

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

BY A. E. M. FINE, M.A., F.I.A., A.S.A., C. P. HEADDON, M.A., F.I.A.,
T. W. HEWITSON, B.Sc., F.F.A., C. M. JOHNSON, B.Sc., F.I.A.,
I. C. LUMSDEN, M.A., F.F.A., M. H. MAPLE, M.A., F.I.A.,
P. J. L. O'KEEFFE, B.Sc., F.I.A., A.S.A., P. J. POOK, B.Sc (Econ.), F.I.A.,
D. E. PURCHASE, M.A., F.I.A., F.R.A.S. AND
D. G. ROBINSON, M.A., F.F.A.

[Presented to the Institute of Actuaries, 28 March 1988]

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1.2 Statutory valuations of long-term insurance business under the Insurance Companies Act 1982 ('the Act', which superseded the 1974 and 1981 Acts) and the Insurance Companies Regulations 1981 ('the current Regulations') have now been prepared by actuaries for some years.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'Keefe. 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

<i>Gross Approach</i>	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%
<i>Net Approach</i>			
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 $8\% \times .925 = 7.4\%$.

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 $\cdot 75\%$ 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 $1\cdot 5\%$ 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 un-zillmerized 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 $DCF + \text{Unit Reserve (UV)}$ 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 $\text{Total Sterling Reserve} + UV = 0$ 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.

REFERENCES

- (1) BEWS, R. P., SEYMOUR, P. A. C., SHAW, A. N. D. & WALES, F. R. (1975) *Proposals for the Statutory Basis of Valuation of the Liabilities of Long-Term Insurance Business*. *J.I.A.* **102**, 61 and *T.F.A.* **34**, 367.
- (2) BROWN, A. S., FORD, A., SEYMOUR, P. A. C., SQUIRES, R. J. & WALES, F. R. (1978) *Valuation of Individual Investment-Linked Policies*. *J.I.A.* **105**, 317 and *T.F.A.* **36**, 343.
- (3) CANNON, C. L. (1985) *Valuation Requirements: Basics and Methods*. *Proceedings of the First U.K. Actuarial Convention*, p 76.
- (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 I

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

Appendix number	Premium frequency	Key features of the cashflow projection				Resulting DCF reserve (£)
		Test	Increased income yield rates	Increased DCF discount rate	Increased renewal expense inflation	
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.

APPENDIX 5.1.1

UNIT LINKED POLICY CASH FLOW PROJECTION

PARAMETER	VALUE	COMMENTS	BREAKDOWN OF UNIT GROWTH RATE : (PRE-RENEWAL CHARGE)			
			ITEM	GROSS GROWTH	TAX RATE	NET GROWTH
SEX	MALE					
VALUATION AGE	35					
ANNUAL PREMIUM (£)	100					
PREMIUM FREQUENCY	ANNUAL					
SUM ASSURED (£)	3,000					
INITIAL UNIT VALUE (£)	600					
RENEWAL MANAGEMENT CHARGE	0.75%		FRANKED INCOME	3.00%	27.00%	2.19%
ALLOCATION + BID/OFFER SPREAD	14.00%		UNFRANKED INCOME	1.50%	33.00%	0.98%
RENEWAL EXPENSE (NET) (£)	13		CHARGEABLE GAIN	0.75%	25.00%	0.53%
MORTALITY	A67/70 ULT		NON-CHARGEABLE GAIN	5.75%	0.00%	5.75%
			TOTAL	11.00%	13.84%	9.48%
UNIT GROWTH (AFTER CHARGES & TAXES)	8.73%					
RENEWAL EXPENSE INFLATION	9.00%					
VALUATION DISCOUNT RATE	4.50%					
		INITIAL POSITION.				

PROJECTION										UNIT VALUE		RENEWAL		ALLOC'n +		TOTAL		MEAN		q		MORT- ALITY		NET		CASH		DCF		I Proj'n	
Year	Opening	Closing	Mean	Charge	Spread	Offer	Income	Income	Strain	q	Cost	Expense	Expense	Outgo	in Year	Flow	Reserve	Year													
1	600	742	671	5.03	14.00	14.00	19.03	19.03	2,329	0.00086	1.99	15.00	15.00	16.99	156.30	2.04	156.30	1													
2	742	896	819	6.14	14.00	14.00	20.14	20.14	2,181	0.00094	2.04	16.35	16.35	18.39	1.75	1.75	1.75	2													
3	896	1,064	980	7.35	14.00	14.00	21.35	21.35	2,020	0.00103	2.09	17.82	17.82	19.91	1.44	1.44	1.44	3													
4	1,064	1,247	1,156	8.67	14.00	14.00	22.67	22.67	1,844	0.00115	2.12	19.43	19.43	21.55	1.12	1.12	1.12	4													
5	1,247	1,445	1,346	10.10	14.00	14.00	24.10	24.10	1,654	0.00129	2.13	21.07	21.07	23.30	0.80	0.80	0.80	5													
6	1,445	1,661	1,553	11.65	14.00	14.00	25.65	25.65	1,447	0.00144	2.09	23.08	23.08	25.17	0.48	0.48	0.48	6													
7	1,661	1,896	1,779	13.34	14.00	14.00	27.34	27.34	1,221	0.00162	1.98	25.16	25.16	27.14	0.20	0.20	0.20	7													
8	1,896	2,151	2,024	15.18	14.00	14.00	29.18	29.18	976	0.00183	1.79	27.42	27.42	29.21	0.03	0.03	0.03	8													
9	2,151	2,429	2,290	17.17	14.00	14.00	31.17	31.17	710	0.00207	1.47	29.89	29.89	31.36	0.18	0.18	0.18	9													
10	2,429	2,730	2,579	19.34	14.00	14.00	33.34	33.34	421	0.00234	0.98	32.58	32.58	33.56	0.22	0.22	0.22	10													
11	2,730	3,058	2,894	21.71	14.00	14.00	35.71	35.71	106	0.00264	0.28	35.51	35.51	35.79	0.08	0.08	0.08	11													
12	3,058	3,415	3,236	24.27	14.00	14.00	38.27	38.27	0	0.00298	0.00	38.71	38.71	38.71	0.43	0.43	0.43	12													
13	3,415	3,802	3,608	27.06	14.00	14.00	41.06	41.06	0	0.00336	0.00	42.19	42.19	42.19	1.13	1.13	1.13	13													
14	3,802	4,224	4,013	30.10	14.00	14.00	44.10	44.10	0	0.00378	0.00	45.99	45.99	45.99	11.89	11.89	11.89	14													
15	4,224	4,682	4,453	33.40	14.00	14.00	47.40	47.40	0	0.00426	0.00	50.13	50.13	50.13	12.73	12.73	12.73	15													
16	4,682	5,180	4,931	36.98	14.00	14.00	50.98	50.98	0	0.00479	0.00	54.64	54.64	54.64	13.65	13.65	13.65	16													
17	5,180	5,722	5,451	40.89	14.00	14.00	54.89	54.89	0	0.00538	0.00	59.55	59.55	59.55	14.67	14.67	14.67	17													
18	5,722	6,311	6,017	45.13	14.00	14.00	59.13	59.13	0	0.00603	0.00	64.91	64.91	64.91	15.79	15.79	15.79	18													
19	6,311	6,952	6,632	49.74	14.00	14.00	63.75	63.75	0	0.00675	0.00	70.76	70.76	70.76	17.02	17.02	17.02	19													
20	6,952	7,648	7,300	54.75	14.00	14.00	68.75	68.75	0	0.00756	0.00	77.12	77.12	77.12	18.37	18.37	18.37	20													
21	7,648	8,405	8,027	60.20	14.00	14.00	74.20	74.20	0	0.00844	0.00	84.07	84.07	84.07	19.86	19.86	19.86	21													
22	8,405	9,229	8,817	66.13	14.00	14.00	80.13	80.13	0	0.00942	0.00	91.63	91.63	91.63	21.50	21.50	21.50	22													
23	9,229	10,124	9,676	72.57	14.00	14.00	86.57	86.57	0	0.01050	0.00	99.88	99.88	99.88	23.31	23.31	23.31	23													
24	10,124	11,097	10,610	79.58	14.00	14.00	93.58	93.58	0	0.01169	0.00	108.87	108.87	108.87	25.29	25.29	25.29	24													
25	11,097	12,153	11,626	87.20	14.00	14.00	101.20	101.20	0	0.01299	0.00	118.67	118.67	118.67	27.47	27.47	27.47	25													
26	12,153	13,306	12,730	95.48	14.00	14.00	109.48	109.48	0	0.01443	0.00	129.35	129.35	129.35	29.87	29.87	29.87	26													
27	13,306	14,557	13,931	104.48	14.00	14.00	118.48	118.48	0	0.01601	0.00	140.99	140.99	140.99	32.50	32.50	32.50	27													
28	14,557	15,917	15,237	114.28	14.00	14.00	128.28	128.28	0	0.01775	0.00	153.68	153.68	153.68	35.40	35.40	35.40	28													
29	15,917	17,396	16,656	124.92	14.00	14.00	138.92	138.92	0	0.01965	0.00	167.51	167.51	167.51	38.59	38.59	38.59	29													
30	17,396	18,903	18,199	136.50	14.00	14.00	150.50	150.50	0	0.02174	0.00	182.58	182.58	182.58	42.09	42.09	42.09	30													
31	18,903	20,752	19,978	149.08	14.00	14.00	163.08	163.08	0	0.02403	0.00	199.02	199.02	199.02	45.93	45.93	45.93	31													
32	20,752	22,652	21,702	162.77	14.00	14.00	176.77	176.77	0	0.02654	0.00	216.93	216.93	216.93	50.16	50.16	50.16	32													
33	22,652	24,719	23,686	177.64	14.00	14.00	191.64	191.64	0	0.02927	0.00	236.45	236.45	236.45	54.81	54.81	54.81	33													
34	24,719	26,966	25,843	193.82	14.00	14.00	207.82	207.82	0	0.03227	0.00	257.73	257.73	257.73	59.91	59.91	59.91	34													
35	26,966	29,409	28,188	211.41	14.00	14.00	225.41	225.41	0	0.03554	0.00	280.93	280.93	280.93	65.52	65.52	65.52	35													
36	29,409	32,066	30,737	230.53	14.00	14.00	244.53	244.53	0	0.03911	0.00	306.21	306.21	306.21	71.68	71.68	71.68	36													
37	32,066	34,954	33,510	251.32	14.00	14.00	265.32	265.32	0	0.04300	0.00	333.77	333.77	333.77	78.45	78.45	78.45	37													
38	34,954	38,094	36,524	273.93	14.00	14.00	287.93	287.93	0	0.04723	0.00	363.81	363.81	363.81	85.88	85.88	85.88	38													
39	38,094	41,508	39,801	298.51	14.00	14.00	312.51	312.51	0	0.05184	0.00	396.55	396.55	396.55	94.04	94.04	94.04	39													
40	41,508	45,221	43,365	325.23	14.00	14.00	339.23	339.23	0	0.05685	0.00	432.24	432.24	432.24	103.01	103.01	103.01	40													

UNIT LINKED POLICY CASH FLOW PROJECTION

PARAMETER	VALUE	COMMENTS
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%	
BREAKDOWN OF UNIT GROWTH RATE : (PRE-RENEWAL CHARGE)		
ITEM	GROSS GROWTH	TAX RATE
FRANKED INCOME	4.00%	27.00%
UNFRANKED INCOME	2.00%	35.00%
CHARGEABLE GAIN	0.75%	25.80%
NON-CHARGEABLE GAIN	5.75%	0.00%
TOTAL	12.50%	15.74%
		10.53%
HATCHING 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 10. ((1.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	Opening	Unit Value	Closing	Mean	Renewal Charge	Alloc'n + Bid/Off	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	1,477	1,389	10.42	14.00	24.42	1,611	0.00144	2.32	23.08	25.40	(0.99)		6	
7	1,477	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	1.52	32.58	33.90	(1.64)		10	
11	2,591	2,935	2,763	20.72	14.00	34.72	337	0.00268	1.23	35.51	36.14	(1.42)		11	
12	2,935	3,312	3,123	23.42	14.00	37.42	0	0.00308	0.00	38.71	38.71	(1.28)		12	
13	3,312	3,726	3,519	26.39	14.00	40.39	0	0.00356	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	12,031	11,473	86.05	14.00	100.05	0	0.01169	0.00	108.87	108.87	(8.82)		24	
25	12,031	13,250	12,686	95.14	14.00	109.14	0	0.01299	0.00	118.67	118.67	(9.52)		25	
26	13,250	14,574	14,017	105.13	14.00	119.13	0	0.01443	0.00	129.35	129.35	(10.22)		26	
27	14,574	16,023	15,478	116.09	14.00	130.09	0	0.01601	0.00	140.99	140.99	(10.90)		27	
28	16,023	17,623	17,083	128.12	14.00	142.12	0	0.01775	0.00	153.68	153.68	(11.56)		28	
29	17,623	19,366	18,844	141.33	14.00	155.33	0	0.01965	0.00	167.51	167.51	(12.18)		29	
30	19,366	21,259	20,777	155.83	14.00	169.83	0	0.02174	0.00	182.58	182.58	(12.75)		30	
31	21,259	23,301	22,900	171.75	14.00	185.75	0	0.02403	0.00	199.02	199.02	(13.26)		31	
32	23,301	25,499	25,230	189.23	14.00	203.23	0	0.02654	0.00	216.93	216.93	(13.70)		32	
33	25,499	27,857	27,789	208.41	14.00	222.41	0	0.02927	0.00	236.45	236.45	(14.04)		33	
34	27,857	30,377	30,597	229.48	14.00	243.48	0	0.03227	0.00	257.73	257.73	(14.25)		34	
35	30,377	33,067	33,680	252.60	14.00	266.60	0	0.03554	0.00	280.93	280.93	(14.32)		35	
36	33,067	35,944	36,837	277.99	14.00	291.99	0	0.03911	0.00	306.21	306.21	(14.22)		36	
37	35,944	39,011	40,781	305.86	14.00	319.86	0	0.04300	0.00	333.77	333.77	(13.91)		37	
38	39,011	42,276	44,781	336.46	14.00	350.46	0	0.04723	0.00	363.81	363.81	(13.35)		38	
39	42,276	45,743	48,861	370.05	14.00	394.05	0	0.05184	0.00	396.55	396.55	(12.50)		39	
40	45,743	49,483	52,829	406.92	14.00	420.92	0	0.05695	0.00	432.24	432.24	(11.32)		40	

UNIT LINKED POLICY CASH FLOW PROJECTION																											
PARAMETER	VALUE	COMMENTS																									
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 + B/D/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%																										
<p>UNIT GROWTH (AFTER CHARGES & TAXES)</p> <p>FRANKED AND UNFRANKED YIELD RATES UP A THIRD.</p> <p>INITIAL UNIT FUND FALLS A QUARTER LESS A CBT RESERVE</p> <p>RELEASE OF 10. (I.E. TO 800-150+10 = 460.)</p> <p>WITH INCREASE IN DCF LIABILITY DISCOUNTING RATE.</p> <p>NO CHANGE IN RENEWAL EXPENSE INFLATION RATE.</p>																											
<p>BREAKDOWN OF UNIT GROWTH RATE : (PRE-RENEWAL CHARGE)</p> <table border="1"> <thead> <tr> <th>ITEM</th> <th>GROSS GROWTH</th> <th>TAX RATE</th> <th>NET GROWTH</th> </tr> </thead> <tbody> <tr> <td>FRANKED INCOME</td> <td>4.00%</td> <td>27.00%</td> <td>2.92%</td> </tr> <tr> <td>UNFRANKED INCOME</td> <td>2.00%</td> <td>35.00%</td> <td>1.30%</td> </tr> <tr> <td>CHARGEABLE GAIN</td> <td>0.75%</td> <td>25.00%</td> <td>0.56%</td> </tr> <tr> <td>NON-CHARGEABLE GAIN</td> <td>5.75%</td> <td>0.00%</td> <td>5.75%</td> </tr> <tr> <td>TOTAL</td> <td>12.50%</td> <td>15.74%</td> <td>10.53%</td> </tr> </tbody> </table>				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%
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%																								
<p>MATCHING TEST "ALL VIA YIELD" POSITION.</p>																											

PROJECTION										UNITS £s				
Proj'n Year	Opening	Unit Value Closing	Mean	Renewal Charge	Alloc'n + Bid/offer	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	986	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	1.52	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	14,011	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	25,250	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	304.21	304.21	(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	(13.55)		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	(11.52)		40

UNIT LINKED POLICY CASH FLOW PROJECTION				APPENDIX 5.1.4	
PARAMETER	VALUE	COMMENTS			
SEX	MALE	BREAKDOWN OF UNIT GROWTH RATE : (PRE-RENEWAL CHARGE)			
VALUATION AGE	35	ITEM	GROSS GROWTH	TAX RATE	NET GROWTH
ANNUAL PREMIUM (£)	100				
PREMIUM FREQUENCY	ANNUAL				
SUM ASSURED (£)	3,000				
INITIAL UNIT VALUE (£)	460				
RENEWAL MANAGEMENT CHARGE		FRANKED INCOME	4.00%	27.00%	2.92%
ALLOCATION + BID/OFFER SPREAD		UNFRANKED INCOME	2.00%	35.00%	1.50%
RENEWAL EXPENSE (NET) (£)	0.75%	CHARGEABLE GAIN	0.75%	25.00%	0.56%
MORTALITY	15	NON-CHARGEABLE GAIN	5.75%	0.00%	5.75%
	A67/70 ULT	TOTAL	12.50%	15.74%	10.53%
UNIT GROWTH (AFTER CHARGES & TAXES)	9.78%	MATCHING TEST "ALL VIA YIELD" POSITION.			
RENEWAL EXPENSE INFLATION	10.50%	FRANKED AND UNFRANKED YIELD RATES UP A THIRD.			
VALUATION DISCOUNT RATE	4.50%	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	Opening	Closing	Unit Value	Mean	Renewal Charge	Alloc'n + Bld/Differ	Total Income	Mean Death Strain	q	Mort- ality Cost	Net Renewal Expense	Total Outgo	Cash Flow in Year	DCF Flow 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	986	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	22.34	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	9,845	9,363	70.22	14.00	84.22	0	0.00942	0.00	122.10	122.10	(37.87)		22	
23	9,845	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	0.02643	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	46,976	44,861	336.46	14.00	350.46	0	0.04723	0.00	603.25	603.25	(252.79)		38	
39	46,976	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	

APPENDIX 5.1.5

UNIT LINKED POLICY CASH FLOW PROJECTION

PARAMETER	VALUE	COMMENTS
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%	
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 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	Opening	Closing	Unit Value	Mean	Charge	Renewal M'gent Bid/Offer	Alloc'n + Spread	Total Income	Mean Death Strain	q	Mort- ality Cost	Renewal Expense	Net Total Outgo	Cash Flow In Year	DCF Flow Reserve	Proj'n Year
1	460	595	528	3.76	14.00	17.96	2,472	0.0086	2.12	15.00	17.12	0.84	466.50	1		
2	595	743	669	5.02	14.00	19.02	2,331	0.0094	2.18	16.58	18.76	0.26		2		
3	743	906	825	6.19	14.00	20.19	2,175	0.0103	2.25	18.32	20.56	(0.38)		3		
4	906	1,085	996	7.47	14.00	21.47	2,004	0.0115	2.30	20.24	22.54	(1.08)		4		
5	1,085	1,281	1,183	8.87	14.00	22.87	1,817	0.0129	2.34	22.36	24.70	(1.83)		5		
6	1,281	1,497	1,398	10.42	14.00	24.42	1,611	0.0144	2.32	24.71	27.04	(2.62)		6		
7	1,497	1,733	1,615	12.11	14.00	26.11	1,385	0.0162	2.25	27.31	29.56	(3.44)		7		
8	1,733	1,993	1,863	13.97	14.00	27.97	1,137	0.0183	2.08	30.17	32.26	(4.28)		8		
9	1,993	2,278	2,135	16.02	14.00	30.42	865	0.0207	1.79	33.34	35.13	(5.11)		9		
10	2,278	2,595	2,434	18.26	14.00	32.26	566	0.0234	1.32	36.84	38.16	(5.90)		10		
11	2,595	2,935	2,763	20.72	14.00	34.72	237	0.0264	0.63	40.71	41.34	(6.62)		11		
12	2,935	3,312	3,123	23.42	14.00	37.42	0	0.0298	0.00	44.99	44.99	(7.56)		12		
13	3,312	3,726	3,519	26.39	14.00	40.39	0	0.0336	0.00	49.71	49.71	(8.32)		13		
14	3,726	4,180	3,953	29.65	14.00	43.65	0	0.0378	0.00	54.53	54.93	(11.28)		14		
15	4,180	4,679	4,430	33.22	14.00	47.22	0	0.0426	0.00	60.70	60.70	(13.47)		15		
16	4,679	5,227	4,953	37.15	14.00	51.15	0	0.0479	0.00	67.07	67.07	(15.92)		16		
17	5,227	5,829	5,528	41.46	14.00	55.46	0	0.0538	0.00	74.11	74.11	(18.65)		17		
18	5,829	6,489	6,159	46.19	14.00	60.19	0	0.0603	0.00	81.89	81.89	(21.70)		18		
19	6,489	7,214	6,851	51.39	14.00	65.39	0	0.0675	0.00	90.49	90.49	(25.11)		19		
20	7,214	8,010	7,612	57.09	14.00	71.09	0	0.0756	0.00	99.99	99.99	(28.91)		20		
21	8,010	8,883	8,447	63.35	14.00	77.35	0	0.0844	0.00	110.49	110.49	(33.14)		21		
22	8,883	9,843	9,363	70.22	14.00	84.22	0	0.0942	0.00	122.10	122.10	(37.87)		22		
23	9,843	10,895	10,369	77.77	14.00	91.77	0	0.1050	0.00	134.92	134.92	(43.13)		23		
24	10,895	12,051	11,473	86.05	14.00	100.05	0	0.1169	0.00	149.08	149.08	(49.03)		24		
25	12,051	13,320	12,686	95.14	14.00	109.14	0	0.1299	0.00	164.74	164.74	(55.59)		25		
26	13,320	14,714	14,017	105.13	14.00	119.13	0	0.1443	0.00	182.03	182.03	(62.90)		26		
27	14,714	16,243	15,478	116.09	14.00	130.09	0	0.1601	0.00	201.13	201.13	(71.06)		27		
28	16,243	17,922	17,083	128.12	14.00	142.12	0	0.1775	0.00	222.27	222.27	(80.15)		28		
29	17,922	19,766	18,844	141.33	14.00	155.33	0	0.1965	0.00	245.60	245.60	(90.27)		29		
30	19,766	21,789	20,777	155.83	14.00	169.83	0	0.2174	0.00	271.39	271.39	(101.56)		30		
31	21,789	24,011	22,900	171.75	14.00	185.75	0	0.2403	0.00	299.89	299.89	(114.14)		31		
32	24,011	26,450	25,230	189.23	14.00	203.23	0	0.2654	0.00	331.38	331.38	(128.15)		32		
33	26,450	29,127	27,789	208.41	14.00	222.41	0	0.2927	0.00	366.17	366.17	(143.76)		33		
34	29,127	32,067	30,597	229.48	14.00	243.48	0	0.3227	0.00	404.62	404.62	(161.14)		34		
35	32,067	35,294	33,680	252.40	14.00	266.60	0	0.3554	0.00	447.10	447.10	(180.50)		35		
36	35,294	38,837	37,065	277.99	14.00	291.99	0	0.3911	0.00	494.05	494.05	(202.06)		36		
37	38,837	42,726	40,781	305.86	14.00	319.86	0	0.4430	0.00	545.93	545.93	(226.06)		37		
38	42,726	46,996	44,861	336.44	14.00	350.44	0	0.4931	0.00	603.25	603.25	(252.79)		38		
39	46,996	51,683	49,340	370.05	14.00	384.05	0	0.5518	0.00	666.59	666.59	(282.54)		39		
40	51,683	56,829	54,256	406.92	14.00	420.92	0	0.6184	0.00	736.96	736.96	(315.66)		40		

APPENDIX 5.1.6

UNIT LINKED POLICY CASH FLOW PROJECTION

PARAMETER	VALUE	COMMENTS
SEX	MALE	
VALUATION AGE	35	
ANNUAL PREMIUM (£)	100	
PREMIUM FREQUENCY	ANNUAL	
SUM ASSURED (£)	5,000	
INITIAL UNIT VALUE (£)	450	
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%	
BREAKDOWN OF UNIT GROWTH RATE : (PRE-RENEWAL CHARGE)		
ITEM	GROSS GROWTH	TAX RATE
FRANKED INCOME	3.00%	27.00%
UNFRANKED INCOME	1.50%	35.00%
CHARGEABLE GAIN	0.75%	25.00%
NON-CHARGEABLE GAIN	5.75%	0.00%
TOTAL	11.00%	13.84%
MATCHING TEST - ALL VIA EARNINGS* POSITION.		
FRANKED AND UNFRANKED YIELD RATES DO NOT CHANGE.		
INITIAL UNIT FUND FALLS A QUARTER LESS A CBT RESERVE		
RELEASE OF 10. (I.E. TO 600-150*10 = 460.)		
DCF LIABILITY DISCOUNTING RATE AND RENEWAL EXPENSE		
INFLATION RATE DO NOT CHANGE.		
	NET GROWTH	
	2.18%	
	0.98%	
	0.36%	
	5.75%	
	9.48%	

PROJECTION										UNITS		Co			
Proj'n Year	Opening	Unit Value	Closing	Mean	Renewal Charge	Alloc'n + M'geant:Bid/Offer	Total Income	Mean Death Strain	q	Mort- ality Cost	Net Renewal Expense	Total Outgo	Cash Flow In Year	DCF Reserve	IProj'n Year
1	460	590	525	3.94	14.00	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	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	20.06	2,192	0.00103	2.27	17.82	20.09	10.03		3
4	884	1,051	968	7.26	14.00	21.26	21.26	2,032	0.00115	2.34	19.43	21.76	10.50		4
5	1,051	1,233	1,142	8.57	14.00	22.57	22.57	1,858	0.00129	2.39	21.17	23.56	11.00		5
6	1,233	1,430	1,331	9.99	14.00	23.99	23.99	1,669	0.00144	2.41	23.08	25.49	11.50		6
7	1,430	1,644	1,537	11.53	14.00	25.53	25.53	1,463	0.00162	2.38	25.16	27.53	12.00		7
8	1,644	1,878	1,761	13.21	14.00	27.21	27.21	1,239	0.00183	2.27	27.42	29.69	12.48		8
9	1,878	2,131	2,004	15.03	14.00	29.03	29.03	996	0.00207	2.06	29.89	31.95	12.91		9
10	2,131	2,407	2,269	17.02	14.00	31.02	31.02	731	0.00234	1.71	32.58	34.29	13.27		10
11	2,407	2,707	2,557	19.18	14.00	33.18	33.18	443	0.00264	1.17	35.51	36.68	13.50		11
12	2,707	3,033	2,870	21.52	14.00	35.52	35.52	130	0.00298	0.39	38.71	39.09	13.57		12
13	3,033	3,387	3,210	24.07	14.00	38.07	38.07	0	0.00336	0.00	42.19	42.19	14.12		13
14	3,387	3,772	3,579	26.85	14.00	40.85	40.85	0	0.00378	0.00	45.99	45.99	15.14		14
15	3,772	4,191	3,982	29.86	14.00	43.86	43.86	0	0.00426	0.00	50.13	50.13	16.26		15
16	4,191	4,646	4,419	33.14	14.00	47.14	47.14	0	0.00479	0.00	54.64	54.64	17.50		16
17	4,646	5,142	4,894	36.71	14.00	50.71	50.71	0	0.00538	0.00	59.55	59.55	18.85		17
18	5,142	5,680	5,411	40.58	14.00	54.58	54.58	0	0.00603	0.00	64.91	64.91	20.21		18
19	5,680	6,265	5,973	44.80	14.00	58.80	58.80	0	0.00675	0.00	70.76	70.76	21.61		19
20	6,265	6,902	6,584	49.38	14.00	63.38	63.38	0	0.00756	0.00	77.12	77.12	23.03		20
21	6,902	7,594	7,248	54.36	14.00	68.36	68.36	0	0.00844	0.00	84.07	84.07	24.47		21
22	7,594	8,346	7,970	59.78	14.00	73.78	73.78	0	0.00942	0.00	91.63	91.63	25.93		22
23	8,346	9,165	8,755	65.67	14.00	79.67	79.67	0	0.01050	0.00	99.88	99.88	27.41		23
24	9,165	10,054	9,609	72.03	14.00	86.07	86.07	0	0.01169	0.00	108.87	108.87	28.91		24
25	10,054	11,021	10,538	79.03	14.00	93.03	93.03	0	0.01299	0.00	118.67	118.67	30.43		25
26	11,021	12,073	11,547	86.60	14.00	100.60	100.60	0	0.01443	0.00	129.35	129.35	31.97		26
27	12,073	13,216	12,644	94.83	14.00	108.83	108.83	0	0.01601	0.00	140.99	140.99	33.53		27
28	13,216	14,459	13,838	103.78	14.00	117.78	117.78	0	0.01775	0.00	153.68	153.68	35.11		28
29	14,459	15,811	15,135	113.51	14.00	127.51	127.51	0	0.02164	0.00	167.51	167.51	36.71		29
30	15,811	17,280	16,546	124.09	14.00	138.09	138.09	0	0.02174	0.00	182.58	182.58	38.33		30
31	17,280	18,878	18,079	135.59	14.00	148.59	148.59	0	0.02403	0.00	199.02	199.02	39.97		31
32	18,878	20,615	19,747	148.10	14.00	162.10	162.10	0	0.02854	0.00	216.93	216.93	41.63		32
33	20,615	22,504	21,560	161.70	14.00	175.70	175.70	0	0.03227	0.00	236.45	236.45	43.31		33
34	22,504	24,558	23,531	176.48	14.00	190.48	190.48	0	0.03527	0.00	257.73	257.73	45.00		34
35	24,558	26,791	25,675	192.56	14.00	206.56	206.56	0	0.03854	0.00	280.93	280.93	46.71		35
36	26,791	29,219	28,005	210.04	14.00	224.04	224.04	0	0.04311	0.00	306.21	306.21	48.43		36
37	29,219	31,859	30,519	229.04	14.00	243.04	243.04	0	0.04900	0.00	333.77	333.77	50.17		37
38	31,859	34,729	33,284	249.70	14.00	263.70	263.70	0	0.05623	0.00	363.81	363.81	51.93		38
39	34,729	37,889	36,289	272.17	14.00	286.17	286.17	0	0.06484	0.00	396.55	396.55	53.71		39
40	37,889	41,242	39,546	296.59	14.00	310.59	310.59	0	0.07585	0.00	432.24	432.24	55.51		40

PROJECTION										UNITS		£s			
Proj'n Year	Opening	Unit Value	Closing	Mean	Renewal Charge	Alloc'n + Bid/Offer	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	10.96	0.00	10.96	39	0.00886	0.03	10.00	10.03	0.92	0.00	1
2	1,422	1,653	1,589	11.91	11.91	0.00	11.91	0	0.00994	0.00	10.90	10.90	1.01		2
3	1,455	1,799	1,727	12.95	12.95	0.00	12.95	0	0.01013	0.00	11.88	11.88	1.07		3
4	1,799	1,957	1,878	14.09	14.09	0.00	14.09	0	0.01115	0.00	12.95	12.95	1.13		4
5	1,957	2,127	2,042	15.31	15.31	0.00	15.31	0	0.01219	0.00	14.12	14.12	1.20		5
6	2,127	2,313	2,220	16.65	16.65	0.00	16.65	0	0.01344	0.00	15.37	15.37	1.26		6
7	2,313	2,515	2,414	18.10	18.10	0.00	18.10	0	0.01462	0.00	16.77	16.77	1.33		7
8	2,515	2,734	2,625	19.68	19.68	0.00	19.68	0	0.01613	0.00	18.28	18.28	1.40		8
9	2,734	2,973	2,854	21.40	21.40	0.00	21.40	0	0.01707	0.00	19.93	19.93	1.48		9
10	2,973	3,232	3,103	23.27	23.27	0.00	23.27	0	0.01834	0.00	21.72	21.72	1.55		10
11	3,232	3,514	3,373	25.30	25.30	0.00	25.30	0	0.01984	0.00	23.67	23.67	1.63		11
12	3,514	3,821	3,668	27.51	27.51	0.00	27.51	0	0.02098	0.00	25.80	25.80	1.70		12
13	3,821	4,153	3,988	29.91	29.91	0.00	29.91	0	0.02336	0.00	28.13	28.13	1.78		13
14	4,153	4,517	4,336	32.52	32.52	0.00	32.52	0	0.02678	0.00	30.66	30.66	1.86		14
15	4,517	4,912	4,714	35.36	35.36	0.00	35.36	0	0.03026	0.00	33.42	33.42	1.94		15
16	4,912	5,340	5,126	38.44	38.44	0.00	38.44	0	0.03479	0.00	36.42	36.42	2.02		16
17	5,340	5,806	5,573	41.80	41.80	0.00	41.80	0	0.03538	0.00	39.70	39.70	2.10		17
18	5,806	6,313	6,060	45.45	45.45	0.00	45.45	0	0.04063	0.00	43.28	43.28	2.17		18
19	6,313	6,864	6,589	49.41	49.41	0.00	49.41	0	0.04675	0.00	47.17	47.17	2.24		19
20	6,864	7,463	7,164	53.73	53.73	0.00	53.73	0	0.05756	0.00	51.42	51.42	2.31		20
21	7,463	8,114	7,789	58.42	58.42	0.00	58.42	0	0.06844	0.00	56.04	56.04	2.37		21
22	8,114	8,823	8,468	63.51	63.51	0.00	63.51	0	0.08942	0.00	61.09	61.09	2.43		22
23	8,823	9,593	9,208	69.06	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	263.41	0.00	263.41	0	0.05184	0.00	264.37	264.37	(0.93)		39
40	36,590	39,784	38,187	286.40	286.40	0.00	286.40	0	0.05685	0.00	288.16	288.16	(1.76)		40

PARAMETER	VALUE	COMMENTS
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%	

UNIT LINKED POLICY CASH FLOW PROJECTION			
PARAMETER	VALUE	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 CB* RESERVE			
RELEASE OF 25. (I.E. TO 1400-350x25 = 1075.)			
NO CHANGE IN DCF LIABILITY DISCOUNTING RATE.			
NO CHANGE IN RENEWAL EXPENSE INFLATION RATE.			

APPENDIX 5.2.2			
PARAMETER	VALUE	COMMENTS	
UNIT LINKED POLICY CASH FLOW PROJECTION			
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 CB* RESERVE			
RELEASE OF 25. (I.E. TO 1400-350x25 = 1075.)			
NO CHANGE IN DCF LIABILITY DISCOUNTING RATE.			
NO CHANGE IN RENEWAL EXPENSE INFLATION RATE.			

PROJECTION			UNITS												£s
Proj'n Year	Opening	Closing	Unit Value	Mean	Renewal 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	0.0086	0.32	10.00	10.32	(1.86)	27.69	1	
2	1,180	1,256	1,238	9.28	0.00	9.28	262	0.0094	0.25	10.90	11.15	(1.86)		2	
3	1,256	1,422	1,359	10.19	0.00	10.19	141	0.0103	0.15	11.88	12.03	(1.83)		3	
4	1,422	1,561	1,492	11.19	0.00	11.19	8	0.0115	0.01	12.95	12.96	(1.77)		4	
5	1,561	1,714	1,638	12.28	0.00	12.28	0	0.0129	0.00	14.12	14.12	(1.83)		5	
6	1,714	1,882	1,798	13.49	0.00	13.49	0	0.0144	0.00	15.37	15.37	(1.90)		6	
7	1,882	2,066	1,974	14.80	0.00	14.80	0	0.0162	0.00	16.77	16.77	(1.97)		7	
8	2,066	2,268	2,167	16.25	0.00	16.25	0	0.0183	0.00	18.28	18.28	(2.03)		8	
9	2,268	2,490	2,379	17.84	0.00	17.84	0	0.0207	0.00	19.93	19.93	(2.08)		9	
10	2,490	2,734	2,612	19.59	0.00	19.59	0	0.0234	0.00	21.72	21.72	(2.13)		10	
11	2,734	3,001	2,867	21.51	0.00	21.51	0	0.0264	0.00	23.67	23.67	(2.17)		11	
12	3,001	3,295	3,148	23.61	0.00	23.61	0	0.0298	0.00	25.80	25.80	(2.20)		12	
13	3,295	3,617	3,456	25.92	0.00	25.92	0	0.0336	0.00	28.13	28.13	(2.21)		13	
14	3,617	3,971	3,794	28.45	0.00	28.45	0	0.0378	0.00	30.66	30.66	(2.20)		14	
15	3,971	4,359	4,165	31.24	0.00	31.24	0	0.0426	0.00	33.42	33.42	(2.18)		15	
16	4,359	4,786	4,572	34.29	0.00	34.29	0	0.0479	0.00	36.42	36.42	(2.13)		16	
17	4,786	5,254	5,020	37.65	0.00	37.65	0	0.0538	0.00	39.70	39.70	(2.08)		17	
18	5,254	5,768	5,511	41.33	0.00	41.33	0	0.0603	0.00	43.28	43.28	(1.95)		18	
19	5,768	6,332	6,050	45.37	0.00	45.37	0	0.0675	0.00	47.17	47.17	(1.80)		19	
20	6,332	6,951	6,642	49.81	0.00	49.81	0	0.0756	0.00	51.42	51.42	(1.60)		20	
21	6,951	7,631	7,291	54.69	0.00	54.69	0	0.0844	0.00	56.04	56.04	(1.36)		21	
22	7,631	8,378	8,005	60.03	0.00	60.03	0	0.0942	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	66.97	66.97	(0.68)		23	
24	9,198	10,097	9,647	72.36	0.00	72.36	0	0.01299	0.00	72.98	72.98	(0.22)		24	
25	10,097	11,085	10,591	79.43	0.00	79.43	0	0.0169	0.00	79.11	79.11	0.32		25	
26	11,085	12,169	11,627	87.20	0.00	87.20	0	0.0219	0.00	86.23	86.23	0.97		26	
27	12,169	13,360	12,745	95.73	0.00	95.73	0	0.02827	0.00	93.99	93.99	1.74		27	
28	13,360	14,667	14,013	105.10	0.00	105.10	0	0.03775	0.00	102.45	102.45	2.65		28	
29	14,667	16,102	15,384	115.38	0.00	115.38	0	0.04965	0.00	111.67	111.67	3.71		29	
30	16,102	17,677	16,889	126.67	0.00	126.67	0	0.06174	0.00	121.72	121.72	4.95		30	
31	17,677	19,406	18,541	139.06	0.00	139.06	0	0.07454	0.00	132.68	132.68	6.38		31	
32	19,406	21,304	20,355	152.66	0.00	152.66	0	0.0894	0.00	144.62	144.62	8.05		32	
33	21,304	23,388	22,346	167.40	0.00	167.40	0	0.10727	0.00	157.63	157.63	9.94		33	
34	23,388	25,678	24,532	183.99	0.00	183.99	0	0.03227	0.00	171.82	171.82	12.17		34	
35	25,678	28,189	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	17.31		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	37,294	35,635	267.26	0.00	267.26	0	0.04723	0.00	242.54	242.54	24.72		38	
39	37,294	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	

APPENDIX 5.2.3

UNIT LINKED POLICY CASH FLOW PROJECTION

PARAMETER	VALUE	COMMENTS
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	5.23%	
BREAKDOWN OF UNIT GROWTH RATE : (PRE-RENEWAL CHARGE)		
ITEM	GROSS GROWTH	TAX RATE
FRANKED INCOME	4.00%	27.00%
UNFRANKED INCOME	2.00%	35.00%
CHARGEABLE GAIN	0.75%	25.00%
NON-CHARGEABLE GAIN	5.75%	0.00%
TOTAL	12.50%	15.74%
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 100-350/25 = 1075.)		
WITH INCREASE IN DCF LIABILITY DISCOUNTING RATE.		
NO CHANGE IN RENEWAL EXPENSE INFLATION RATE.		
NET GROWTH		
		2.92%
		1.30%
		0.56%
		5.75%
		10.53%

PROJECTION		UNIT VALUE		RENEWAL CHARGE		ALLOCATION		TOTAL INCOME		MEAN DEATH STRAIN		MORTALITY COST		NET RENEWAL EXPENSE		TOTAL OUTGO		CASH FLOW IN YEAR		DCF RESERVE		UNITS	
Proj'n Year	Opening	Closing	Mean	Charge	Bid/Spread	Alloc'n +	Income	Income	Mean	Strain	q	Mortality Cost	Renewal Expense	Total Outgo	Cash Flow in Year	Reserve	Proj'n Year						
1	1,075	1,180	1,128	8.46	0.00	0.00	8.46	8.46	372	0.00086	0.32	0.00	10.90	10.32	(1.86)	26.04	1						
2	1,180	1,296	1,238	9.28	0.00	0.00	9.28	9.28	262	0.00094	0.25	0.00	10.90	11.15	(1.86)		2						
3	1,296	1,422	1,359	10.19	0.00	0.00	10.19	10.19	141	0.00103	0.15	0.00	11.88	12.03	(1.83)		3						
4	1,422	1,561	1,492	11.19	0.00	0.00	11.19	11.19	8	0.00115	0.01	0.00	12.95	12.96	(1.77)		4						
5	1,561	1,714	1,638	12.28	0.00	0.00	12.28	12.28	0	0.00119	0.00	0.00	14.12	14.12	(1.83)		5						
6	1,714	1,882	1,798	13.49	0.00	0.00	13.49	13.49	0	0.00144	0.00	0.00	15.39	15.39	(1.90)		6						
7	1,882	2,066	1,974	14.80	0.00	0.00	14.80	14.80	0	0.00162	0.00	0.00	16.77	16.77	(1.97)		7						
8	2,066	2,268	2,167	16.25	0.00	0.00	16.25	16.25	0	0.00183	0.00	0.00	18.28	18.28	(2.03)		8						
9	2,268	2,490	2,379	17.84	0.00	0.00	17.84	17.84	0	0.00207	0.00	0.00	19.93	19.93	(2.08)		9						
10	2,490	2,734	2,612	19.59	0.00	0.00	19.59	19.59	0	0.00234	0.00	0.00	21.72	21.72	(2.13)		10						
11	2,734	3,001	2,867	21.51	0.00	0.00	21.51	21.51	0	0.00264	0.00	0.00	23.67	23.67	(2.17)		11						
12	3,001	3,295	3,148	23.61	0.00	0.00	23.61	23.61	0	0.00298	0.00	0.00	25.80	25.80	(2.20)		12						
13	3,295	3,617	3,456	25.92	0.00	0.00	25.92	25.92	0	0.00336	0.00	0.00	28.13	28.13	(2.21)		13						
14	3,617	3,971	3,794	28.45	0.00	0.00	28.45	28.45	0	0.00378	0.00	0.00	30.66	30.66	(2.20)		14						
15	3,971	4,359	4,165	31.24	0.00	0.00	31.24	31.24	0	0.00426	0.00	0.00	33.42	33.42	(2.18)		15						
16	4,359	4,786	4,572	34.29	0.00	0.00	34.29	34.29	0	0.00479	0.00	0.00	36.42	36.42	(2.13)		16						
17	4,786	5,254	5,020	37.65	0.00	0.00	37.65	37.65	0	0.00538	0.00	0.00	39.70	39.70	(2.06)		17						
18	5,254	5,768	5,511	41.33	0.00	0.00	41.33	41.33	0	0.00603	0.00	0.00	43.28	43.28	(1.95)		18						
19	5,768	6,332	6,050	45.37	0.00	0.00	45.37	45.37	0	0.00675	0.00	0.00	47.17	47.17	(1.80)		19						
20	6,332	6,951	6,642	49.81	0.00	0.00	49.81	49.81	0	0.00756	0.00	0.00	51.42	51.42	(1.60)		20						
21	6,951	7,631	7,291	54.69	0.00	0.00	54.69	54.69	0	0.00844	0.00	0.00	56.04	56.04	(1.36)		21						
22	7,631	8,378	8,005	60.03	0.00	0.00	60.03	60.03	0	0.00942	0.00	0.00	61.09	61.09	(1.05)		22						
23	8,378	9,198	8,788	65.91	0.00	0.00	65.91	65.91	0	0.01050	0.00	0.00	66.59	66.59	(0.68)		23						
24	9,198	10,097	9,647	72.36	0.00	0.00	72.36	72.36	0	0.01149	0.00	0.00	72.58	72.58	(0.22)		24						
25	10,097	11,085	10,591	79.43	0.00	0.00	79.43	79.43	0	0.01299	0.00	0.00	79.11	79.11	0.32		25						
26	11,085	12,169	11,627	87.20	0.00	0.00	87.20	87.20	0	0.01443	0.00	0.00	86.23	86.23	0.97		26						
27	12,169	13,360	12,765	95.73	0.00	0.00	95.73	95.73	0	0.01601	0.00	0.00	93.99	93.99	1.74		27						
28	13,360	14,667	14,013	105.10	0.00	0.00	105.10	105.10	0	0.01775	0.00	0.00	102.45	102.45	2.65		28						
29	14,667	16,102	15,384	115.38	0.00	0.00	115.38	115.38	0	0.01965	0.00	0.00	111.67	111.67	3.71		29						
30	16,102	17,677	16,889	126.67	0.00	0.00	126.67	126.67	0	0.02174	0.00	0.00	121.72	121.72	4.95		30						
31	17,677	19,406	18,541	139.06	0.00	0.00	139.06	139.06	0	0.02403	0.00	0.00	132.68	132.68	6.38		31						
32	19,406	21,304	20,355	152.66	0.00	0.00	152.66	152.66	0	0.02684	0.00	0.00	144.62	144.62	8.05		32						
33	21,304	23,388	22,346	167.60	0.00	0.00	167.60	167.60	0	0.02927	0.00	0.00	157.63	157.63	9.96		33						
34	23,388	25,676	24,532	183.99	0.00	0.00	183.99	183.99	0	0.03227	0.00	0.00	171.82	171.82	12.17		34						
35	25,676	28,188	26,932	201.99	0.00	0.00	201.99	201.99	0	0.03554	0.00	0.00	187.28	187.28	14.71		35						
36	28,188	30,946	29,567	221.75	0.00	0.00	221.75	221.75	0	0.03911	0.00	0.00	204.14	204.14	17.61		36						
37	30,946	33,973	32,459	243.45	0.00	0.00	243.45	243.45	0	0.04300	0.00	0.00	222.51	222.51	20.93		37						
38	33,973	37,296	35,635	267.26	0.00	0.00	267.26	267.26	0	0.04733	0.00	0.00	242.54	242.54	24.72		38						
39	37,296	40,945	39,121	293.40	0.00	0.00	293.40	293.40	0	0.05184	0.00	0.00	264.37	264.37	29.04		39						
40	40,945	44,950	42,948	322.11	0.00	0.00	322.11	322.11	0	0.05685	0.00	0.00	288.16	288.16	33.95		40						

PARAMETER	VALUE	COMMENTS
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	467/70 ULT	
UNIT GROWTH (AFTER CHARGES & TAXES)	9.78%	
RENEWAL EXPENSE INFLATION	10.50%	
VALUATION DISCOUNT RATE	4.50%	
UNIT LINKED POLICY CASH FLOW PROJECTION		
APPENDIX 5.2.4		

PROJECTION										UNITS		£s	
Proj'n Year	Unit Value	Mean	Renewal Charge	Alloc'n + Bid/Off	Total Income	Mean Death Strain	q	Mort- ality Cost	Net Renewal Expense	Total	Cash Flow in Year	DCF Flow Reserve	Proj'n Year
1	1,075	1,180	1,128	8.46	0.00	372	0.00886	0.32	10.00	10.32	(1.86)	331.40	1
2	1,180	1,296	1,238	9.28	0.00	262	0.00994	0.25	11.05	11.30	(2.01)		2
3	1,296	1,422	1,359	10.19	0.00	141	0.01013	0.15	12.21	12.36	(2.16)		3
4	1,422	1,561	1,497	11.19	0.00	8	0.01015	0.01	13.49	13.50	(2.31)		4
5	1,561	1,714	1,638	12.28	0.00	0	0.01029	0.00	14.91	14.91	(2.62)		5
6	1,714	1,882	1,798	13.49	0.00	0	0.01044	0.00	16.47	16.47	(2.99)		6
7	1,882	2,066	1,974	14.80	0.00	0	0.01062	0.00	18.20	18.20	(3.40)		7
8	2,066	2,268	2,167	16.25	0.00	0	0.01083	0.00	20.12	20.12	(3.86)		8
9	2,268	2,490	2,379	17.84	0.00	0	0.01207	0.00	22.23	22.23	(4.38)		9
10	2,490	2,734	2,612	19.59	0.00	0	0.01234	0.00	24.56	24.56	(4.97)		10
11	2,734	3,001	2,867	21.51	0.00	0	0.01264	0.00	27.14	27.14	(5.64)		11
12	3,001	3,295	3,148	23.61	0.00	0	0.01288	0.00	29.99	29.99	(6.38)		12
13	3,295	3,617	3,456	25.92	0.00	0	0.01338	0.00	33.14	33.14	(7.22)		13
14	3,617	3,971	3,794	28.45	0.00	0	0.01378	0.00	36.82	36.82	(8.17)		14
15	3,971	4,359	4,165	31.24	0.00	0	0.01426	0.00	40.46	40.46	(9.23)		15
16	4,359	4,786	4,573	34.29	0.00	0	0.01479	0.00	44.71	44.71	(10.42)		16
17	4,786	5,254	5,020	37.45	0.00	0	0.01538	0.00	49.41	49.41	(11.76)		17
18	5,254	5,768	5,511	41.35	0.00	0	0.01603	0.00	54.60	54.60	(13.27)		18
19	5,768	6,332	6,050	45.37	0.00	0	0.01675	0.00	60.33	60.33	(14.95)		19
20	6,332	6,951	6,642	49.81	0.00	0	0.01756	0.00	66.66	66.66	(16.85)		20
21	6,951	7,631	7,291	54.69	0.00	0	0.01844	0.00	73.66	73.66	(18.98)		21
22	7,631	8,378	8,005	60.03	0.00	0	0.01942	0.00	81.40	81.40	(21.36)		22
23	8,378	9,198	8,788	65.91	0.00	0	0.02050	0.00	89.94	89.94	(24.04)		23
24	9,198	10,097	9,647	72.36	0.00	0	0.02169	0.00	99.39	99.39	(27.03)		24
25	10,097	11,085	10,591	79.43	0.00	0	0.02299	0.00	109.82	109.82	(30.39)		25
26	11,085	12,169	11,627	87.20	0.00	0	0.02443	0.00	121.35	121.35	(34.15)		26
27	12,169	13,360	12,765	95.73	0.00	0	0.02601	0.00	134.10	134.10	(38.36)		27
28	13,360	14,667	14,013	105.10	0.00	0	0.02775	0.00	148.18	148.18	(43.08)		28
29	14,667	16,102	15,384	115.38	0.00	0	0.02965	0.00	163.74	163.74	(48.35)		29
30	16,102	17,677	16,889	126.67	0.00	0	0.03174	0.00	180.93	180.93	(54.26)		30
31	17,677	19,406	18,541	139.06	0.00	0	0.03403	0.00	199.93	199.93	(60.87)		31
32	19,406	21,304	20,355	152.66	0.00	0	0.03654	0.00	220.92	220.92	(68.25)		32
33	21,304	23,388	22,346	167.60	0.00	0	0.03927	0.00	244.11	244.11	(76.52)		33
34	23,388	25,676	24,532	183.99	0.00	0	0.03227	0.00	269.75	269.75	(85.75)		34
35	25,676	28,188	26,933	201.99	0.00	0	0.03554	0.00	298.07	298.07	(96.08)		35
36	28,188	30,946	29,567	221.75	0.00	0	0.03911	0.00	329.37	329.37	(107.61)		36
37	30,946	33,973	32,459	243.45	0.00	0	0.04300	0.00	363.95	363.95	(120.51)		37
38	33,973	37,298	35,635	267.26	0.00	0	0.04723	0.00	402.17	402.17	(134.90)		38
39	37,298	40,945	39,121	293.40	0.00	0	0.05184	0.00	444.39	444.39	(150.99)		39
40	40,945	44,950	42,948	322.11	0.00	0	0.05685	0.00	491.05	491.05	(168.95)		40

UNITS £s

PROJECTION

Proj'n Year	Opening	Unit Value	Closing	Mean	Renewal Charge	Alloc'n + Bld/Offr	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	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	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	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	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	1,568	11.76	0.00	11.76	0	0.00129	0.00	14.12	14.12	(2.36)		5
6	1,633	1,778	1,705	1,705	12.79	0.00	12.79	0	0.00144	0.00	15.39	15.39	(2.60)		6
7	1,778	1,931	1,854	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	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	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	2,387	2,387	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	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	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	3,062	22.97	0.00	22.97	0	0.00336	0.00	28.13	28.13	(5.18)		13
14	3,190	3,469	3,329	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	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	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	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	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	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	5,501	41.23	0.00	41.23	0	0.00756	0.00	51.42	51.42	(10.16)		20
21	5,731	6,231	5,981	5,981	44.85	0.00	44.85	0	0.00844	0.00	56.04	56.04	(11.19)		21
22	6,231	6,764	6,503	6,503	48.77	0.00	48.77	0	0.00942	0.00	61.09	61.09	(12.32)		22
23	6,764	7,344	7,070	7,070	53.03	0.00	53.03	0	0.01050	0.00	66.59	66.59	(13.56)		23
24	7,344	7,969	7,687	7,687	57.65	0.00	57.65	0	0.01169	0.00	72.58	72.58	(14.93)		24
25	7,969	8,649	8,358	8,358	62.67	0.00	62.67	0	0.01299	0.00	79.11	79.11	(16.43)		25
26	8,649	9,378	9,087	9,087	68.16	0.00	68.16	0	0.01439	0.00	86.23	86.23	(18.07)		26
27	9,378	10,154	9,861	9,861	74.10	0.00	74.10	0	0.01590	0.00	93.99	93.99	(19.87)		27
28	10,154	11,000	10,703	10,703	80.57	0.00	80.57	0	0.01755	0.00	102.45	102.45	(21.88)		28
29	11,000	11,922	11,620	11,620	87.60	0.00	87.60	0	0.01934	0.00	111.67	111.67	(24.07)		29
30	11,922	12,931	12,626	12,626	95.25	0.00	95.25	0	0.02127	0.00	121.72	121.72	(26.47)		30
31	12,931	14,031	13,720	13,720	103.56	0.00	103.56	0	0.02335	0.00	132.68	132.68	(29.11)		31
32	14,031	15,221	14,903	14,903	112.60	0.00	112.60	0	0.02554	0.00	144.62	144.62	(32.02)		32
33	15,221	16,500	16,173	16,173	122.43	0.00	122.43	0	0.02784	0.00	157.63	157.63	(35.21)		33
34	16,500	17,869	17,531	17,531	133.11	0.00	133.11	0	0.03227	0.00	171.82	171.82	(38.71)		34
35	17,869	19,329	18,981	18,981	144.73	0.00	144.73	0	0.03554	0.00	187.28	187.28	(42.55)		35
36	19,329	20,889	20,531	20,531	157.36	0.00	157.36	0	0.03911	0.00	204.14	204.14	(46.78)		36
37	20,889	22,549	22,181	22,181	171.10	0.00	171.10	0	0.04300	0.00	222.51	222.51	(51.42)		37
38	22,549	24,309	23,941	23,941	186.03	0.00	186.03	0	0.04723	0.00	242.54	242.54	(56.51)		38
39	24,309	26,169	25,801	25,801	202.26	0.00	202.26	0	0.05185	0.00	264.37	264.37	(62.10)		39
40	26,169	28,129	27,761	27,761	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,

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

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

$$= \text{DCF} - \text{Min} (UV + \text{DCF}, SC_0)$$

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 $SC_{t-1} - SC_t$.

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 $i \geq (\text{DCF discounting rate})/0.925$.

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,

$$i \geq (\text{valuation rate used to calculate the term assurance reserve})/0.925.$$

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 preceding paper 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 of 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 difference 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 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 recognized 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 reserve 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 the case where the units allocated to contracts and the assets actually held were fundamentally different by type and/or currency.

26 February 1988

ABSTRACT OF THE DISCUSSION

Mr C. M. Johnson (introducing the paper): The paper still leaves one or two open issues with regard to mismatching reserves. We were unable to go further for two main reasons. One of these was the coherence issue. The Working Party believes that further work can be done to refine the test so that it has greater regard to the economic environment of the valuation date. There was no opportunity to pursue that further work within the time scales of early publication. More investigative work is currently underway. The other problem was how to interpret the benchmark test for equities and properties. We need a clearly stated test scenario, possibly via another informal note by the Government Actuary. This should provide both the necessary direction for further detailed work and ensure the test is equally applied to all types of business.

Mr M. D. Moule (opening the discussion): The calculation of reserves for linked business is only one of the more technically difficult aspects of the life office actuary's work. There are many variables to consider, the income and growth rates of units, the tax, both actual and deferred on linked and sterling assets, etc. Linked business, by life office standards, has been recently introduced. The types of product have been constantly developed, particularly over recent years. Not surprisingly, regulations specifically for the valuation of linked business have been amongst the last to emerge. It reflects well on those concerned that the existing situation has worked.

The paper suggests that a gross premium cash flow approach is essential for the valuation of linked policies, and that the current value of units is used as a base from which to project future sterling cash flows. This makes the basis very sensitive to current market conditions and also questionable. It seems rather odd that one's perception of the amount of money required to provide the excess of expenses over margins (i.e. the sterling reserve) should be altered by small changes in the stock market. There are at least two alternatives, both of which seem to have much to recommend them. The first would be to use a moving average of past unit prices as a base price. The other might be to use as the initial value of units the value which would have resulted had units grown in the past in the way they are assumed to grow in the future. I am not suggesting that either of these approaches should be used in the calculation of the unit reserve, merely as the basis of calculation of sterling reserve cash flows. The use of either of these suggestions as standards does of course beg the question as to what should happen when the actual unit value is less than the smoothed value. The strict theory would suggest the smoothed value should be used, but in practice I suspect that actuarial caution would use the lower of the two values.

Turning to the mismatching test, there seems little difficulty with the 3% rule gilt-edged type stocks. There does seem to be more problem with the 25% fall for equity type investments. I think the 25% test could well be thought to be appropriate for a broadly based equity portfolio such as those backed with profits funds. It is less appropriate for linked funds. Many linked funds are now very specialized, and in some cases invest in speculative areas where falls of 25% are not unusual. It takes very little effort to look at the unit prices section of the financial press and find prices which are currently 50% of their previous high. An alternative approach which might be more acceptable would be to use this smoothed unit price approach and determine the effect on the sterling reserves of a 25% fall in the smoothed unit price. Whatever unit price is chosen, it seems that as the GAD note circulated with the paper implies it is very hard to believe in a mismatching test which on an assumed fall in unit values reduces the sterling reserve required. This is caused by the assumption that a fall in equity prices has a corresponding increase on the yield and I believe it would prudently follow that, for the purposes of mismatching tests, any fall in unit price should be associated with no change in yield.

The paper offers two approaches for establishing unit growth rates: (1) a gross approach where the gross yield on assets is netted down by an appropriate rate of tax; (2) a net yield approach. The gross yield approach has the obvious advantage that it removes the need to determine separate yields for life and pension products and the argument put forward that the net rate of return is important to investors is doubtful. In my view it attributes too much sophistication to investors particularly when it assumes a negative real rate of return would cause policyholders to surrender. Although those

investors who invest in single premium products might review their policies regularly to ensure a real rate of return, it is considerably less likely that regular premium policyholders with, for example, unit linked mortgage products, do likewise.

The choice of a gross yield gives the problem of the appropriate rate of tax to use for life business. There is little doubt that the profession and legislators could agree appropriate tax rate parameters given the current tax regime but there must be rather more doubt as to the correct rates going forward. The abolition of pegged rate at 37½% and the advent of a tax reforming Chancellor of the Exchequer gives all life companies a major problem. It is perhaps interesting to compare the financial effect of the recent decrease in tax on franked investment income on linked and conventional business. Other things being equal after-tax yields on equity type investments will of course increase; for linked business these yields are normally passed on to the policyholders and the effect on the insurance company would be to reduce the rate of tax relief available on expenses and possibly in the longer term increase the annual management charge on units. In the short term at least the effect of this will probably be to increase any sterling reserves which the office carries. If we then contrast conventional business the increased yield would allow the office to increase its valuation rate of interest should it wish, and hence *reduce* its reserves, the exact opposite of the linked office. By this I am trying to show that it is very hard to give long-term financial guarantees when the fiscal ground is constantly shifting and more importantly it is equally difficult to determine an appropriate long-term basis for taxation in reserving calculations. This appears to be one of the major challenges facing anyone attempting to draw up valuation regulations for either linked or conventional business and it is not a challenge to which there appears to be an easy answer.

Although it is not solely their province, many linked offices have excess management expenses carried forward, (*xse* in the jargon), and many use it within their valuation basis. This may be by valuing income bonds gross, by reducing their capital gains tax reserves or even taking credit for future tax deductions from unit funds which need not be paid to the Inland Revenue. An independent actuary should have sufficient published information at his disposal to make an assessment to the strength of an office's valuation basis and this means the Department of Trade Returns should show both an estimate of *xse* brought forward together with the amount of *xse* the appointed actuary has used in his valuation. At present this information is not available, and any new regulations should provide for this to be published.

In conclusion I would like to make some brief comments on even-handedness. I have a unit trust linked monthly savings plan; my reasonable 'expectation' is that the unit trust company will continue to offer me 100% allocation. I accept that the current management charge of 1% per annum plus V.A.T. may go up, but I know that the trust deed puts an absolute ceiling of 1½% on the charge. The contract looks like a unit-linked policy with a zero sum assured. As an insurance company I would have to carry a solvency margin against this product and almost certainly a sterling reserve in the early years. As a unit trust company I would have to carry *neither*. How can this be 'a level playing field'?

Mr T. A. L. M. Wakeling: The paper does not include much discussion of the objectives of the valuation. If we are to see a statutory basis based on a gross premium approach for the valuation of linked business, it seems absolutely essential to be very clear as to what the aim of the valuation should be. If the aim is that the supervisory authorities should be made confident, say for one year, that it is safe to allow the office to stay in business, then it would seem necessary that the valuation should take some account of the financial impact of a limited period of new business. If on the other hand the aim is that the actuary should demonstrate that sufficient assets are held to secure the contractual obligation to in force policyholders, then it would seem to be consistent for the actuary to assume that the office is closed to new business and to take this stance consistently when setting all the parameters in his gross premium valuation. Generally actuaries wish to place their solvency valuation somewhere between these positions and it must be considered whether there can be satisfactorily firm ground in any approach which assumes the fund is open to new business and then ignores the impact of new business. If we are to have a gross valuation basis, actuaries must know what stance they are expected to take. Is the actuary to assume that renewal expenses will continue broadly according to the current level of service, or is it reasonable for him to consider the minimum contractual obligation to service the policyholder and to set this as a lower expense provision in his valuation?

The contrast in position between reserving for unit-linked by gross premium methods and reserving for conventional business by net premium method is stark and cannot be satisfactory. There have been many debates over the relative merits of gross and net methods. We seem set to go down a path of using both methods together, ensuring that the benefits of completeness for the gross premium method are undermined by the presence of any conventional business catered for by a net premium method in the same fund. Perhaps more crucially we are set to be mixing an active valuation basis with a passive method and we might wonder what the overall effect of adding these two results together might mean.

The authors do make the point that even-handedness is important and the principle should apply between different types of business and different types of providers. This point is important and could have justified more attention. We should expect to see sterling reserves for unit trust companies running regular premium purchase plans and the impact of mismatching tests applied naturally through to building societies. If level playing fields are to mean anything then they should rear their head in this subject.

Mr T. M. Cooke: I comment from the point of view of the valuation actuary of a major proprietary unit linked life and pensions office. The purpose of the valuation is to demonstrate adequacy of the reserves. Both the authorities and the non-actuaries within the office need to be confident in practice that all goes well; the latter also wish to be assured that funds are not being unnecessarily tied up. Consideration is given to the progress of the fund as a whole, not individual policies, across a wide range of possible scenarios. Difficulties in presentation can arise where for example zero lapses and surrenders are assumed in the sterling reserve calculations, but high rates of surrenders are used in the CGT reserve calculation. Similarly it can be difficult to explain why when a fund as a whole is being considered, it is necessary to value on an individual policy basis using a potentially stringent per policy expense assumption.

In practice there is a trade-off between ease of calculation and accuracy and higher reserves may be held unless resources are available to carry out the complex calculations necessary to control the operation on finer margins. This would involve an unusually wide range of long-term projections which may not be cost effective given the size of the reserves. Margins may overlap for practical reasons. The implicit item for future profits used to calculate the explicit solvency margin is, however, a substantial offset in the longer term to overlaps of this sort and those arising from the regulatory framework. I would welcome regulation or guidance from the authorities on economic factors to help achieve uniformity across offices and thus facilitate effective comparison between offices. However, the business risks vary considerably from office to office and in practice require individual actuarial judgement to be applied.

A major theme of the paper is the unit growth assumption used in the determination of the mismatching reserve. The increase in growth rate of one-third referred to in § 5.1.5, only applies to the first year. Lower growth rate should apply to future years. Unit prices may rise again in the future reducing the growth of investments in future premiums. The illustrative projections use low premium values and may show variations in reserves greater than expected in practice. An alternative approach which still has regard to current market yields is to calculate both sterling and mismatching reserves using the same unit prices. Unit prices may fall without a change in interest rates. For example, the sterling reserve basis may assume a 25% fall from current unit values and a mismatching basis no further fall, or the former may assume a 37½% fall and the latter only a 12½% further fall. Coherence can be achieved at the next valuation by referring back to the same prices accumulated at the valuation growth rate and reviewing the percentage fall assumptions in the light of yield and earnings levels. Using this approach the same unit growth assumptions are used for sterling and mismatching reserves since the same prices are used. For the capital gains tax reserves surrenders should be allowed for where, for example, the prospective CGT reserve on a zero surrender basis plus DCF liabilities produces a lower reserve. However, although surrenders assumed should be higher than expected, they may not approach the very high rates referred to in the paper. The higher the unit growth rate assumed in allowing for reallocations of units for existing policyholders the higher the reserve will be. A sustained further fall in prices below current levels following the stock market crash may give rise to profits if prices are lower than the average price at which units were allocated. However, it is prudent to assume prices recover in setting reserves.

Referring now to negative sterling reserves I would like to consider a ten year level allocation endowment with no capital units where net investment income is credited to the policyholder and where there is a surrender charge expressed as a percentage of premium but where the DCF reserve over the full term of the contract determines the maximum negative sterling reserve. It may be substantially less than the surrender charge. For a fund consisting only of this business, negative sterling reserves can only be set up if a loan is obtained to purchase some of the units required to match the unit liability. This assumes that units are not allowed to be underfunded in this situation. When matching against other positive liabilities in a fund covering several types of business it is essential to consider the term of the liabilities. If the positive reserves are too short then further finance will be needed in future to bring the negative sterling reserves up to zero. The reference in Appendix 6 to the matching of negative sterling reserves involving unappropriated surplus for shareholders' funds is unclear to me. Presumably this means that surplus will be reduced or shareholders' funds will be transferred into the long-term fund.

Going on now to renewal expenses; expenses expressed as a percentage of premium can produce lower reserves than when expressed as an amount per policy especially where there is a wide spread of premium sizes across business in force. On a zero lapse/surrender basis the percentage of premium may vary as shorter term policies mature. A range of lapse and surrender assumptions varying by premium band may give rise to a range of total renewal expenses expressed as a percentage of total premiums. Inflation should still be allowed for it as a percentage of premium assumption is used. It is simpler in practice to use a per policy assumption which assumes the adequacy of the reserve. However, this approach should not be used without an assessment of any extra reserve involved. To achieve coherence the per policy assumptions would normally increase in line with inflation from year to year. To secure the independence of the solvency of the fund from new business, provision for new business overheads during the winding down period is required. These might be expressed as a percentage of outstanding first year premiums and can be substantial, for example, where an office has a direct sales force who are employees. The renewal expense assumption used with this approach may be lower than that derived from an expense analysis which assumes new business will continue.

The value of tax relief carried forward depends on the future level of income from linked assets and on realized capital gains crystallizing in the fund. For this and other reasons it is not certain that a higher unit growth rate and corresponding inflation assumptions gives higher total liabilities. A range of bases should be tested, each basis being applied consistently across the totality of liabilities.

Mr J. Goford: In reading the paper, I have taken as my themes, firstly, the avoidance of future losses, and, secondly, the avoidance of mismatching—two of the crucial activities of the appointed actuary. I have also had in mind a basis and mechanics of actuarial provisions which was in use during the period of rapid development of unit linked products in the mid 70's—to see if that basis and those mechanics have stood the test of time. Firstly, I have problems with the statement in § 1.11.4 that the unit reserve and the sterling reserve are not usually independent. A reserve which is ostensibly a sterling reserve but moves because the valuation price moves is surely not a sterling reserve. It is, at least in part, a unit reserve. If dropping the unit price causes a rise in the sterling reserve then surely to that extent the sterling reserve is partly a (negative) unit reserve. The problems associated with this phenomenon are two-fold. Firstly, there is a mismatch which, if followed through logically, would be corrected by regarding the sterling reserve as made up of a negative unit reserve and a larger sterling reserve. Proper matching would then dictate underfunding of units—a dangerous path to follow. Secondly, if the logic is not followed, then we have a 50% chance of an immediate valuation strain if unit prices fall.

Revisiting first the old basis and bringing it up to date—it comprises a passive test which satisfies all the criteria in Appendix 3 and the principles are as follows:

1. The unit fund assumed at any time, both currently and in the future, is calculated by accumulating unit allocations less deductions from the outset of the policy at the assumed growth rate and then reducing that fund by 25%. This is not the same as assuming a lower growth rate; it says that the fund falls at the valuation date from its assumed level and then reverts to the trend line for future allocations. The effect on cash flows is to reduce management fees by 25% and increase the mortality cost by 25% of unit fund.

2. All options are allowed for assuming 100% of policyholders exercise their options. That is to say that at each future valuation date, the reserve will be sufficient to cover the cash value, the paid-up reserve, the reserve required for a withdrawal plan and the reserve required if the maximum or minimum sum assured is taken. This is obviously stringent and I will come to ameliorating it later. Incidentally, being actually able to incorporate these tests depends on the mechanics of the program—of which also more later.
3. The reserves should be tested in a low/low and a high/high environment.
4. The DCF sterling reserve so calculated should not be increased unless the actual unit reserve falls below a given percentage below the trend line. The benchmark percentage below the trendline may be assessed, for the purpose of guidance notes, at that which avoids a 1 in 100 risk of loss.
5. Similarly the DCF reserve may be reduced by using a higher assumed unit reserve provided the enhanced trend line is at least the benchmark percentage below the current unit reserve. This is akin to bringing through growth which has a 99% chance of being permanent. The Maturity Guarantee Working Party mechanics can give us guidance on the appropriate benchmark.

This basis truly separates unit reserves and sterling reserves which the proposed basis does not, and it avoids future losses and valuations strains and covers all the options. Whether it is feasible depends on two factors. It may not be feasible because the reserves emerge as unreasonably high for the portfolio as a whole. However, what that means is that the product design is such that, if options are taken, then the company will suffer losses on the policies on which the options are taken. If this valuation basis were to be introduced in respect of products sold after a certain date, there would be a salutary impact on product design to eliminate those losses from the options. For existing policies, the probability of the options being exercised may be introduced to reduce the reserves to reasonable levels, but those probabilities would have to be monitored closely to be justified. The second factor which would prevent such a basis is what I call the IBM factor—computer programs that are too expensive to alter. Companies which cannot test for the effect of future options may do so by test sampling and adjusting reserves by a comparison with the results of tests from a desk top PC.

Now for the old mechanics. The principles were three:

1. Sterling cash flows were calculated each year in the normal way.
2. Then, starting in the final year and working forwards, the reserve is established at the beginning of each year sufficient to provide for the net cash outflow of the year, taking the end-year reserve as an outflow.
3. Then the begin-year reserve would be compared with the higher of the cash value reserves and those required to support a paid-up policy or withdrawal plan.

This zeroization method can be shown to be mathematically equivalent to the successive summations method but does allow for the multiple comparison with option reserves to be made at each future duration. It also allows for a high conservative interest rate to be used when the sterling reserve is negative.

I have some other brief comments on detail:

1. One of the most crucial effects of a firm but reasonable valuation basis is that on product design. No shareholder or informed with-profit policyholder wants to hold unnecessary reserves unless there is a real marketing advantage from the benefits granted to the unit linked policyholder which gives rise to those additional reserves.
2. I think there is a flaw in §6.3 on negative units. If a negative unit reserve is zeroized to avoid holding the policy as an asset, it must be done with an additional *unit* reserve not an additional *sterling* reserve otherwise there is a mismatch in the currency of units. A negative unit reserve is an asset just like a negative sterling reserve. To have value it must have future unit income—namely the unitized deductions yet to be made. If a negative unit reserve is zeroized this future income will fall into surplus as it arises. This future income is unit income and therefore the correcting item is a unit reserve. So a negative unit reserve can only arise where a larger, positive DCF sterling reserve is also needed (before a cash value test). The negative unit reserves may be held up to the level of positive reserves and §6.3.4. does not apply.

3. On the subject of the relationship between growth and inflation—in any scenario for single premium products and paid-up policies it would be reasonable for the inflation rate to be limited to the net growth rate as otherwise the expense reserve amount can exceed a reasonable figure. Even so, it is possible for the company to design its way out of the problem—by increasing the minimum retainable fund size or charging a per policy fee to the policy by cancelling units.
4. As for what subjects should be covered by regulation and what by guidance, I believe that regulation should cover all assumptions and methodology in principle including avoiding future losses and valuation strains and matching by currency—in units and sterling reserves. The rest should be left to guidance notes agreed preferably between the Institute and GAD.

Mr P. H. Grace (a visitor): I accept that the mismatching test should take into consideration a fall in equity values, especially if interest rates increase or earnings fall. The 25% drop aspect of the test seems an extremely crude test to apply. The working party hint at the use of a model based on yield as a possible solution and I would like to put forward one or two ideas in this respect.

The ratio of a high coupon long-term gilt yield to the All Share yield, over say the last ten years, with one or two brief exceptions, has ranged between 2 and 3. It dropped just below 2 in 1982 (very briefly) and was above 3 for a few months last year immediately prior to 19 October. Over the 10-year period it has averaged just under 2.35. If in the first instance we were to adjust equity values to reflect the yield ratio of say 2.35, we would at a stroke remove the effect of day-to-day sentiment on the market. Furthermore, the values would then be moving in line with changes in interest rates. However, such an adjustment makes no allowance for the possibility that earnings will fall, leading in the first instance to a drop in price and an increase in dividend yield because at that stage dividends are unlikely to have been reduced. This scenario could be dealt with by adjusting the equity values to reflect a lower yield ratio. If it was felt desirable to test valuation resilience to reflect a drop in earnings of say 15%, then altering equity values to reflect a yield ratio of 2 would achieve this objective. I don't claim that there is any merit in 15%, it is just that it produced a nice answer. Having altered the equity values and their yield to reflect a standard yield ratio, the equity values should be further altered for a change of plus or minus 3% in the gilt yields. Having already taken steps to remove the effect on equities of day-to-day sentiment, and a possible drop in earnings of say 15%, I do not see that it is necessary to link the drop in interest of 3% with a further fall in equities.

The fifth principle refers to even-handedness but appears to refer to even-handedness between providers of similar services especially in the light of the Financial Services legislation. I believe this refers to, for example, Building Societies. The principle should also specifically refer to even-handedness between different classes of business; but it would be better if this was highlighted as one of the principles. Currently I have the feeling that the working party's proposals in this area are slanted towards giving unit linked business slightly more lenient treatment than conventional business.

One final point, reverting to the plus and minus 3% test, my employer's board, were prior to 19 October 1987 vehement in their criticism of the minus 25% aspect. They have been strangely mute since then. However, not so our Inspector of Taxes with whom we are currently in argument over our 1985 tax computation. He has already said in writing to us that he expects the special reserve set up in 1985, the mismatching reserve, should be released following the October collapse and should not be reinstated. I hope the Government Actuary will put the Inland Revenue right.

Mr C. D. O'Brien: I wish to comment on the assumption made in the paper concerning inflation of renewal expenses. The level of renewal expenses per policy incurred by a life office will depend upon the activities or services being undertaken and price of such services. Some debate is possible on whether the quantity of such services will increase or decrease in the future; there is an argument that in a closed fund situation such services would decrease. I assume that this quantity will remain unchanged. An appropriate *prima facie* assumption might be that the price of the renewal services would increase at the same rate as the general rate of price inflation. The paper indicates that renewal expense inflation will be a mixture of price and earnings inflation, but this may be based on a misapprehension. Much of a life office's costs will be the earnings of its staff; the remainder will be

mainly the cost of goods and services purchased from outside, which will be largely earnings too. But we expect prices to increase less than earnings, basically because of increases in productivity, so although costs will include earnings, productivity improvements should be expected such that prices will only increase at the rate of general price inflation. The view could be taken that the life assurance industry would not expect productivity improvements and hence the expectation is of renewal expenses increasing at a rate higher than general price inflation. I would not think this consistent with the aims of the companies' management. Another possibility is for account to be taken of earnings in the life assurance industry growing at a rate higher than the national average, which would be reason for renewal expenses to grow at a rate higher than overall price inflation, although I feel this is unlikely to be sustainable in the long run. My view is therefore that the prices of goods and services elsewhere in the economy would grow less than earnings, including goods and services, and also that the price of administration services provided by life offices may grow at the general price inflation rate, i.e. less than the increase in earnings. If the long term view were therefore that unit growth is three percentage points higher than the price inflation, which is equal to renewal expense inflation then a valuation basis using such needs some margin for prudence. One possibility is to assume renewal expense inflation one percentage point higher than otherwise, though it seems odd to derive this by assuming, as the paper appears to do, that there will be productivity improvements in the economy with the exception of the life assurance industry. Another possibility is unit growth being taken at less than the long term view. Alternatively some combination of these margins is possible. I do think it is important to have an appropriate long term view of the parameters and then consider separately the sensible margins for prudence.

Mr C. O. Beard: I would like to mention a practical, but important point in the context of the mismatching test for sterling reserves (§ 5.5). As the authors mention (in § 4.3.1) the discount rate used to calculate the present value of the cash flow should reflect the assets matching the sterling reserve. Part of the problem shown, in the summary of results in Appendix 5, of the DCF reserve trebling from line 5.1.1 to line 5.1.5 on a change in the yield is due to the net discount rate only changing by .75% from 4.5% to 5.25% when inflation goes from 9% to 10.5%. If the assets backing sterling reserve are invested in matched index linked gilts, and if we can assume a non-negative real return on those gilts, we will get an actual return on the assets at least as great as the rate of price inflation, even in a life fund net of tax. Hence, if the assets backing the sterling reserves are invested in matched index linked gilts, it is reasonable to use a net discount rate at least as great as the rate of price inflation assumed. This will mean sterling reserves in the appendices would be much smaller and far less sensitive to inflation assumptions.

Mr J. Instance: I would like to consider the renewal expenses provision. The authors suggest that it is an undoubted truth that a substantial part of the direct servicing expenses relates to numbers of policies. It therefore follows that the valuation basis reflecting the true incidence of costs is one which has an inflated expense loading which is on a per policy cost. The authors suggest that professional guidance is required to draw to the attention of appointed actuaries the potential for future loading inadequacies if loadings are not primarily based on numbers of contracts. I would quarrel on the veracity of this undoubted truth; whilst in some circumstances costs are policy related, other significant costs may be related to other measures of volume or not related to anything. The present regulations requiring the expense provision to be set with regard to current operating experience is more than adequate. In my experience it is not the form of the experience provision that is inappropriate, but the optimism on expense control that underlines the amount of provision set up.

I would like to consider the impact of surrender charges on the non unit reserve. I thought the distinction between a discounted cash flow component of the non unit reserve and an offsetting surrender charge component useful. Whilst I agree that it may be appropriate to match the surrender charge asset if calculated on an interest bearing basis against discounted cash flow liabilities or even mathematical reserves on non linked business, I am not sure that matching it against unappropriated surplus of shareholders' funds is as appropriate. What is an unappropriated surplus? If, as an appointed actuary, I am using surplus to match surrender charge assets held as an offset to the

mathematical reserves, is this surplus unappropriated? Could it be transferred to shareholders' funds? If it cannot be then surely it is not unappropriated surplus. Is it surplus at all? Similarly is it appropriate to use the shareholders' funds as a matching liability? Effectively I am using a loan from the shareholders' fund to the long-term fund. I don't believe this is permissible. I am therefore led to the conclusion that it is inappropriate to hold a negative non unit reserve in aggregate, that is an amount in excess of the positive DCF reserves and other positive liabilities held elsewhere in the portfolio. Does this require regulation or guidance?

Mr D. J. Le Grys: In § 4.9 the working party consider variable management charges and distinguish as between two types of charges. Firstly those management charges which are normally increased regularly—they give an example of an annual administration charge which is increased in line with the RPI. Secondly, those management charges which are normally expected to stay the same, but give the office protection against possible future adverse experience. They give an example here of a fund related charge of $\frac{1}{2}\%$ where the office has the right to increase it at some future stage, say to $1\frac{1}{2}\%$. The paper draws the conclusion that these two types of charge are fundamentally different. It recommends for the first type of charge that future increases can be accepted in the valuation basis subject to reasonable limits. This conclusion appears quite logical, particularly as policyholder's expectation would have been based upon this assumption.

The second case is more difficult. The working party points out that there are two different views on whether an increase in charge above the current levels should be included in the liability valuation. In the end they recommend that an increase above the current level can be included in the valuation basis, but they also state that the actuary should take into account the possible effects and ramifications of such an increase. They give a list of five possible considerations. To my mind these five considerations are too vague to estimate with any degree or certainty and I suspect putting a value on them is no more than pure guesswork. For the purposes of a statutory valuation basis, and a solvency test, a more certain set of parameters is required. It would be more logical to employ a rule for this second type of charge. No increase in value should be permitted unless either the office has actually changed its charging basis, or secondly, it has published in some other way the intention to increase them at some future date. If either of these actions which affect the policyholder's expectation has been taken, then again subject to reasonable limits a full increase can be taken into account. On the other hand, if the office hasn't taken this type of action, then no increase in the levels should be taken into account for a statutory valuation and a basic test of solvency.

Mr R. C. Wilkinson: We should be debating whether the current standards used by appointed actuaries in the United Kingdom are adequate, whether actuaries require further guidance notes issued by the GAD and whether further regulations are needed. There are many concepts which have developed in unit linked business. People are gradually becoming more aware of the problems of such business. We have seen the withdrawal of maturity guarantees on virtually all unit linked policies, the withdrawal with a lot of policies of mortality guarantees and the transfer of the possible expense inflation problems from the office to the policyholder. Where are the weaknesses in our current valuation systems used by actuaries today, and in the current methods to formulate premium rates which are used for modern unit linked contracts? The modern method of profit testing policies has to make some assumption about the valuation basis being adopted. If we are now saying that current actuaries are not using the right method, problems could arise with policies which are already in force with further strains imposed on offices. If we presuppose that all actuaries are at the moment using reasonable standards, there are four problems which the paper particularly isolates: excess expense inflation over the assumptions in the premium basis, under performance of the funds, the exercising of options against the office, and mismatching of assets.

Concerning expenses the matching of investments against sterling reserves is very important. We can end up with expenses being valued after tax (if we assume the tax at an office greater than $27\frac{1}{2}\%$) using a zero or negative rate of interest which throws up very high reserves. The general concepts of matching which the GAD has suggested we use to date is the 25% move in equity prices or the 3% yield variation in fixed interest securities. This quick and crude method needs to be reviewed. We should devise a much more effective and sophisticated method similar to that which has already been

used by the Unit Linked Guarantees Working Party of the trend line and measuring deviations from that trend line.

If we look at Black Monday 19 October 1987 this was the first experience a lot of actuaries have had of the market prices falling. However, I think we should look at it in perspective—where are equity prices today compared with the 1 January 1987? During 1987 we saw a very large increase in prices and a reduction in yields. On the 19 October everything was brought back into line and by 1 January 1988 prices of U.K. stocks were at least equal if not greater than those of the previous year-end. Prices and yields are on a trend line still, even if it has come further down than it was before. The paper does make one valid point which perhaps is overlooked by a lot of traditional offices as it concerns the even-handedness of the treatment of traditional and unit linked business and that is traditional endowments do carry a substantial maturity guarantee. This is something which is forgotten by certain offices—they feel that as it is with profits there is always a margin but if we are going to introduce more stringent mismatching concepts that should be equally applied to traditional business. In conclusion as an actuarial profession we have to be very careful of how much is put into guidance notes and how much is actually put into statute. As an actuary I believe the actual statute should lay down the principles only and it is the actuarial profession which should lay down the guidance in detail.

Mr C. A. Evers: As things stand at the moment, sterling resources change when unit values change—inversely so. That seems correct, but might there be an alternative to avoid the difficulty of explaining to one's board why a sterling reserve does fluctuate with unit values? As the paper says, if the reason for the change is a fundamental change in economic circumstances, then this cannot be avoided and the sterling reserve ought to alter. On the other hand, if it resulted from a temporary aberration, a change in the market yield, then it could be argued that that sort of change ought not to be reflected in a change in sterling reserve levels. Is there a solution? One possibility is that it might be possible to use a calculated value of the assets similar perhaps to the asset valuation principles which are used in the valuation of pension funds. The resilience test would apply by looking to see what the effect in the change in the yield was on the valuation of those assets.

I have one other point to make concerning variability charges. It would be difficult to reflect in any new guidelines or regulations any distinction in the different types of variability of charges. If an expense charge which arises by cancelling units increases and that expense charge has in practice increased each year in line with inflation, surely it would be reasonable for the valuation basis to assume that such increases will continue into the future. The test should be whether it would be reasonable for policyholders to expect charges to increase as assumed. The current valuation regulations, or the Institute's guidelines, do not mention anything about policyholders' expectations, for reasons to do with traditional business; I wonder whether it would need to be brought into the rules for unit linked business.

Mr C. S. S. Lyon: Mr Grace commented that the ratio of high coupon gilt yields to equity dividend yields had varied between 2 and 3 in the past 10 years. When I first came into the life assurance industry the yield on Daltons was 2% and the dividend yield on equities was considerably higher, and people talked of zero rates of interest although these did not materialize. What this tells us is that the dividend yield on equities tends to track a fairly average figure of about $4\frac{1}{2}\%$ because essentially equities are an indexed type of security, whereas gilt yields are related very much to the expectation of inflation in monetary terms. Whilst we might be able to use a ratio of the kind Mr Grace suggested over a very short period, there is nothing fundamental about it.

Regarding Mr Wakeling's remarks on the aim of the valuation, are we talking about the valuation based on a fund open to or closed to new business? If you look at Guidance Note 1 carefully you see it defines the appointed actuary's responsibility in two particular respects. Firstly to value the liabilities of the existing business in such a way as to avoid future losses and mismatching problems. That summarizes the position very well. The guidance goes on to say that the appointed actuary has a professional duty to take all reasonable steps to ensure that he is at all times satisfied that if he were to carry out an investigation of the type we are talking about, the position would be satisfactory.

Mr C. J. Hairs: There is a suggestion in § 6.1.2(c) of the paper that non-linked endowment contracts carry substantial maturity guarantees and hence extra 'shock proofing' tests should be applied to them. I disagree. The point about non-linked endowment assurances is that, while they do offer maturity guarantees, they do not offer alternative guarantees, and hence you can invest for the guaranteed maturity benefit. In the case of linked business you normally invest to match the expression of the liability in terms of the units—the need for shock-proofing where long term maturity guarantees are offered stems from the impossibility of investing so as to match both of the benefits.

Mr R. J. Squires (closing the discussion): Our skill lies in designing products that are sufficiently robust to stand up to the variations in conditions that may have to be faced, and designing valuation systems that are sufficiently resilient to ensure that our offices survive those conditions. The question we have to address is where the division should be between regulation and guidance. The opener suggested that the current value of the units is not necessarily the appropriate base from which to project future values for the purpose of calculating sterling reserves. In the paper which I presented to the Institute in 1974 (*J.I.A.* 101, 1) I suggested using a value produced by an exponential smoothing formula as a starting point. Since this formula incorporates growth rates applied to the earlier values, it is equivalent to estimating a future value as the weighted average of a number of estimates, based on a series of past values. The working party has suggested an alternative basis, using a comparison of the current yield on the equity portfolio with a long-term yield. This warrants further investigation. The objective in either case is greater coherence in the valuation basis. A smoothed value, or a yield adjusted value will change as a result of a sharp change in market values, but to a smaller extent. If the smoothed value is greater than the market value, caution would suggest that the latter should be used, but I do not think that should be required by regulation. In the event of extreme adverse market movements, the authorities will be concerned that offices are not forced out of business by inappropriate valuation rules, and this might be just the kind of flexibility needed. Starting from a smoothed value also addresses the point made by the opener, that falls of 50% in price from the previous high are not unusual.

Mr Wakeling raised the question of unit trusts and building societies, and whereas I agree with the tenor of his remarks, our jurisdiction does not run that far at present. Mr Cooke reminded us that if we are to have negative sterling reserves we have to consider where we are borrowing the money from, which requires a consideration of the terms of the various contracts and I endorse that point. Mr Goford suggested that since the sterling reserve is affected by the value of the unit reserve, perhaps the division is somewhat artificial and this an interesting point. My approach has been to say that one should leave some of the fund margin to emerge in the future rather than calculate a funding value which anticipates all of the annual charge because that gives a better match between the emergence of the margins and expenses.

Renewal expense provision is a very important part of this subject. The advantage of the group approach is the possibility of allowing for the effect of overheads. Economies of scale is a concept we usually talk about when we are considering expanding the volume of business. When we are approaching the valuation, we are looking at a closed group which is going to get smaller in the future, and it cannot be assumed that a reduction in the number of policies will be precisely matched by a corresponding reduction in the cost of administering them. Whether or not we believe in economies of scale, I certainly believe in diseconomies of scale.

Mr O'Brien made some comments on the quantity of service. If one closes the office to new business, it is quite likely that the level of service one gives will be cut to the minimum, but it would be imprudent to assume that in the basic valuation. It is probably a reasonable point to take into account when considering the cost of closing the office to new business but not in the valuation basis primarily designed for the ongoing business.

Concerning the provision for paid up policies and surrender values, in my own office we divide our management expenses not just into new business and renewal, but into new, continuing and closed and make explicit assumptions in the valuation basis for the cost of dealing with a surrender or a claim. The point is that in many cases the surrender penalties run out before the term of the policy,

and a policy surrendered after that point in time is going to involve cost without providing any margin. This approach gives a minimum value to the sterling reserve which is required on a policy, by reference to the expected cost of dealing with a closure, compared with the margin that would be available.

On capital gains tax reserve the authors cannot get away with their proposal that allowance should be made for a 100% surrender rate without some comment. Apart from the fact that it is exceedingly unlikely that every policyholder would choose to surrender his policy on the same day, there are three hidden margins which can be taken into account. There is very often a surrender penalty which is more than enough to cover the closure costs, and so there is a contribution towards the capital gains tax cost. Another is that from time to time individual policyholders have capital losses on their policies. This has become more common as a result of indexation, but it is not normal practice to pay a policyholder more because of a capital loss. Thirdly, there is a delay between making a deduction on the policy proceeds in handing the tax over to the Inland Revenue and an opportunity to earn interest on money in the meantime.

Referring to the problems with the assumptions of increasing yield corresponding to a drop in market value, it is undeniably true that when a price falls, if the dividends remain the same the yield must increase. This is simple arithmetic, but it does lead to other problems, and this is where the trend line approach offers a solution. If it is assumed that any drop from the trend line is temporary, and that the price is going to return to the trend line in one year, or three years or five years, there is an effect on the yield over that short period until we get back to the trend line, but the perception of the long term rates for discounting sterling reserves, or allowing for inflation, or allowing for capital gains tax, are unchanged by that short term effect. This is a better solution because it builds more coherence into the valuation system.

I very much agree with the need to keep down the cost of compliance with regulations. It is fine for those offices that set out initially with the idea that they were going to have unit linked contracts valued on an individual basis—no doubt their computer systems were designed this way right from the beginning. For those of us whose systems are not designed in this way, and who are currently trying to deal with the requirements of the Financial Services Act and the new pensions market etc. a requirement to move to an individual valuation basis would be horrendous. If it was absolutely necessary for actuarial orthodoxy, then that would be a different matter. Group approaches achieve perfectly reasonable results provided one makes allowance for the fact that expenses will not necessarily reduce in proportion to premium income. Any regulations should not require a demonstration that the result of valuing on an individual basis would not be a higher reserve, because I do not see how I could demonstrate that without actually doing the work I wanted to avoid in the first place. The parallel in somebody's mind is with the office which chooses to use a gross bonus reserve valuation for its own internal purposes and then has the choice of either publishing a net premium valuation or demonstrating that its basis is no weaker, but the comparison is not valid.

The President (Mr M. H. Field, C.B.E.): Tonight's paper is noteworthy because no less than ten authors have managed to produce much needed and long delayed recommendations that are both forthright and unequivocal. They are all to be congratulated, but particularly the Chairman to whom the task at the outset must have been daunting. I will not refer to the detail of the recommendations, nor to the supporting paper issued by the Government Actuary's Department, but I will make two general comments.

First, members will not be surprised to hear that I was delighted to see the enunciation of basic principle number four that regulation should protect the interest of the consumer, but that it should not be so burdensome so as to restrict the company's ability to provide service at competitive cost. It is the consumer who pays and not all want to pay the price of total security, either for product design, or the security of the institution and we must remember that 1992 approaches. Second I am pleased to see that the working party has not been afraid to go beyond its immediate brief and made recommendations in respect of traditional business. Coherence in this regard is important particularly now the life assurance industry is facing new competition from other sources.

I ask you to join me in a vote of thanks to the working party and in particular to its chairman David Purchase.

Mr D. E. Purchase (replying): I respond on behalf of the working party to the GAD's note of 26 February 1988 which was circulated with our paper. I know that some members of the working party agree with my views; I expect I will be supported by most members of the working party.

I have sympathy with the opener in his comments on volatility and the unsatisfactory nature of the current market value. In considering this issue we have to begin in the real world, and adopt market value as our starting point. We do however need to do more work on trying to evolve a more robust resilience test, involving reversion to trend lines or means, and having regard to the current position within a suitable range. It is important to have reasonable consistency of parameters between the values of the unit linked part of the reserves and the sterling reserves.

Mr Cooke commented on the use of very high and very low lapse assumptions and I agree we must be very careful not to insist on the most prudent assumption in each part of the valuation and place margin upon margin. I was less happy about Mr Le Grys' comments on variability of charges (§ 4.9). He felt it reasonable to insist that in no circumstances could the actuary take account of the potential to increase future fund management charges unless the office had actually said it was going to do so. This is too harsh a test and it would certainly be unworkable if you applied the same rule in the context of a resilience test where there may be no current intention to increase charges, but you might need that protection.

Turning to the GAD's note, my first comment relates to the assumption of a 2% differential between gross unit growth and renewal expense inflation. We nearly all agree this is an appropriate guideline value. But conditions can change—so can our views—and its insertion in regulations seems to me to be too inflexible. In addition it seems to be somewhat inconsistent with their acceptance, in paragraph 4 of the note, of flexibility in determining the inflation rate itself. I favour this flexibility, and I would prefer one of the more objective methods that have been put forward, with provision for variation if that can be justified. There is a surprising statement in paragraph 6 of the GAD's note: "An approach which has the effect of releasing reserves when market values fall does not appear to be credible." Is it really suggested that as conditions deteriorate reserves must always increase? This seems like a vicious circle to me. There does seem to be an air of unreality sometimes about non unit reserves for life business in any case: many contracts are written as whole life, whatever the underlying intention, and (on the gross approach favoured by GAD and, to be fair, the working party as well) tax may well force the assumption of a negative real return. The prohibition on withdrawals already mentioned means that large contributions to non unit reserves can come from very distant cash flows, most of which, in practice, never arise.

As we comment in § 4.6.3.2 of 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, in my view it borders on the absurd. If we contemplate the test with -25% on market values, and -3% on the gilt yields supporting the discount rate—a combination we regrettably did not address in § 5.6—the results, on GAD's current thinking, would produce quite excessive reserve requirements.

The working party is very grateful that the principle of even-handedness received such support here tonight. As indicated in § 5.1.7 of the paper, GAD take the firm 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 are quite happy to assume unchanged earnings and thus allow a rise in yields. Since higher yields on linked assets are credited through the unit price, and result in increased growth rates, the current test is much harsher for linked business, a situation which I am sure cannot be intended and I hope will soon be corrected.

WRITTEN CONTRIBUTIONS

Mr P. J. Tuley: The paper proposed further guidance or regulation which is likely to lead to further detailed disclosure—for example more disclosure in the Department of Trade Returns of unrelieved management expenses. The need for enough details to be available for any independent actuary to value the business was also referred to. We are in danger of burdening ourselves with overmuch form filling. The purpose of the Returns is to satisfy the supervisors, not to enable other offices or consultants to value the Company. The Actuary's Certificate should perhaps return to being more

like the Auditor's Certificate, an expression of professional opinion and not directly verifiable from the Returns.

On the concept of a one-off fall in unit values, there is the oddity that a very new office or one with a recent heavy influx of business sees little strain as premiums have yet to come in to build unit values or support negative sterling reserves. Strains are therefore likely to arise in future years, and to counter these my office assumes every future premium sees a unit allocation which immediately suffers the same fall before being added to the pool of 'depressed' units. This is still more *ad hoc* and logically confusing, but does achieve a test of present and future resilience—which is all we require.

On the question of variable sterling or fund charges, it does seem wrong to take these in a 'normal' valuation, but the point of a resiliency test is that it is abnormal. There is a very valid point as to the company's resolve in calling on such potential for greater profit, and the general industry lack of action on raising charges post 19.10.87 is significant. While such escape routes may be invalid for the -25% resiliency test they perhaps should be for greater disasters such as the higher test of -40%, akin to calling on variable mortality charges to meet AIDS.

Lastly, the approach of using 'valuation prices' of units based on a trend line was put forward by a number of speakers. However, the returns are on market values of assets and much debate is current on how to combine these with a valuation of conventional business to give a satisfactory statement of strength and solvency. This seems the wrong time to create our own unit linked 'net premium' valuation on artificial prices. The resiliency test is then specifically to ensure the valuation copes with such shifts. Could not the actuary allow for more than 25% if actual prices seem inflated, such as a valuation at 30.9.87, and revert to a more normal test in more normal times? The catch, as always, is in depressed times, but could we really create our sterling reserves on trend line unit prices significantly over actual unit prices in any event?

The authors subsequently wrote: Several speakers supported the use of trend line, or smoothed, unit 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. The purpose of the paper was to propose a *minimum* standard for statutory valuation. Given that, the authors hold to their recommendation of a market value price supported by a mismatching test which covers the effect of a reasonably substantial price fall. This gives maximum simplicity to the legislation and does not rule out the possibility of using trend line approaches, or other methods of smoothing, in practice. It simply means that 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 recognized within 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 this area.

In his comments on unit growth rates and real rates of return, the opener suggested that regular premium policyholders were unlikely to review investment performance with any frequency. In this context it is worth bearing in mind that for many recently designed linked products the life office regularly performs reviews for policyholders, to assess continued premium adequacy. Mr Cooke felt that the increase in unit growth rate referred to in § 5.1.5 only applied to the first year and that unit prices may rise again in the future, reducing the growth for future premiums. Our view is that the unit growth rate rises permanently if all factors remain unchanged other than the market yield. The dividend D, shown in Appendix 4, is reinvested and it too then earns the higher running yield which applies in the changed circumstances. On the issue of the unit price rising again in the future, we see this scenario as weaker in almost all cases than the pre-test situation, since whilst the price is down more units are purchased and thus the projected unit fund is higher once the price recovery has occurred. Our continued view is that the post-test scenario should be projected price pattern which does not revert back to the equivalent pre-test structure. Mr Cooke made some good points in support of per policy renewal expenses and noted that expenses expressed as proportion of premium could produce lower reserves, especially where there is a wide spread of premium size across business in force. This can be important and needs to be recognized by the actuary. Our own example (which should perhaps have been included in the paper) is a pensions portfolio. This typically has larger

premiums for those policies closer to retirement. Progressive maturities can thus lead to an uncovering of a premium related renewal loading—and without any selective influence being exercised by the policyholders involved.

Mr Goford raised a number of issues, and in particular described a valuation approach from the 1970's with which he was familiar and which he had brought up to date. We feel sure that the basis would normally be more than sound, but again do not view it as appropriate as a statutory minimum. To begin with, there are the two substantial problems Mr Goford highlighted—that the basis is very stringent and very complex to apply. In addition, we feel there are two other difficulties. First, the problem of identifying the 1% risk levels involved without expensive stochastic simulations. Second, the very foundation of the approach, the use of a current and future unit fund calculated by growing unit allocations less deductions from the outset of the policy at the assumed growth rate. Modern contracts incorporate unit cancellation monthly for mortality, expenses, morbidity, and on occasion for other reasons, such as the charging of switch fees; some contracts have the added complication of joint life statuses, whilst yet others have units allocated on the receipt of premiums not the due date. To reconstruct policy history to obtain the current unit fund, using trend line growth which is in any case different from the real growth actually experienced seems an extremely complex and rather unnecessary activity to turn into a statutory requirement. Mr Goford also felt there was a flaw in § 6.3 and described this further. Whilst we do not agree there is a flaw, we do agree with many of the further comments! Our view is that negative units can be held, in effect, by offset against positive units in the unit funds. Sterling reserves are then needed and, because these are not well matched against the negative unit balance, a mismatching reserve is also required to cover the possibility of a rise in unit price. Quite clearly, too, surplus emergence patterns will be changed by different actual unit price experiences.

We take Mr O'Brien's views on life offices' productivity. However, life offices seem to have used automation to increase the complexity of linked products rather than to reduce costs. (Often with good actuarial reasons, such as designing away mortality and expenses risks.)

Mr Instance disagreed with the paper's conclusions on per plan expense loading, feeling that significant costs may be related to other measures of volume, or not related to anything. Clearly, within the confines of a valuation, expenses need to be related to something. Given that, we still feel that the per plan approach is best for a substantial part of the expenses and that the relative freedom which would result from our recommendation in § 4.4.6 ought not to lead to too restrictive a situation.

Mr Le Grys commented upon the five considerations set out in § 4.9.6, feeling that putting a value on them would be little more than pure guesswork. We agree that significant subjectivity may well be involved, but conclude that the appointed actuary's informed guess is better than no provision at all. We do not agree that the difficulties of quantification should lead to potential increases in charge levels being excluded from consideration.

Mr Hairs suggested that maturity guarantees under non-linked contract were different in nature from those under linked. We accept the point that the impact of maturity guarantees may be different in severity. What we are calling for in the paper is that there should be appropriate and even-handed requirements for guarantees under non-linked business as compared with linked business. The extent of any additional guarantee reserves required would depend, *inter alia*, upon the assets supporting the guarantees. In particular, the proportion invested in equities would be important.

We would like to clarify our comments on CGT reserves on terminal deduction policies in § 4.10.1. The reference to 100% surrenders was by way of illustrative example only—we were not suggesting that this was the 'high level of surrender' which had to be used in practice. The actuary would decide what was prudently high for any particular portfolio of business.