date.

I think there is a secondary point related to Mr Gupta's comment that you compare the hypothetical fund you arrived at using his basis with the current market value fund and then you make a decision as to whether this is within a 95% probability distribution of some form of recovery. I think it is going to be very difficult for anybody to make any quantitative assessment of what the 95% probability interval is in that situation. If you did manage that and you arrived at the view that the artificial trend line type fund was OK — even though that fund might actually be higher than the current market value fund — I would have some concerns about what that really meant in terms of the strength of the valuation on that day and in terms of then using the 25% fall test.

Professor A. D. Wilkie said: I am not going to contribute anything positive to the discussion but I should like to raise one question which has been prompted by Mr Johnston's contribution. He referred to what was happening in other English-speaking countries. What would also be of interest, and since I do not know the answer I cannot contribute it, is how our colleagues in other

countries of the European Communities deal with unit-linked business. In many countries it is not written at all, but in a number of countries quite a lot of business is written, in France and in the Netherlands particularly. In France the valuation method for conventional policies has traditionally been a net premium method laid down by the Government on the original premium basis for each policy with no deviation from that. The unit-linked policy is so much at variance with that sort of approach that I wonder how they have coped with it. I think this is of relevance to us because of the possibility, not in the immediate future but in the further distant future, of some pressure towards, if not harmonisation, at least some understanding of valuation methods in different countries within the Communities so that life offices can exercise the freedom of services allowed under the Treaty of Rome with the same sort of background supervision in each country. I expect that there are only very tentative moves being made in that direction at present but this is something that will come and this relatively new field of linked life assurance may cause a great deal more difficulty in harmonisation than conventional life assurance. It might be a useful idea for the Working Party or a successor working party to try to find out what does happen in other countries within the Communities in this field so that at least we know where we are when we start talking about some sort of common approach to valuation standards among supervisors throughout the twelve countries of the Communities.

Mr W. W. Stewart said: In common with a lot of other members tonight I also came along completely unprepared to speak. However I would like to comment on the very last bit of the paper itself which I suppose is just below paragraph 7.18 where the question of even-handedness between linked and non-linked business comes in. I think this concept could be taken far too far. There is, as we all know, an intrinsic difference between unit-linked business and conventional with-profit business. It seems to me that the solvency problem for unit-linked business is really quite simple. The way of getting the answer may not be but the question itself is. Are the expenses that the office expects to receive at least equal to what it expects to have to pay out. If yes, it is solvent, if no it is insolvent. The question of solvency for with-profit business is quite different. To digress for a moment, some of the so-called solvency margins which we have been asked to consider nowadays have an element of Heath Robinson in them. It seems to me that the mismatching test that has been brought in recently is an attempt at a "scenario" as described by Mr Johnston, but I would beg to suggest that it does not take into account properly the interaction of some of the parameters. I think for instance, having already taken a 7.5% margin, to be looking at 25% margins in equities and 3% yield drops for gilts, and then still have to take some mismatching adjustment for non-sterling assets, begs the question of what we are really trying to prove.

Valuations for with-profit business may be used to demonstrate solvency, but when policyholders' expectations are brought in, then we have a vastly different situation. Even-handedness here in relation to unit-linked business is difficult to imagine.

Mr A. D. Shedden said: Around 1973 a colleague of mine was asked — "What was the probability that the market value of the present equity assets of the Company would fall below their book value?" At the time the market value of equities was considerably above the book value, in fact it was I think almost double and the Management were considering whether they might write-up the value of the fund shown in the Company accounts. I cannot remember the exact result but it was something like a 99.75% probability. On this assertion the Management cautiously wrote up the fund by a small amount. Six months later the asset value of the equity portfolio was in fact about equal to its book value. Now had we been then required to operate the resilience test which is now recommended we would have had to take a 25% margin in the value of these assets regardless of the exceptionally low (and temporary) level to which the assets had fallen. I mention this simply to make a plea for trying to introduce into the Regulations, but certainly at least into our Guidance Notes, some coherence of principles rather than rules of thumb. Other people have mentioned this point. In my view we have suffered as a profession in not being quite sure what we are doing when dealing with the Government Actuary's Department. From my own experience in the Joint Actuarial Working Party a lot of our time was taken in trying to marry what we thought were general actuarial principles with proposed valuation regulations which in many respects conflicted with these principles and had been presented for discussion in a sort of *fait accompli.*

It became difficult, if not impossible, to reach sensible rules in these circumstances. I therefore consider that the setting up of the various working parties mentioned in the paper is a step in the right direction. I would greatly like to see these expanded in number to include a working party to consider what general valuation principles should apply in the absence of valuation regulations altogether. We really have not got our act together on valuation principles and I do not think we will get very far attempting to solve specific problems without having established first of all a satisfactory general framework. Consider how much of the paper we have been discussing has had to deal with constraints of regulations rather than with valuation principles.

Professor A. D. Wilkie said: I am grateful for being allowed to speak again, since Mr Shedden has quoted me on something. I am not quite sure what the point of his story was, but I was pointing out that there was a small but non-zero probability of share prices falling very heavily, and in 1972 that was something that most people would have ignored completely.

Mr J. S. R. Ritchie, closing the discussion, said: I would like first to join with other speakers in congratulating the authors on the quality of the paper before us this evening and thanking them for the quantity of work which so obviously went into producing it.

Having read the paper and the Government Actuary's Department's note on it, and listened to the discussion this evening I am forced to the conclusion that the main issues have narrowed down from the wide-ranging title of the paper. I believe they now are:

1. The parameters for the statutory valuation of the sterling reserve.
2. To what extent these parameters should be laid down in regulations as opposed to less formal (but surely still very effective) guidance from the professional bodies and Government Actuary's Department itself.
3. Even-handedness of regulation and supervision between different players in the savings industry.

I accept that there are other important issues such as the treatment of mismatched unit reserves and the treatment of unitised with-profits contracts, which I thought might have got a better airing here tonight but I suggest these are satellites rather than planetary bodies in their own right.

Most of the discussion has related to what I describe as main issue 1, the parameters for the statutory valuation of the sterling reserve. On resilience testing, Mr McKinlay made the important point that resilience testing should begin at the product design stage.

On the question of reducing reserves when market values fall, I wonder if there has been some misunderstanding of paragraph 6 of the Government Actuary's Department's note accompanying tonight's paper. The second sentence of the note does not object to sterling reserves falling when market values fall — only to them being released. I interpret this as meaning the Government Actuary's Department does not object to a 25% fall in assets being accompanied by a fall of up to 25% in sterling reserves (if that is what the Discounted Cash Flow figures give) but does object to a 25% fall in assets being accompanied by a 30% or 40% fall in sterling reserves.

If my interpretation is correct, I find it hard to understand why there should be a disagreement between the profession and the Government Actuary's Department on this matter. I would have to confess however, that I find paragraph 6 in its entirety to be difficult to get to grips with, and in particular the fourth sentence's reference to extra reserves threatens to contradict my interpretation of the second sentence.

Mr McKinlay puts forward one variation of using other than market values for sterling reserve purposes — a trend line based on a long-term yield. I note Mr Johnson's suggestion that a trend line is OK if it produces a stronger answer. Mr Gupta puts more emphasis on a hypothetical unit fund approach coupled with more conservative and passive assumptions. Mr Johnson objects to this for statutory valuation requirements on the grounds of practicality for offices who have not been following this all along.

The Government Actuary pointed out that the 25% resilience test is only part of the story and the Appointed Actuary should be asking himself more searching questions in exercising his overall actuarial responsibilities.

The authors define coherence as being whether the resilience test should be modified in the light of investment conditions. This was a point Mr Shedden dealt with by suggesting that a fairly sophisticated regulation needs to be drafted. However, I suspect that a lot of research and

discussion is needed before that. In the meantime this coherence issue shows the value of keeping resilience test parameters out of regulations. The Government Actuary's Department can, one hopes, be relied upon to modify the resilience test quickly and with pragmatism if the circumstances demand.

On the subject of unit growth and renewal expense (the 2% gap) Mr McKinlay suggests a further margin is required where the link is to a specialised fund. The difficulty I find with this is where do you stop? One might suggest an extra margin for a cash fund, because it will probably yield less than either gilts or UK equities. I think the answer should be, to leave this to the prudence required of the actuary in his particular circumstances.

On the question of whether a gross or net approach should be used for the unit growth rate assumption, Mr McKinlay favours gross and I agree with him. It just seems such an unnecessary impediment to yoke the tax assumption into the unit growth rate.

On the question of renewal expenses on a "per policy" basis, Mr McKinlay criticises the "per policy" approach by making the valid point that cross-subsidy from large to small may be allowed for in premium rates. However, I have to defend the authors by pointing out that they only suggested renewal expenses should be **substantially** on a per policy basis.

No one touched on the question of closed fund expenses. I think it would be optimistic to assume a reduction in renewal expenses for a policy in a closed fund. Safer to believe it when you see it.

On the question of the discount rate, paragraph 5 of the Government Actuary's Department's note seems to accept that the 7.2% restriction should be removed on a high/high test.

On the 7.5% margin, Mr McKinlay agreed that this should be the reduced earnings element of the 25% fall in asset values — the balance reflecting an increased yield. On the subject of margins generally Mr Stewart made a plea for streamlining with which I suspect most of us would agree.

On the question of variable management charges, Mr McKinlay disagrees with the authors and feels that increases in management charges should not be taken credit for until implemented. Mr Smith would give the actuary a freer hand.

I feel the authors' recommendations are well thought out but I do not think we should overestimate the effect of management charges on an existing policyholder. I think he is much more likely to be concerned with the general size of his net return than with how it is made up. Frankly, for in-force business I suspect a 0.5% per annum increase in management charge is neither here nor there.

I move on now to the second main issue I identified, namely to what extent the parameters should be laid down in regulations. The Government Actuary's Department note in paragraph 3 is clearly inclined to putting the 2% real rate of investment return into regulations to ensure a uniform standard, but it suggests in paragraph 4 that the rate of inflation for expenses could be announced each autumn. I note that the Government Actuary feels there is a place for both Regulations and Guidance, and I am sure we will now study other countries' approaches to second guess what is in his mind!

It is difficult for those of us without Government Actuary's Department experience to really make a value judgement on the dividing line between Regulation and Guidance. It does however, appear that most of us incline towards Guidance rather than Regulation where possible on grounds of flexibility to reach practical and mutually acceptable understandings with the Government Actuary's Department.

I turn now to the final one of the three main issues I have defined, namely even-handedness. I doubt if any of us would dispute the concept of even-handedness but, like beauty, it is in the eye of the beholder. A requirement to asume a 25% earnings drop for unit-linked in isolation appears unfair. I am pleased to note however that paragraph 5 of the Government Actuary's Department's note indicates a relaxation of the 7.2% yield limit for unit-linked business.

The appliance of even-handedness between linked and non-linked business is highlighted by the issue of unitised with-profits. As the proposals stand we could be valuing part of one policy using a net premium method with one set of parameters and another part of the same policy on a gross premium method with a different set of parameters. In practice one suspects the actuary might seek to use the stronger of the two methods to value the whole policy but this crucially depends on the answers for each portion being of reasonably equivalent strength. There also remains the practical problem of the division of the answer between Forms 55 and 56.

In the wider context, it is probably ultra vires to make a detailed case in this Hall that the insurance sector of the savings industry is much more heavily regulated and supervised than other sectors. My feeling is that a major correction of this will have to wait for an as yet unknown scandal to erupt in another sector of the savings market.

You will be relieved to hear that I am nearly finished. However, I crave your indulgence for a little crystal ball gazing which, judging from the Government Actuary's remarks tonight, may not be all that fanciful!

If computing power and computing value for money continue to increase at the rate of recent decades, in the next millennium we may see some changes. The Government Actuary's Department may ask us to carry out 200 valuation runs, each on a different set of assumptions. To demonstrate adequate strength we would have to be solvent on at least 195 of them!

Alternatively, if the Government Actuary's Department can command enough Civil Service computing resources we might not be asked to carry out any statutory valuations at all. Once a year we would simply give the Government Actuary's Department data of all our policies and assets. The Government Actuary's Department would then conduct its own statutory valuations to its heart's content. Whether the heart of the Appointed Actuary would be so content is another matter!

Mr D. E. Purchase, replying to the discussion, said: May I start on behalf of the Working Party by thanking you again for making such a predominantly English set of authors so welcome here in the Faculty Hall. I am sorry that you have had to suffer Institute men both at the start and the end of this meeting. That is my fault. When I allocated members of the Working Party to their sub-groups I was not thinking far enough ahead; I believe that we may do better if our second paper sees the light of day, which I think it will, although it is not going to do everything that I now learn that the Government Actuary wants it to do. Mind you, I do not think it could ever have done that, even if he had told me 3 years ago that that was what he wanted. Ultimately surely the objective strength of any test of the type that we are considering here must be that which emerges from a concensus of the profession as a whole rather than that which happens to appeal to the members of one particular working party. We hinted as much in section 2.9 of the current paper and I suspect that we will not go very much further in the next one. However there were one or two remarks about adaptation of the test in extreme conditions, and whatever the correct severity of a resilience test in normal circumstances, in my view the end of 1987 was normal, but the end of 1974 was not. I would also thank you, Mr President, for the kind remarks just now in introducing me and all of those who have contributed to a fascinating discussion. I jotted down before the meeting six topics which seemed most likely to call for comment and I take some small pride in the fact that they have indeed been commented on and in a volume which is in the order in which I wrote them down.

Mr Johnson in introducing the paper, and subsequently, made some comments on the argument as between market values and trend lines for determining the sterling reserves — I hope there is nobody here who is arguing for trend lines to determine the unit reserve! We had a forthright contribution from the floor advocating the trend line approach. My personal view remains that the trend line approach is one method, but it is only one method, of smoothing out the volatility of the basic market value approach to sterling reserves. As a purely personal comment it is not the method I favour but I do not think that is really the main issue. There are other methods by which the actuary can achieve such smoothing and I do not think it would be appropriate for one such method to be singled out in regulations. If I may give an analogy, I think that any specific regulation in this area should refer to market values and this would be the unit-linked equivalent of Regulation 59.1. It would normally be prudent for the reserves to be higher than those so calculated. As an aside it would certainly have been prudent for them to be significantly higher on 1 October 1987, maybe they would not have needed to be so much higher on 1 November 1987. I think that that comes straight from Regulation 54, and leaves the freedom with the Appointed Actuary. There was some interesting comment from the opener about the sensitivity of the sterling reserves to the parameters chosen and those of us who are deeply involved in unit-linked valuations know that that is something that is always at the front of our minds. There was a further comment to the effect that maybe the mismatching test should depend upon some perception of the volatility of the particular fund in which the investment is held, and although that has some

instinctive appeal, I think reflection on the ease with which policyholders can switch their money from one linked fund to another almost overnight rules out any such complication.

The Working Party's approach to variability of charges in section 4.9 of the paper was criticised in Staple Inn Hall and it was also not supported by the opener here tonight. I was glad to receive some support later on. My own feeling is that, although I can understand the criticism, I can envisage circumstances where conditions are perhaps moderately unfavourable but not extreme, and where if they continue on an unfavourable basis you would wish to implement the increase in charges, but if they recovered as you perhaps perceive they might then you would not wish to do so. Developing the theme slightly further, even if, contrary to the Working Party's recommendation, you said that in determining the main sterling reserve you could not take account of the right to increase charges, I think it would be very harsh indeed to carry that through to the determination of the resilience or mismatching reserve, when in those hypothetical circumstances changing the charge might well be an early measure that you took.

The only other of my likely topics which calls for comment is the question of our suggestion that renewal expenses should be largely on a per policy basis and as the closer said we did say substantially, not entirely. It is perfectly feasible to give an example where it is not selective withdrawals that would cause a reduction in the expense loadings as time went on if you were loading in any other way. Many portfolios of individual pensions business will have much higher average premiums for shorter term policies than for longer term policies and the natural process of retirement will then lead in due course to a significant lowering of the average premium. Of course that is all in the context of the closed fund valuation but that is the basis on which we are operating.

When our Paper was presented at Staple Inn in March this year I made some comments about the GAD note of 26 February that was circulated with it. I would like if I may to take the opportunity to emphasise some of those points again although I will try to be a little briefer here. I think I have to add that although most members of the Working Party share my views on this note I am sure that not all do so. I must also add that while we were preparing this paper we had much help from members of GAD and I and the Working Party are most grateful for that. However they did not wish to be named or acknowledged and perhaps you will understand why.

The statement in the GAD note that surprised me most was in paragraph 6 — "An approach which has the effect of releasing reserves when market values fall does not appear to be credible." I think the opener found this one a little bit difficult as well. Is it really being suggested that if conditions deteriorate reserves must always and automatically increase? It does seem to me that these mismatching or resilience reserves are needed in part to protect offices against potential adverse conditions, not to cripple them if those conditions actually arise. There are some areas of unreality in this whole field of unit-linked valuation, for example many unit-linked policies are written as whole-life policies whatever the underlying intention and whatever the likely operation in practice, and in that situation, if it is a Life Fund policy, tax can well force the assumption of a negative real return. Combine that with the prohibition on withdrawals and large contributions to the sterling reserves can come from very distant cash flows, most of which in practice will never arise. As we say in the paper this is harsh enough for the primary valuation. When it is carried through to the resilience test with no relaxation on the assumed current return it becomes almost unworkable. If we contemplate the test with -25% on market values and -3% on the gilt yield supporting the discount rate — a combination we regrettably did not address explicitly in paragraph 5.6 — the results produce I think quite excessive reserving requirements.

Finally I return to the subject of even-handedness. The Working Party is grateful that that principle received substantial support both in Staple Inn and here tonight. As indicated in the paper, section 5.1.7, GAD take the view that when testing for a 25% fall in market values it is not permissible to assume a higher unit growth rate, but in the conventional situation they seem happy to assume unchanged earnings and thus allow a rise in yield. Now since higher yields on linked assets are credited through the unit price and thus emerge as increased growth rates I believe that the current test is harsher for linked business than conventional. I do not believe this is really intended and I hope it will be corrected.

Mr C. M. Johnson subsequently wrote: As the Working Party has had the opportunity to express its view in the paper itself, and subsequently at Sessional Meetings of both the Faculty and the

Institute, it feels it better not to add further, by way of a written response, to what has already been said on the valuation of linked business. However, there is one point of detail which arose in Edinburgh which I would like to pick up.

During his remarks, Mr Gupta commented that the "successive summation" approach to calculating the DCF reserve does not always ensure that the company can pay future cash values at all times. If this were correct, I would agree that the method was inappropriate — and probably in breach of Regulation 56! However, under the Working Party's view of how the method is applied, the resulting DCF reserve is always adequate to pay future cash values, since the reserve at any point in time is the Cash Value together with any required DCF reserve at that point in time. The Cash Value includes the projected unit fund and any surrender charge. Changes in the surrender charge over time are brought through as items of cash flow in the DCF calculation (see Appendix 6 of the paper), which ensures that the office always has adequate resources.