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UNIT-LINKED ASSURANCE AND CAPITAL GAINS TAX

by

P. A. C Seymour

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C O N T E N T S

INTRODUCTION

1. The scope of this paper

1.1 The paper is divided into four parts. The first three parts are devoted to the subject of capital gains tax deductions from the proceeds of unit-linked policies. The matter is discussed in some detail. The fourth part deals with various other related topics, including brief reference to the much argued question of capital guarantees at maturity.

2. The difference between "unit-linked" and "equity-linked"

2.1 It is worth emphasising the distinction between the terms "unit-linked" and "equity-linked". The "unit-linked" approach was defined by Melville in his paper "The unit-linked approach to life insurance", discussed by the Institute on 27th April 1970, as

> "the application of unit-trust principles to the 'savings element' of each premium paid and the application of insurance principles to the remaining 'insurance element' only".

Unit-linked policies are frequently issued with the savings element invested not in equities, but in property funds, or in the shares of building societies.

2.2 "Equity-linked" describes those unit-linked policies in which the unit is equity based. In principle, there seems no reason why any policy in which the savings element is mainly invested in equities should not be described as equity-linked. This definition would, however, include most conventional with profit policies, and it is customary to restrict the definition to those policies in which the equity fund is divided into units.

2.3 This paper is chiefly concerned with the effects of capital gains tax on equity-linked policies. The principles will be the same however for any other unit-linked policy where capital gains tax may arise, and in particular for property bonds.

THEORETICAL DEVELOPMENT

3. The need for a deduction from policy proceeds for C.G.T.

3.1 The issuing office is the owner of the units allocated to its policies. When units are sold to meet claims, the liability to capital gains tax therefore falls on the office, not the policyholder. In practice, the issuing office will often have sufficient incoming cash, from premiums and any dividends from the units, to meet the claim without the necessity of realising units. Nevertheless, the capital gains tax liability will remain with the office, and if it does eventually have to sell some units, the tax may have to be paid. For this reason most offices deduct a percentage of the chargeable gain, generally 20 per cent, to cover their future liability.

3.2 It is interesting to enquire, why 20 per cent? Much time has been spent arguing the correct premium to charge for a capital guarantee on maturity. The financial effects of the capital gains tax deduction are far more important. It is the role of the actuary to check the rate of deduction from time to time and refix it if necessary. How is he to set about the task?

4. The nature of the deferment of tax - a simple model

4.1 The tax deduction is at less than the full rate of 30 per cent, because the tax bill will be deferred. What precisely is the nature of this deferment? A simple model may be developed. The deferment depends on what proportion of units claimed it is necessary to realise in order to pay the claim, which will be met in part out of premiums and dividends (if any). Suppose it is necessary to realise on average a fraction p ($0 \leq p \leq 1$) of the units. We may also assume that the average life of a policy is $2t$ years, and that the deductions are invested in a reserve fund which earns a net average return of i per annum.

4.2 Suppose a policy becomes a claim with a chargeable gain on which the bill for capital gains tax would be £1, if the whole gain were immediately realised. Tax of p will be paid immediately and a liability of $(1-p)$ passed on to the existing policyholders who will be on average halfway through the life of their policies. When these existing policyholders withdraw on average t years later, tax amounting to $p(1-p)$ will be paid in respect of the original claim, and a liability of $(1-p)^2$ again passed on.

4.3 The present value of all tax payments is therefore

$$\sum_{n=0}^{\infty} p(1-p)^n v^{nt} = \frac{p}{1-(1-p)v^t} = \frac{D}{T}, \text{ say,}$$

where D is the proportion of chargeable gain theoretically to be deducted from policy proceeds, and T is the full capital gains tax rate.

5. Extension of the model to test the reserve fund

5.1 The next question is how to test the adequacy of the reserve fund of accumulated deductions. The crude model may be analysed further, by studying how the reserve fund builds up. The reserve held immediately after the claim will be the amount deducted, minus the tax paid immediately, i.e.

$$\frac{\beta}{1-(1-\beta)v^t} - \beta = \frac{\beta(1-\beta)v^t}{1-(1-\beta)v^t} .$$

5.2 By the time of the second payment of tax this amount will have accumulated with interest to

$$\frac{\beta(1-\beta)}{1-(1-\beta)v^t} .$$

A further tax bill of $\beta(1-\beta)$ is then paid, leaving a reserve of

$$\frac{\beta(1-\beta)^2 v^t}{1-(1-\beta)v^t} .$$

5.3 Just before payment of the m^{th} tax bill in respect of the original claim, the reserve held for that claim will therefore be

$$\frac{\beta(1-\beta)^{m-1}}{1-(1-\beta)v^t} = \frac{D}{T}(1-\beta)^{m-1}$$

Tax paid in respect of the claim then amounts to

$$\sum_{n=0}^{m-2} \beta(1-\beta)^n = 1-(1-\beta)^{m-1}$$

Therefore the tax bill still outstanding will be $(1-\beta)^{m-1}$

Hence the theory of the simple model suggests that the value of the reserve fund should equal D/T times the outstanding tax bill. Expressing this result algebraically, if

F is the amount of the reserve fund,

G_P is the chargeable gain attributable to the existing policyholders, and

G_T is the total chargeable gain on the unit fund,

then $F = D(G_T - G_P)$.

This formula suggests that any surplus, S, may be expressed as

$$S = F - D(G_T - G_P).$$

5.4 An alternative formula is suggested by Ford (J.I.A.S.S., Vol.19, p.99, § 53). The formula which can be developed by inference from that paragraph is $TG_T = DG_P + F$.

The corresponding expression for surplus would be

$$S = F + DG_P - TG_T = F - D(T/D\, G_T - G_P).$$

Since T is greater than D, this is a much stricter test. Ford rejects the use of the equation for calculating D; it would result, as he rightly states, in the deduction rate being high in the early years of business, and falling off, possibly to zero, as the business expands.

5.5 In either case, the value of D should first be settled in the light of past experience; the value decided upon can then be used to test the surplus. This is analogous to a bonus reserve valuation, in which a suitable rate of interest has to be chosen to calculate the liabilities.

5.6 The formula for S in paragraph 5.3 appears to be more suitable than that in 5.4. It seems unduly cautious to ensure that the fund is sufficient to pay tax if all units were immediately realised, before allowing surplus to emerge. One of the more interesting questions for this type of reserve is when to release surplus and to whom it should be distributed.

6. Building a model office

6.1 It might appear that if an office has an increasing premium income, then incoming cash will always be sufficient to pay claims. In fact the requirement is better stated as the necessity for the average growth in premium income to exceed the average increase in the unit price. Even this criterion is insufficient to prevent the necessity for realising units to pay claims, because of the wide fluctuation in maturity values due to changes in the price of the units.

6.2 To investigate the level of deduction required, it is necessary to build a model which incorporates a fluctuating unit price. Turner has demonstrated, in his paper entitled "Asset value guarantees under equity-based contracts", that the returns on certain U.S.A. common stock indices can be treated as random variables (with a drifting mean); this point has interesting light to shed on the activities of stock market analysts, but this is a matter beyond the scope of this paper. Benjamin in his paper "Putting computers onto actuarial work" (J.I.A. vol.92, p.145, § 56) has assumed that the U.K. market can also be represented by a random variable. He has used a computer simulation model to calculate the premium which should be charged to provide a capital guarantee on an equity-linked contract. A similar model could be used to investigate the required deduction for capital gains tax.

6.3 Unfortunately, the author has been unable to use the power of the computer for his investigations into the subject, which were accordingly limited. It was possible, however, to construct a model using the past behaviour of the equity market. (Perhaps we could call this a pseudo-random variable!) de Zoete & Gorton's 30 share index was used for this purpose, because it provided the longest convenient source of history available, going back to 1919.

6.4 To ease the work of calculation policies were assumed to be issued for a term of ten years only, to policyholders entering at age fifty. Surrenders were assumed to be 9 per cent in the first year, 8 per cent in the second and so on; on these assumptions the mean term of policies is 7.3 years. Mortality was taken on A49/52 tables, unadjusted. Unit prices were assumed to follow de Zoete and Gorton's index, with income (net of tax at 41.25%) reinvested. The chargeable gain was taken to include the reinvested income, which would be appropriate if the units had zero dividend yield.

6.5 The models assume an office issuing policies linked to an accumulation unit. An office which receives the income from the units will be in a better position, irrespective of whether it allocates further units to the policyholder. It will be able to pay claims out of both premium and dividend income. The amount of realisation necessary to pay claims will therefore be lower; the higher the income from the units the greater will be the advantage. The results of the models therefore provide an estimate of the maximum rate of deduction likely to be required

7. Model office A

7.1 The first model constructed (model A) was for an office which started business in 1919, and received new premium income of £1 million each year. On this basis the stationary state was reached in 1928, from which time the office had a premium income of £7.3 million per annum.

7.2 The proportion of units realised, p in the simple model developed in section 4, was calculated for each year. Units were realised in every year except 1932 when prices were severely depressed. The average proportion over the years was found by weighting the values of p for individual years by the "appreciation" for that year (i.e. the ratio of the chargeable gain for the year to the cost over which the gain was made).

8. Model office B

8.1 The first model, using an office with a stationary premium income of £7.3 million, is clearly very conservative. Accordingly, a second model (model B) was investigated in the same way. In this second model the new premium income was assumed to grow at 8 per cent per annum (so that it increased at about the same rate as the price of the units). On this basis the premium income rose from about £11 million in 1928 to about £258 million in 1969.

8.2 For this model the values of p and their average were calculated as in model A; it was necessary to realise units in 18 years out of the 41 between 1929 and 1969.

9. Model office C

9.1 One of the main criticisms of the two models A and B is that they both assume the office issues only ten year policies. To examine the effect of term, model B was adjusted so that all remaining policies matured after five years; the rather artificial choice of five years simplifies the calculation work. The average term of policies was then 4.2 years; premium income rose from about £5 million in 1923 to about £173 million in 1969.

9.2 It was noticeable that the issue of shorter policies increased the amount of realisation necessary. This is because the maturity value is the average of only five years purchase; it therefore fluctuates more violently than in the case of ten year policies. This augments the increase in deduction rate required because of the short period of deferment.

10. Deduction rates calculated from the model offices

10.1 The following table gives the results for a tax rate of 30 per cent, assuming the reserve fund to be invested in units. The deduction rate is calculated from the formula in paragraph 4.3.

Period	Average net return on units %	Average rate of realisation			Deduction rate		
		Model A %	Model B %	Model C %	Model A %	Model B %	Model C %
1930-1969	6.5	40.5	14.2	18.1	23.1	13.4	19.2
1935-1969	7.4	41.2	15.8	18.1	22.6	13.2	18.4
1940-1969	8.0	41.6	16.0	16.8	22.4	13.2	17.3
1945-1969	8.4	43.2	17.2	17.4	22.5	13.5	17.3
1950-1969	9.3	45.3	19.8	19.5	22.5	14.2	17.6
1955-1969	10.9	47.3	21.1	20.3	22.2	13.8	17.0
1960-1969	9.7	49.5	23.9	20.2	23.2	15.7	17.7
1965-1969	7.7	39.7	10.5	13.0	22.1	10.0	15.4
1930-1969*	5.5	34.9	7.7	16.2	22.6	9.6	19.4

*excluding period 1960-1965, when very heavy realisation occurred.

Model A : 10 year policies - level premium income
Model B : 10 year policies - premium income growing 8% p.a.
Model C : 5 year policies - premium income growing 8% p.a.

10.2 The table indicates that the 20 per cent deduction rate generally in use is probably too high. Although the assumption of 8 per cent per annum growth in premium income is perhaps rather optimistic, the ten year term of policies is pessimistic. On the assumption of 5 per cent per annum increase in premium income and fifteen year policies, the figures suggest that a deduction of about 12½ per cent might be more appropriate than 20 per cent.

11. Behaviour of the model office C.G.T. reserves

11.1 Having used the model offices to estimate the rate of deduction appropriate to each case, it is interesting to see how the capital gains tax reserve fund would have behaved if these deductions had been made. The surplus was calculated using the formula given in paragraph 5.3. The reserve was assumed invested in units, or alternatively to be held on deposit at 6 per cent per annum. Only models A and B were investigated, model A on the basis of a 20 per cent deduction and model B assuming a deduction of 10 per cent.

11.2 An examination of appendices I and II shows that the surplus fluctuates greatly. The fluctuations are in the direction one would expect, however. The office was building up business from 1919 to 1928 and there were no maturities in the period. The fund started off in surplus therefore. The year 1928 was a peak in the market, and heavy realisation of units was necessary to pay the large maturity bill. This produced the deficit in 1930. The next five years are known to have been bad for the market, so that in this period the claims bill was low. The fund is therefore in an improved position by 1935. The same sort of rationalisation can be put forward for the behaviour of the fund over the whole period.

11.3 The surplus figures demonstrate that the rates of deduction found by use of the formula are reasonable, possibly slightly conservative. They also demonstrate the volatility of surplus in this type of reserve fund. It would have needed a strong mind not to increase the deduction rate in 1930, but by 1935 the position was looking much healthier. The important point in administering this type of reserve is to keep the long term in view. The great temptation is to change the deduction rate with every swing in the market.

11.4 If the surplus had been calculated using the formula given in paragraph 5.4, the reserves for both models would have shown a deficit in every year, whether invested in units or on deposit. This demonstrates the severity of this test for surplus, as pointed out in paragraph 5.6.

PRACTICAL APPLICATION

12. The appropriate investment medium for C.G.T. reserve

12.1 It has often been argued that it is a good idea to invest the capital gains tax reserve fund in the units themselves. If the unit price increases, the liability covered by the fund increases, and the reserve fund itself also increases. An examination of the results in Appendices I and II demonstrates the point. The market rose strongly between 1965 and 1969 and heavy realisation of units was necessary to pay claims. One would expect therefore that the total surplus should fall. This was the case for the surplus when the fund was held on deposit (model B figures are somewhat distorted by the effect of the growing premium income). The surplus when the fund was invested in units increased however; the increased value of the fund was more than sufficient to pay the extra capital gains tax.

12.2 Nevertheless, this oversimplified matching argument can be misleading. The formula for surplus given in paragraph 5.3 indicates that the liability, covered by the capital gains tax reserve fund amounting to F, is $D(G_T - G_P)$. If the unit price rises or falls, G_T and G_P, which relate to the same number of units, will bothrise or fall equally. The liability therefore remains unchanged.

12.3 Thus, an increase in unit price does not in itself immediately increase the liability. The reserve covers the liability to tax unpaid on the gains attributable to preceding generations of policyholders. These gains are fixed at the time units are transferred from the outgoing policy to an existing policy, instead of being realised. The current unit price has no effect on this liability, which is determined once and for all at the time of transfer.

12.4 The more precise argument for investing the fund in units is that if the unit price increases faster for a long period, then it will be necessary to realise more units to pay claims, i.e. p will increase. Thus, in theory, the rate of deduction for existing policies should increase. An increase may not, however, be necessary if the fund is invested in units, because the higher growth rate in units will give the fund a higher rate of return, i.e. the discount factor v will reduce. It was shown in paragraph 4.3 that

$$D = \frac{p}{1-(1-p)v^t}\,T.$$

An increase in p and a reduction in v will work in opposite directions so that a change in the deduction rate may not be necessary. This is demonstrated by the table in paragraph 10.1.

12.5 On the other hand, a momentary change in unit price at the time of valuation will have the effect of altering the value of the assets, but not the value of the liabilities, so that the surplus revealed is more volatile (see appendices I and II). This makes interpretation of the figures more difficult.

12.6 On balance it is probably better, despite this difficulty, to invest the reserve fund in units so that the rate of return on the fund is linked to the rate of realisation of units to pay claims, and therefore also to the rate of outgo on the fund in tax payments.

13. The effect of investment activity in the unit trust

13.1 It has often been said that the rate of deduction should depend on the investment activity of the unit trust. This is because the gains made on switching within the unit trust have already borne tax. This argument assumes that the deduction is based on the difference between the market value and the cost at which units were allocated to the policy. This difference is not the chargeable gain attributable to the policy. The office will have received capital gains tax certificates from the unit trust. Like any other unit-holder, it should add the net gains shown to the cost of the units it holds. This should be done for the records of each individual policyholder.

13.2 Some offices issue policies linked to accumulation units. In this case, the policyholder benefits from the income, not by having further units allocated but by the increase in unit price on account of ploughed back net income. If the deduction were to be calculated under these circumstances on the difference between market value and allocation cost, the policyholder would have every reason for complaint; the deduction would be taken from ploughed back net income as well as capital appreciation. There is the same objection to applying the deduction to ploughed back net gains on which tax has already been paid. Indeed, in the case of an active, low yielding trust the ploughed back net gains often exceed the net income.

13.3 Deductions should be based on the true chargeable gains attributable to the policy, and the office computer records should ensure that this figure is available when the claim occurs. Any other method causes problems in fixing the deduction rate, because it depends on the trust activity; it is also unfair to the policyholder, unless the office publishes in its prospectus the exact method it uses.

14. Fixing the deduction rate for a particular office

14.1 The models give one an insight into the underlying theory. How can the results be applied to the practical situation? What can be done to take account of the particular circumstances of each office?

14.2 It has been demonstrated that the examination of past rates of realisation will give a reasonable estimate of the necessary rate of deduction. When an office has been in the unit-linked business for a long time, say twenty or thirty years, and the initial growth in premium income has settled, the value of p should be reasonably steady. From its claims books it should be possible for the office to determine the number of units claimed each year.

14.3 The number of units realised to pay those claims is a more difficult matter to establish. In most cases the allocation of units to a policy does not mean that the office must purchase units to match the allocation. A study of the ledgers of the investment department will not establish the number of units sold to pay claims or match allocations. It will show only the actual sales and purchases. There is therefore a need for a book in which are recorded the notional sales and purchases necessary to ensure that the units held exactly match the units allocated to the policies. Very often this can be done by the computer at the same time as it handles the allocations to policies and the payments of claims. This book can be called the "unit allocation book".

14.4 The use of the unit allocation book will establish how many units were notionally realised each year. It should also show both the gain and the cost for those units. The weighted average rate of realisation p can then be determined for the office's own situation, as was done for the models (paragraph 7.2).

14.5 The ordinary claims books of the office should also give a good idea as to the average duration of a policy when a claim arises. The return on the reserve fund will be known from the past unit record. The office may therefore decide on what rate of deduction most suits its own circumstances using the formula in paragraph 4.3.

14.6 Until each office has some past history of its own as a guide to the future it is only possible to build some sort of abstract model based on reasonable assumptions, as has been attempted in this paper.

15. Valuation of the C.G.T. reserve in practice

15.1 Having settled on a suitable rate of deduction, the office can check the position of the reserve fund using the formula in paragraph 5.3 to calculate the surplus. The unit allocation book (paragraph 14.3) will supply a figure for G_T. By totalling the computer records for individual existing policies the office can obtain a figure for G_P. The only remaining figure required is F.

15.2 Although the reserve fund is supposedly invested in units, it is unlikely that the office will in fact have a separate investment fund earmarked for this purpose. Once again therefore a book will have to be created, in which notional movements in the reserve fund will be recorded. When the unit allocation book indicates that a (notional) tax bill was paid on (notionally) realised units, the bill will be paid from the reserve fund. Conversely, all deductions from policies when a claim occurs will be credited. The book so created will provide the figure for F.

15.3 It should be noted that the actual investment holding of units will only match the liabilities if it covers both the allocated units and the capital gains tax reserve fund units.

15.4 When making returns to the Board of Trade, the capital gains tax position is ignored. Units held on behalf of unit-linked business are valued in the balance sheet at full market value, and the liabilities are also shown as the market value of allocated units (but see paragraph 19.4).

16. The elimination of the actuary

16.1 One of the attractions of the unit-linked approach is that the policyholder knows exactly what he is to receive when his policy becomes a claim. When he effects the policy, he can be confident that the distribution of future profits to his policy is no longer the subject of actuarial judgement. Melville makes this point in paragraph 10 of his paper (op. cit.) and again in paragraph 71.

16.2 But is the policyholder not deceived? The actuary makes the final decision on the amount to be deducted from the proceeds to cover capital gains tax - a glorious form of negative terminal bonus. Furthermore, the deduction is not insignificant; in the case of a long term policy, which has done fairly well, the deduction of 20 per cent of the chargeable gain may amount to over 15 per cent of the whole proceeds.

17. Charging a premium or guaranteeing the deduction rate

17.1 One way to make the results of the policy truly independent of actuarial judgement would be to charge a premium to cover the office's eventual tax liability, instead of making a deduction from the proceeds of the policy. This approach has been offered, as an alternative to deductions, by some offices, but it is not generally available. The alternative to charging a premium is to guarantee the deduction rate in the terms of the policy; no-one appears to do this.

17.2 Both methods are obviously less flexible than fixing a rate of deduction at the time the policy proceeds are paid. Alterations in course can be made for new policies only, whereas a change in deduction rate for all future claims will affect the income of the reserve fund immediately as the existing policies become claims. This problem might be acceptable, were the necessary deduction rate or premium determined only by the fortunes of the stock market and the office's own portfolio of unit-linked policies.

17.3 Unfortunately, one of the reasons for which it may be necessary to make adjustments is to allow for changes in the rate of capital gains tax. Such changes are outside the control of the actuary, and totally impossible to forecast. Unless, therefore, it is possible for offices to be assured of no future increase in their rate of capital gains tax, neither method seems to be a viable proposition.

17.4 It is possible, however, to draw a comparison with the income yield situation. In the days when offices invested mainly in fixed interest securities, the net income yield was the basis of all actuarial calculations. It was accepted by the Revenue that it would be impossible for life offices to operate if the rate of income tax was subject to unlimited increase. Accordingly this tax was limited to 37½%.

17.5 The chargeable gains of companies are normally taxed at the corporation tax rate. For life offices, however, a lower rate of corporation tax has been allowed as a continuation of the original income tax concession. Furthermore the tax on chargeable gains for life offices has been limited to the maximum rate of capital gains tax payable by an individual. In effect therefore life offices are taxed on chargeable gains at the minimum of

the normal corporation tax rate (now 42½%),

any concessionary corporation tax rate for life offices (now 37½%)

and the maximum rate of capital gains tax for individuals (now 30%)

Thus life offices' tax rate on capital gains is currently lower than it is for income; it is quite possible, however, that the full benefit of this lower rate may not be realised because expenses must be offset first against unfranked income and then against chargeable gains. In any event, with legislation as it now stands, the tax rate for chargeable gains cannot be more than the rate for income. If life offices can provide guarantees dependent on the current tax on income, it should be possible to offer guarantees dependent on the rate of tax on chargeable gains. Thus the objection raised in paragraph 17.3 is not as serious as it seems.

17.6 Guaranteeing the rate of deduction may be less risky from the office's point of view than charging a premium, because the income of the reserve fund is directly related to the size of the gain. From the policyholder's point of view, however, a guarantee is less satisfactory. He will be unable to calculate his current claim or surrender value at any time from the then quoted unit price, unless the guaranteed deduction rate is applied to the gain without allowing credit for net gains certificates held by the office, in which case the problems of section 13 will arise.

17.7 Figures calculated for model offices A and B, but not shown in this paper, indicate a charge of 10 per cent and 5 per cent of the savings element respectively, instead of deductions of about 20 per cent and 10 per cent of the chargeable gain. One office actually offering this facility charges about 7 per cent, and another charges 5 per cent, of the savings element for ten year policies.

17.8 To make the proceeds of unit-linked policies independent of any actuarial decision at the time of the claim seems an objective worth achieving, despite the difficulties. On balance, it is probably more appropriate to do this by charging a premium, rather than by guaranteeing the rate of deduction.

OTHER RELATED TOPICS

18. Income from the units - to the office or the policyholder?

18.1 One of the basic factors distinguishing between types of unit-linked policy is who gets the income. Ford has called the type of policy in which the income is credited to the policyholder the "decreasing term assurance group", and the type in which the income is kept by the office he calls the "endowment assurance group" (op. cit.).

18.2 In the endowment assurance group, the income held back by the office will usually be more than sufficient to cover the insurance element of the premium. The excess is generally used to allocate extra units to the policyholder at a predetermined level. The apparent generosity, of more units being allocated than the premium would buy, may be attractive to the policyholder, but it poses considerable problems. By fixing the rate of overpurchase the office assumes a mean yield on the units. This yield must be maintained if the office is not to lose. The policyholder, on the other hand, is only interested in the capital performance of the units. Such a conflict of interest seems most undesirable.

18.3 Sometimes the excess income of the units over the insurance element is handed back to the policyholder in the form of a bonus declared on the sum assured. This means that the office can assume a minimum yield, rather than a mean, when the rates are calculated. The conflict between office and policyholder is thus reduced. On the other hand, this method rather destroys one of the main objectives of the unit-linked approach already mentioned, namely that the distribution of surplus is not dependent on the judgement of an actuary.

18.4 One criticism of unit-linked policies has been that the results at maturity fluctuate. The issue of policies in the endowment assurance group aggravates the fluctuation considerably. Other things being equal, when prices fall, dividend yield rises. The total return, capital and dividend combined, is therefore likely to be more stable than capital return alone. Turner's paper (op. cit.) demonstrates a close correlation between four U.S. common stock indices. Standard and Poor's composite index is then analysed further, because it has the longest history. Yearly returns from capital, from dividend and from their combined total are calculated; the following figures emerge for volatility ratios, which are defined as the standard deviation divided by the mean:

Volatility ratios for period 1880 to 1967		
Capital only	:	3.60
Dividend only	:	0.25
Total return	:	1.92

It is fortunate from the office's point of view that the dividend is the most stable, but this is no consolation to a policyholder dependent on capital appreciation alone.

18.5 These severe difficulties in the endowment assurance group no doubt explain why the recent trend has been to issue policies of the decreasing term assurance group. It is a trend in the right direction.

18.6 The models, and the comments on the practical handling of the capital gains tax reserve, assume policies of the decreasing term assurance group. The concepts can easily be modified to suit policies of the endowment assurance group. The unit allocation book for such policies would relate to units reserved, rather than units actually allocated. The funding of a policy of the endowment assurance group follows a similar pattern to that for a policy of the decreasing term assurance group. Units will be reserved in respect of a percentage of the gross premium, equivalent to the savings element, and extra units added to reserve in respect of the income assumed in the premium calculation as it arises.

18.7 In fact, of course, the decreasing term assurance group is merely a limiting case of the endowment assurance group. The premiums can be calculated in the same way, assuming the yield received by the office is nil. The results would be very slightly different, because of the assumption of non-zero interest in calculating the decreasing term assurance element of the premium.

19. Capital guarantees at maturity

19.1 The pros and cons of offering capital guarantees at maturity have been argued at length; the argument will not be carried further in this paper. The opportunity will be taken, nevertheless, of using the available model offices A and B to look at the possible behaviour of a capital guarantee reserve fund.

19.2 It is a simple matter to study the capital guarantee payments. The office claims books will record the amounts paid under guarantee in any year. This amount can be compared with the savings element income for the same year. The average ratio over the years will give an indication of the premium rate required. This procedure was carried out for the model offices; the results are shown below:

	Percentage of savings element paid under guarantee	
Period	Model A	Model B
1920-1969	.042	.016
1925-1969	.043	.016
1930-1969	.048	.017
1935-1969	.026	.013
1940-1969	.025	.012
1945-1969	.010	.008
1950-1969	.011	.009
1955-1969	.006	.006
1960-1969	.004	.005
1965-1969	.007	.007

19.3 The reason for the lower figures for model B is that the major guarantee claims occurred early in the period, when the business was small; the premiums, but not the guarantee claims, grew subsequently. The results show the very low cost of capital guarantees for a policy of the decreasing term assurance group. The worst year for payment under guarantee was of course 1932, when payments were .8 per cent and .7 per cent of savings elements received for model offices A and B respectively. This level of claim is not likely to arise very frequently; the models assume policies for ten years issued to lives aged 50; both these assumptions are likely to lead to higher rates of claim under capital guarantee than will occur in practice.

19.4 The behaviour of the reserve funds was examined, assuming a 4 per cent per annum yield on the fund. The charges for the guarantee were taken as .06% of the savings element for both models A and B. The results are given in outline in appendix III. The main point to note is the relative size of the reserves for capital gains tax (appendices I and II). Capital guarantees have such a small financial effect that the simplest answer may well be to ignore them in the premium rates and the valuation. General contingency margins will probably be quite large enough to include the cost of the capital guarantees. The only point to watch is that the Board of Trade valuation returns should show the liability to a policy as the guaranteed value of units allocated if this is higher than the market value.

19.5 Although the cost of capital guarantees can be dismissed relatively lightly in the case of decreasing term assurance group policies, the position is not so simple for the endowment assurance group. For this type of policy, a claim occurs whenever the capital appreciation alone is negative; for the decreasing term assurance group the total return must be negative before a claim occurs. The cost is therefore much greater for endowment assurance group policies. The de Zoete and Gorton index was used to build a model, but without reinvestment of net income, which averaged about 2.9 per cent. The results indicate that the cost of a full capital guarantee on death and maturity could be as high as 1½% of the savings element. At this level a charge would have to be made in the premium and the movements of the reserve fund recorded.

19.6 The higher the net yield received by the office, the lower in general will be the capital appreciation. Thus the cost of capital guarantee is greater, the higher the income taken by the office. This is yet another drawback to the endowment assurance group policy; it is more doubtful whether a maturity guarantee is appropriate to this type, despite the fact that it is more usually given than in the case of policies in the decreasing term assurance group. Appendix IV shows graphs of expected payment under capital guarantee for a policy with a savings element of £100 per annum, becoming a claim at various durations.

20. Matching units allocated with an investment in units

20.1 For an office set up by a unit-trust group solely for the purpose of issuing policies linked to the trust group's own units, there should be little problem. There seems no reason why the office should not purchase units, since the objective of the trust group is to "sell" units to savers through the medium of a policy. The office has no funds allocated to conventional policies to complicate the situation.

20.2 The position of an existing office with a conventional fund entering the unit-linked field is rather different, particularly if the office itself administers its own unit-trust through the medium of a subsidiary management company. Such an office is in a position to take a view on its own units.

20.3 If the office thinks that the unit price of its own units is going to fall, it can intentionally arrange that the unit-holding is not sufficient to cover the units allocated to its policies. In these circumstances, it can either fail to purchase units when they are allocated to policies, or it can take the more positive step of actually selling units. The effect of such manoeuvres will be to reduce the cash available in the unit trust and so further inhibit the performance of the units.

20.4 The manoeuvre will mean in effect that conventional policyholders are selling units short, which is an action they would be unable to take if the unit-linked business was not also part of the office portfolio. The conventional policyholders will benefit at the expense of the unit-linked policyholders, if the assumed drop in unit price materialises. All the risks of selling short are borne by the conventional policyholders, and these risks are known to be serious if the view taken in the units proves wrong. Failing to match the units allocated with an actual investment in units is therefore a practice to be frowned upon.

20.5 The situation when the actual unit holding is more than sufficient to match the unit-linked liabilities is akin to purchasing units for the conventional fund. There seems no objection to this, provided the unit holding looks reasonable considered as an investment in its own right from the conventional policyholders' point of view. Quite possibly the office may wish to transfer units to the conventional policy-holders, rather than sell them in the event of a contraction in the numbers allocated to unit-linked policyholders. The benefit of the consequent tax deferment should accrue to the conventional fund.

20.6 It is possible however, to use the relatively large conventional fund, in the event of a liquidity problem in the unit trust, to take up surplus units. This may help to support the unit price and hence benefit unit-holders, but may also not be in the conventional policyholders' interest; from their point of view it may not be a suitable time to invest in units.

20.7 To sum up, therefore, an office running its own unit trust and having both conventional and unit-linked business must be at pains to balance the interests of all parties - the conventional policyholders, the unit-linked policyholders and the unit-holders. In general the rules can be expressed as:

(i) the number of units actually held should not be less than the number of units allocated,

and (ii) any excess units held should be considered as an investment suitable in size and quality to the interests of the conventional policyholders, taking into account any possible tax advantages.

APPENDIX I

CAPITAL GAINS TAX RESERVES

Model A, deductions at 20% - premium income level

Year	Unit Fund	Reserve held in units			Reserve held on deposit at 6		
		(a) Reserve Fund	(b) Total Surplus	(c) (b) x 100 / (a)	(d) Reserve Fund	(e) Total Surplus	(f) (e) x 100 / (d)
	(£000)	(£000)	(£000)	(%)	(£000)	(£000)	(%)
1920	3,170	8	+2	+25	8	+2	+25
1925	21,510	201	+13	+6	199	+11	+6
1930	45,700	1,553	-451	-29	1,663	-341	-21
1935	53,070	2,943	-211	-7	2,861	-293	-10
1940	37,340	2,943	-1,409	-49	3,834	-518	-14
1945	47,000	4,282	-660	-15	5,323	+378	+7
1950	36,060	3,918	-1,598	-41	6,611	+1,095	+17
1955	57,630	6,370	+500	+8	8,250	+2,380	+29
1960	72,010	9,904	+3,476	+35	8,590	+2,162	+25
1965	46,490	8,098	+1,278	+16	8,116	+1,296	+16
1969	56,710	11,605	+4,647	+40	8,027	+1,069	+13

APPENDIX II

CAPITAL GAINS TAX RESERVES

Model B, deductions at 10% - premium income growing 8% p.a.

Year	Unit Fund (£000)	Reserve held in units			Reserve held on deposit at 6%		
		(a) Reserve Fund (£000)	(b) Total Surplus (£000)	(c) (b) x 100 / (a) (%)	(d) Reserve Fund (£000)	(e) Total Surplus (£000)	(f) (e) x 100 / (d) (%)
1920	3,250	4	+1	+25	4	+1	+25
1925	32,480	112	+6	+5	111	+5	+5
1930	67,880	1,050	-440	-42	1,090	-400	-37
1935	118,430	3,308	+152	+5	3,014	-142	-5
1940	121,060	5,209	-1,081	-21	6,375	+85	+1
1945	224,640	11,669	+2,137	+18	12,082	+2,550	+21
1950	254,990	16,599	+1,549	+9	22,091	+7,041	+32
1955	594,290	38,047	+16,245	+43	34,232	+12,430	+36
1960	1,070,370	75,906	+34,645	+46	41,796	+535	+1
1965	1,024,590	75,474	+4,731	+6	43,223	-27,520	-63
1969	1,722,970	147,150	+39,216	+27	66,255	-41,679	-63

APPENDIX III

CAPITAL GUARANTEE RESERVES

(income not retained by the office)

.06% of savings element, less claims under the capital guarantee, accumulated at 4% p.a. compound.

Year	Model A (£000)	Model B (£000)
1920	+1	+1
1925	+5	+7
1930	+29	+41
1935	-23	-46
1940	-15	-24
1945	-37	-77
1950	-22	+54
1955	-14	+202
1960	+4	+581
1965	+29	+1,200
1969	+51	+1,878

APPENDIX IV

EXPECTED CAPITAL GUARANTEE PAYMENTS

(savings element of £100 per annum)