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EQUITY-BASED LIFE INSURANCE IN THE UNITED KINGDOM

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ABSTRACT

This paper indicates the historical development of equity-based insurance products in the United Kingdom, describes the types of equity-based life insurance products now being sold, presents the actuarial bases underlying these products (including the treatment of asset value guarantees), and considers the application of United Kingdom product concepts in the United States and Canadian environment. The paper does not consider the tax structure of the regulation of equity-based insurance products in the United Kingdom.

INTRODUCTION

MANY actuaries in the United States and Canada are now deeply involved in the development of equity-based life insurance products. Such products have been marketed in the United Kingdom and other countries for several years. While there are admitted differences between United States and foreign markets, there is some value in considering, from an actuarial viewpoint, the equity-based life insurance products which have been successfully marketed in other countries, especially in the United Kingdom. For example, one of the values in considering equity product developments in other countries is the stimulation of new ideas and new approaches which might be applied in a different environment.

HISTORY OF EQUITY-BASED INSURANCE PRODUCTS

The 1950's gave birth to a revolutionary new insurance product—the equity-based, or variable, product (life insurance or annuity). In the United States, CREF (College Retirement Equities Fund) was established in 1952 and is regarded as offering the first variable annuity in the United States. PALIC (Participating Annuity Life Insurance Company) was founded in 1954 and was the first life insurance company to issue variable annuities in the United States. It was late in the 1960's before the variable annuity was offered by a significant number of companies. Variable life insurance is coming in the United States, perhaps in 1971.

In other countries, variable life insurance was first introduced in the Netherlands around 1953. This product had both variable premiums and variable benefits and had only limited market acceptance. The first variable annuity was offered in the United Kingdom in early 1957 by the London and Manchester Assurance Company. The first variable life insurance product was offered in the United Kingdom in the autumn of 1957 by the London and Edinburgh Life Insurance Company. This product had variable benefits but fixed premium, and thus more sales appeal than the earlier form introduced in the Netherlands. As was the case with the variable annuity in the United States, it was late in the 1960's before variable products were offered by a significant number of companies.

DESCRIPTION OF PRODUCTS

Types of Products

1. *General.*—One of the most comprehensive guides to the many equity-based insurance products offered in the United Kingdom is *Equity-linked Life Assurance Tables*, published by Stone & Cox Publications, Ltd. The October, 1970, edition of this publication presents summaries of some 141 equity-based life insurance plans (109 annual premium plans and 32 single premium plans) offered by 93 life companies.[1] While the plans offered in the United Kingdom vary considerably, most of the plans may be grouped into three categories.

2. *Type A: percentage allocation plans.*—This type of plan represents approximately 52 per cent of the annual premium, equity-based life insurance plans now offered in the United Kingdom. Under this type of plan, a specified percentage of each gross annual premium is used to cover expenses and mortality costs and to provide a contribution to profits of the life company, with the balance of each premium invested in units of an investment account. Unit values reflect realized and unrealized capital appreciation (or depreciation); net dividend income is reinvested, that is, used to purchase additional units. The percentage allocation to units may be uniform throughout the premium payment period or may be graded (e.g., 25–40 per cent the first year and 90–95 per cent thereafter). This type of plan is seldom if ever written on a participating basis.

a) *Death benefit.*—The death benefit is equal to the value of units purchased, plus the sum of all remaining premiums unpaid at the time of

[1] The number given in each case is the number of plans listed and does not reflect different benefit periods under the same plan. If each benefit period had been counted as a separate plan, there would have been 422 plans, 386 of which were annual premium plans.

death. Minimum death benefit guarantees, that is, asset value guarantees on death, are common.

b) *Surrender benefit.*—Generally, the surrender benefit is equal to the value of units purchased, less, in some cases, a nominal surrender charge. No specific effort is made to deal with unamortized acquisition expenses.

c) *Maturity benefit.*—Where the plan is an endowment form, the maturity benefit is equal to the value of units purchased. Asset value guarantees on maturity are seldom provided. Where such guarantees are provided, however, the minimum maturity benefit is usually the sum of the premium amounts invested in units (excluding units purchased from dividend distributions).

TABLE 1

Issue Age	Term (Years) of Endowment Plan			
	10	20	30	40
25.....	97%	95%	94%	90%
35.....	96	94	90	.....
45.....	95	90	.....	.....
55.....	90	.....	.....	.....

d) *Commissions.*—The most frequent practice is to pay flat commissions, where the periodic allocation to units is a uniform percentage of each premium and where the surrender benefit is the full value of units purchased.

e) *Specimen premiums.*—The level percentage allocation to units normally ranges from 90 to 96 per cent of each premium. Table 1 indicates specimen level percentage allocations of premiums for several endowment forms.

f) *Summary.*—In essence, this type of plan is a combination of a periodic payment investment plan which accumulates with both capital growth and income, and nonparticipating decreasing term insurance with an initial amount equal to the total premiums to be paid under the policy, possibly with minimum asset value guarantees—all provided in a single insurance contract. The life company guarantees mortality and expenses—and capital, if asset value guarantees are provided. This type of plan is most frequently offered by life companies which are owned by mutual fund management companies.

3. *Type B: endowment assurance.*—This type of plan represents approximately 28 per cent of the annual premium, equity-based life insurance plans now offered in the United Kingdom. This type of plan is similar to a traditional endowment insurance product. On payment of each annual premium, an amount equal to the face amount divided by the number of premiums payable is deemed to be invested in units of an investment account. Unit values reflect realized and unrealized capital appreciation (or depreciation). Net dividend income is retained by the life company—corresponding adjustments are made in the premium scale and benefits which will be noted later. This type of plan is written on both a participating and a nonparticipating basis.

a) *Death benefit.*—The death benefit is equal to the value of units deemed to have been purchased at the date of death, plus a sum equal to the amounts that would have been deemed to be invested in units during the remainder of the premium-paying period. In other words, the death benefit is equal to the face amount adjusted for any capital appreciation (or depreciation) in units deemed to have been purchased at the date of death. Asset value guarantees on death (i.e., guaranteed minimum death benefit) equal to the face amount are normally provided.

b) *Surrender benefit.*—A surrender benefit is not usually available until at least one or two years' premiums have been paid. Thereafter, a surrender benefit is provided equal to the value of units allocated, less a surrender charge which decreases with duration.

c) *Maturity benefit.*—The maturity benefit is equal to the value of units deemed to have been invested over the premium-paying period. Asset value guarantees on maturity are quite common.

d) *Commissions.*—A common commission practice is to pay the same scale of commissions on an equity-based life insurance plan of this type as would be payable on an otherwise similar orthodox (i.e., fixed-dollar) plan—a first-year commission equal to 2 per cent of the face amount, plus a renewal commission expressed as a percentage of premium.

e) *Specimen premiums.*—The periodic amount deemed to be invested can, and often does, exceed 100 per cent of the premium paid because of the effect of dividend income which is retained by the life company. Table 2 indicates specimen level annual premiums per $1,000 face amount for several nonparticipating endowment forms.

f) *Summary.*—In essence, this type of plan is a level premium endowment insurance under which benefits reflect capital growth. Plans are writ-

ten on both a participating and a nonparticipating basis. Participating plans, as expected, have somewhat higher premiums than nonparticipating plans and entitle the policyholder to participate in the profits of the company over and above the expressed unit benefit. The life company effectively guarantees interest, mortality, and expenses—and capital, if asset value guarantees are provided. This type of plan was initially offered by new and smaller life companies as an answer to the highly competitive orthodox participating plans offered by the large mutual life companies. It is typically offered by companies not associated with mutual fund management companies.

TABLE 2

Issue Age	Term (Years) of Endowment Plan			
	10	15	20	30
25.....	$92	$70	$41	$32
35.....	93	71	42	33
45.....	94	72	45	.....
55.....	98	77	.....	.....

4. *Other plan types.*—Two types of plans which do not fall in the categories defined above warrant mention, although they will not be considered further in this paper.

Combination orthodox/equity-based plans.—These plans represent approximately 20 per cent of the annual premium, equity-based life insurance plans now offered in the United Kingdom. Most of these plans are simply combinations of orthodox permanent life insurance plans with some form of supplemental equity accumulation provision—either a "side-fund" type of provision or a Type B endowment assurance plan as described above. In other words, each premium is divided into two distinct parts—the first part allocated to some form of investment in equity units and the second part allocated to an orthodox life insurance plan.

Single premium bonds.—These plans are single premium whole life insurance or, less frequently, single premium endowment insurance products. A percentage of the single premium (95–100 per cent) is allocated to purchase units of an investment account. Unit values reflect realized and unrealized capital appreciation (or depreciation). Net dividend income is reinvested, that is, used to purchase additional units. This type of plan is usually issued on a nonparticipating basis only.

a) *Death benefit.*—The death benefit is, typically, the greater of the value of the units allocated and a guaranteed minimum death benefit equal to a stipulated face amount. Table 3 indicates a typical schedule of face amounts per $1,000 single premium for a whole life insurance plan.

b) *Maturity benefit.*—Where applicable, the maturity benefit is the value of units allocated. Asset value guarantees are sometimes provided, although the extent of the guarantee varies considerably—from 100 per cent of the single premium to 100 per cent of the stipulated face amount.

c) *Surrender benefit.*—A surrender benefit equal to the value of units allocated is typically provided.

TABLE 3

Issue Age	Face Amount per $1,000 Single Premium
Under 30	$2,500
35	2,000
45	1,500
65 and over	1,000

Funding Media

While equity-based insurance (including annuity) plans in the United States have thus far tended to be equated with "common stock-based" insurance, the funding media underlying insurance contracts in the United Kingdom have been much broader. Funding media used in the United Kingdom include common stocks, preferred stocks, fixed-interest securities, and, more recently, real estate properties and mortgages.

The general term "investment account" has been used in the plan type descriptions above. More specifically, both internal investment accounts (i.e., separate accounts) and external investment accounts (i.e., mutual funds) are utilized in the United Kingdom. The pool of assets derived from sales of Type A (percentage allocation) plans are most commonly invested in mutual funds, since these plans are predominantly offered by life companies which are associated with mutual fund management companies. Other types of plans utilize both internal and external funds, comrising one or more of the classes of securities referred to above.

Where an external fund is utilized, the mutual fund management company typically makes an initial charge of 5 per cent on new money invested and an annual investment management charge of $\frac{1}{4}$ to $\frac{3}{8}$ per cent of the fund assets. The life company may receive a "commission" on external fund units purchased by it, substantially equal to the initial charge

made by the mutual fund management company, but rarely receives any portion of the annual investment management charge.

Where an internal fund is utilized, the life company typically makes charges similar to those which would otherwise be made by a mutual fund management company. All such charges are usually disclosed in sales material and contractual forms.

Funding Methods

The phrase "deemed to be invested" in units of a specified investment account used in the plan type descriptions above is frequently used in describing the life company's contractual obligation under equity-based insurance products in the United Kingdom. It is of considerable importance. First, the life company has no contractual obligation to actually invest the *amount* "deemed to be invested" at the *time* indicated—it may overfund or underfund. In this regard, a concept referred to as "actuarial funding," applicable to Type B plans, will be discussed later.

Second, the life company has no contractual obligation to *actually* invest in the investment *account* specified, even though plan benefits are linked to the specified account; it may "shadow-fund," that is, link benefits to a specified investment account and actually invest plan assets in some other investment account or accounts. Thus a life company has considerable flexibility in its funding operation where the contractual wording used is that indicated. If this flexibility is utilized, however, the life company obviously assumes some additional investment risk.

ACTUARIAL BASIS

Type A (Percentage Allocation) Plans

This type of plan normally is based on conventional actuarial principles. The life insurance company receives premium amounts to cover expenses, mortality, and some contribution to profits, the remainder being allocated to purchase units of an investment account (usually an external fund). The calculation of the premium for the decreasing term insurance portion is a rather straightforward procedure, being independent of the performance of units purchased. Reserves are equal to the value of units allocated to the policy plus an orthodox reserve for the decreasing term insurance—usually an unearned premium reserve.

One novel problem does arise in those cases in which the plan provides for an asset value guarantee on death and/or maturity. This problem will be discussed in the section entitled "Treatment of Asset Value Guarantees."

Type B (Endowment Assurance) Plans

This type of plan is, from the buyer's viewpoint, much more akin to the orthodox endowment insurance plan than is a Type A plan. From an actuarial viewpoint, however, several novel and challenging problems are presented. Before considering the basis for gross premium calculations, surrender benefits, reserves, and the funding of units will be examined.

1. *Funding.*—On each premium due date, a specified amount is "deemed to be invested" in units, that is, notionally allocated to purchase equity units. One funding alternative would be to actually purchase the full unit allocation specified at the time each premium is paid. This alternative would, however, require borrowing, either from shareholders or from other classes of policyholders, substantial funds with which to do this, since the amount "deemed to be invested" may and often does exceed the premium paid. To the extent that this unit allocation exceeded the reserve under the policy, the units would be earning investment income which, since retained by the company, would be available to repay the loan in due course and to pay interest on the loan.

It can be noted that the life company's liability with respect to units so notionally allocated is, in effect, to pay out their market value on death or maturity. If it can be assumed that units will have a constant running yield i, units could be purchased with respect to each notional allocation equal to that allocation multiplied by $A_{x+t:\overline{n-t}|}$. This concept is referred to as "actuarial funding"—discounting the prospective liability of the life company with interest and mortality. In effect, this process involves merely purchasing a series of paid-up endowment assurances by means of successive single premiums with reinvestment of income (at the assumed running yield i) on units purchased. From the contractholder's viewpoint, the company receives actual dividend income in return for a guarantee of uniform rate of dividend income equal to the assumed running yield in discounting the prospective liability of the company. It is the author's understanding that the concept of "actuarial funding" was developed by H. Langhorst of Brans and Company (consulting actuaries) and was first applied by André W. Smit, actuary of Abbey Leven Nederland, N.V., The Netherlands.

Consider the following example. On each premium due date, a notional allocation is made under an n-year, n-pay annual premium endowment insurance plan equal to F/n, where F is the face amount, and an actual allocation is made with respect to each notional allocation equal to $(F/n)A_{x+t:\overline{n-t}|}$ (based on an assumed investment income rate of i per cent, the assumed running yield on unit assets).

Considering only successive liabilities related to the first (annual) notional allocation at issue of (F/n), the liability at issue would be (F/n) $A_{x:\overline{n}|}$ and would be equal to the initial investment in units. The liability at the beginning of the second year is $(F/n)A_{x+1:\overline{n-1}|}$. The required additional investment in units at the beginning of the second year with respect to the first allocation would therefore be $(F/n)(A_{x+1:\overline{n-1}|} - A_{x:\overline{n}|})$. Thus there may be a funding gain or loss to the extent that actual investment income is greater than or less than, respectively, that assumed. There could, of course, be a funding gain or loss attributable to variance of actual survivorship from that assumed in funding.

2. *Surrender benefits.*—As previously stated, surrender benefits under Type B plans are normally not available during at least the first policy year. The simplest basis for determining a cash value is merely to apply $A_{x+t:\overline{n-t}|}$ to the value of the units allocated, that is, to the value of the units actually purchased. To provide for expenses on surrender, a rate of interest in excess of the rate assumed in funding and/or an adjustment for unamortized acquisition expenses are used.

3. *Reserves.*—The valuation reserve for a Type B plan consists of two parts, the first held in unit assets and the balance held in general account (nonunit) assets. The determination of the proportions in each is predicated by the use of the funding method adopted. For the moment, the question of asset value guarantees on death or maturity has been ignored.

If the actuarial funding method described above is used, the portion of the reserve held in unit assets and valued at current market value is, as of the end of the tth year,

$$\left(\frac{F}{n}\right) A_{x+t:\overline{n-t}|} \left(p_t \sum_{r=0}^{t} \frac{1}{p_r}\right), \tag{1}$$

where F/n = notional periodic allocation to units, p_t = current market price of a unit on the valuation date t, and p_r = market price of a unit on the purchase date of the rth payment. If $p_t = p_r$—in other words, if there has been neither capital appreciation nor depreciation—the unit reserve reduces to the orthodox reserve form, $[t(F/n)A_{x+t:\overline{n-t}|}]$, where $t(F/n)$ represents the portion of the face amount which has been notionally allocated to units as of the end of the tth year.

The portion of the reserve held in general assets, representing the portion of the face amount not yet allocated to units, is

$$\left[F - \left(\frac{F}{n}\right) t\right] A_{x+t:\overline{n-t}|} - \beta_{x:\overline{n}|} \ddot{a}_{x+t:\overline{n-t}|}. \tag{2}$$

The total reserve held under a Type B plan which contains no asset value guarantees is therefore (combining formulas [1] and [2])

$$\left\{\left(\frac{F}{n}\right) A_{x+t:\overline{n-t}|}\left(p_t \sum_{\tau=0}^{t} \frac{1}{p_\tau}\right) + \left[F - \left(\frac{F}{n}\right) t\right] A_{x+t:\overline{n-t}|}\right\} - \beta_{x:\overline{n}|}\ddot{a}_{x+t:\overline{n-t}|} \tag{3}$$

$$= \left(F A_{x+t:\overline{n-t}|} - \beta_{x:\overline{n}|}\ddot{a}_{x+t:\overline{n-t}|}\right) + \left[\left(p_t \sum_{\tau=0}^{t} \frac{1}{p_\tau} - t\right)\left(\frac{F}{n}\right) A_{x+t:\overline{n-t}|}\right] \tag{4}$$

$$= {}_tV_{x:\overline{n}|} + C_t A_{x+t:\overline{n-t}|}, \tag{5}$$

where C_t represents the capital appreciation or depreciation (if negative) in the portion of the reserve held in unit assets, as of the valuation date. (Modification of reserve formulas where asset value guarantees are provided will be discussed in the section entitled "Treatment of Asset Value Guarantees.") It is apparent from formula (5) that, if there has been neither capital appreciation nor depreciation, the total reserve held under a Type B plan is equivalent to that for an otherwise similar orthodox endowment plan.

4. *Gross premiums.*—In calculating premium rates for equity-based plans, the yield expected from unit investments must be divided into capital and income elements. This division of over-all yield on unit assets into its component parts adds to the complexity of the problem. The actuary has historically viewed yield as an over-all concept and has basically thought in roughly the same terms whether assets were held in equity or in fixed-interest securities. In calculating the premium for an equity-based plan, such as that described for a Type B plan, assumptions as to capital growth and income yield must be considered separately.

Apart from considering the division of reserves and yield into the respective portions applicable to equity and fixed-interest assets, the approach to the determination of gross premiums is very much similar to that taken for orthodox plans. The impact of dividends has been ignored for the sake of simplicity. The impact of asset value guarantees has also been ignored but will be considered later.

Taking the "Anderson approach" to determining gross premiums, the following formula represents the book profit (BP) at the end of the tth policy year for a Type B equity-based endowment plan:

$$
\begin{aligned}
{}_tBP_x = \frac{1}{1 - q_{[x]+t-1} - w_t} \{ & ({}_{t-1}V'_x + GP_x - {}_tE - {}_tFA_x)(1 + r) \\
& + i({}_{t-1}V''_x + {}_tFA_x) + m({}_{t-1}V''_x + {}_tFA_x) \\
& - q_{[x]+t-1}[(1{,}000 \text{ or } {}_tV''_x \text{ if greater}) - {}_tV''_x] \\
& - w_t({}_tCV_x - {}_tV''_x)\} - {}_tV'_x ,
\end{aligned}
$$

where

${}_tV'_x = F(1 - t/n)A_{x+t:\overline{n-t}|} - \beta_{x:\overline{n}|}\ddot{a}_{x+t:\overline{n-t}|}$ = portion of reserve not held in units at the end of year t;

${}_tV''_x = F(t/n)A_{x+t:\overline{n-t}|}$, adjusted appropriately for capital appreciation or depreciation (see formula [1]) = portion of reserve held in units at the end of year t;

${}_tFA_x = F\{(t/n)A_{x+t:\overline{n-t}|} - [(t-1)/n]A_{x+t-1:\overline{n-t+1}|}\}$ = fund allocation (to units) in year t;

r = total investment rate of return on general assets;

i = rate of investment income (only) on unit assets;

m = investment management fee on unit assets.

It is apparent from the above formulas that the emerging profit is very sensitive to capital appreciation (or depreciation) in unit assets. Changes in capital value of unit assets affect income to the life company through the investment management fee, and expenses to the life company through both the cost of mortality and the cost of surrender.

TREATMENT OF ASSET VALUE GUARANTEES

General

If asset value guarantees are provided, a risk charge is determined. The only published source of information in the United Kingdom regarding determination of net risk premiums for asset value guarantees is a paper by Sidney Benjamin (*JIA*, XCII, 134). The stated approach to valuation, that is, to the establishment of additional reserves for asset value guarantees, is "to determine on each valuation date (normally every three years, although more and more companies are making annual valuations) any reserve which, in the opinion of the actuary, would be required considering the nature of the guarantees provided and the financial situation at that time."

Type A Plans

Under Type A plans, valuation practice with respect to asset value guarantees appears to be either to hold no additional reserve or to hold

a contingency reserve based on the accumulation of applicable risk charges.

Type B Plans

Valuation considerations and procedures for asset value guarantees under Type B plans are outlined below.

1. *Minimum death benefit guarantees.*—The reserve for the notional allocations to units was given in formula (1). If an asset value guarantee on death equal to the face amount was provided, a minimum reserve equal to $t(F/n)A^{1}_{x+t:\overline{n-t}|}$ would theoretically be called for at time t. An equivalent modification to formula (5) would be an additional reserve equal to the depreciation in unit assets multiplied by $A^{1}_{x+t:\overline{n-t}|}$.

In practice, a contingency reserve would be accumulated based on the net risk premiums for this guarantee. From this contingency reserve would be transferred any amounts required to meet the theoretical minimum reserve requirements (determined in accordance with the modifications noted above) at any point in time. If the contingency reserve is inadequate, additional sums would be transferred from general funds of the company.

2. *Minimum maturity value guarantees.*—If an asset value guarantee on death *and* maturity equal to the face amount was provided, a minimum reserve in formula (1) equal to $t(F/n)A_{x+t:\overline{n-t}|}$ would theoretically be required as of time t. An equivalent theoretical constraint applicable to formula (5) would be a minimum reserve equal to that held for an otherwise similar orthodox plan (i.e., ${}_tV_{x:\overline{n}|}$)—in other words, the reserve represented by formula (5) *plus* an additional reserve equal to the depreciation in unit assets multiplied by $A_{x+t:\overline{n-t}|}$.

In practice, a contingency reserve would be accumulated based on the net risk premium for the asset value guarantee on maturity (and death, if applicable). From this contingency reserve would be transferred amounts required to meet any minimum reserve requirements imposed by the company's actuary.

Some flexibility in reserve requirements for asset value guarantees on maturity is justified because of the prospective nature of the risk, where the contingency reserve is inadequate to meet theoretical minimum over-all reserve requirements as of any point in time. The justification for flexibility in this case is derived from the fact that the liability under a maturity value guarantee may be many years in the future. There would, therefore, appear to be no real justification for requiring that

theoretical minimum reserve requirements be met at each point in time based on then existing market conditions, if adequate provision is made to meet guarantees at time of maturity. Such provision would be made by a reserve procedure which progressively recognizes, and provides for, any aggregate deficiency in reserves with respect to maturity guarantees on all business then in force.

APPLICATION OF CONCEPTS TO UNITED STATES ENVIRONMENT

This section will apply to the United States environment the product design concepts underlying Type A and Type B plans.

Type A (Percentage Allocation) Plans

As previously noted, this type of plan is a combination of a periodic payment investment plan which accumulates with both capital growth and income, and a nonparticipating decreasing term insurance plan with an initial amount equal to the total premiums to be paid under the policy, possibly with minimum asset value guarantees—all provided in a single insurance contract. This type of plan normally is based on conventional actuarial principles.

The product design concept represented by a Type A United Kingdom plan could be currently applied in the United States environment by packaging two or more available financial products or product components. One approach would be to package an individual deferred variable annuity (as the investment medium) with a decreasing term life insurance rider. An asset value guarantee on death equal, under the basic variable annuity, to the periodic payments "invested"—a guarantee now made under many variable annuity products—could provide a minimum death benefit for the total product equal to the face amount. An asset value guarantee on maturity could be included in the basic variable annuity. If the premiums are appropriately structured, this approach would essentially duplicate a Type A United Kingdom product in terms of premiums, benefits, single contract, and so on.

Another approach would be the packaging of a mutual fund periodic payment plan with a decreasing term life insurance policy. Two separate contracts would be required, with some consequent loss of marketability, although a "one-check payment scheme" would meliorate the situation to some degree. An asset value guarantee on death and/or maturity would require yet a third contract. Thus, while it would be possible to achieve the premium and benefit structure of a Type A United Kingdom

product using a mutual fund–life insurance package approach, it could be somewhat awkward in that several separate contracts would be required.

Type B (Endowment Assurance) Plans

As previously noted, this type of plan is a level premium endowment insurance under which benefits reflect capital growth only, dividend income being retained by the insuring company. On payment of each premium, a specified amount is (under most plans) notionally allocated to purchase (i.e., "deemed to be invested" in) units of an investment account. The amount actually allocated to purchase units represents the prospective liability of the company with respect to such notional allocation (e.g., death or maturity) discounted with interest and mortality.[2] The retention of dividend income by the company on units purchased is essential to this discounting process, that is, to the utilization of the actuarial funding concept previously discussed.

Application of the product design concept underlying Type B United Kingdom plans in the United States environment is considerably more difficult than for Type A United Kingdom plans, because of potential regulatory problems arising from the required retention of dividend income by the insuring company on units purchased. Assuming that the required split in actual investment return on units purchased could be accomplished, the remainder of this section will illustrate the development of values for a Type B plan and its equivalence to an otherwise similar orthodox plan of insurance where there is neither capital appreciation nor depreciation.

1. *Description of applied Type B plan.*—Endowment insurance maturing at attained age 65; level annual premiums payable to attained age 65; issued to a male, aged 45. All values are based on the 1958 CSO (curtate, age last birthday) 2 Per Cent Tables, that is, the assumed running yield on unit assets is 2 per cent. Benefits provided are assumed to be as follows: death benefit, $1,000 plus any capital appreciation in units notionally allocated prior to the date of death, but in no event less than $1,000; maturity benefit, $1,000 plus any capital appreciation in units notionally allocated, but in no event less than $1,000.

[2] It should be recalled that the specified periodic notional allocation *could be* fully funded. In other words, the company could actually purchase units on receipt of each premium equal in value to the specified amount notionally allocated. A substantial investment of capital funds would, however, be required to support "full funding" of a Type B United Kingdom product, and this alternative will not be considered further.

2. *Development of values for applied Type B plan.*—The amount notionally allocated to purchase units on receipt of each annual premium is equal to \$1,000 divided by the number of premiums to be received over the life of the plan—\$1,000 ÷ 20 = \$50. Table 4 illustrates the amount actually allocated on receipt of each premium, the accumulated allocation to date, and the reserve maintained—all assuming no capital appreciation in unit values.

It is apparent from Table 4, particularly column (5) and the corresponding formula, that where there has been no change in unit values (i.e., no capital appreciation or depreciation), the values and benefits produced under an applied Type B plan are equivalent to those for an otherwise similar orthodox product.

TABLE 4

Policy Year	Notional Allocation	Actual Allocation(s)		Reserve (CRVM)		
		For Year (1)	To Date (2)	Nonunit (3)	Unit (4)	Total (5)
1.....	\$50.00	\$35.59	\$ 35.59	(\$28.00)	\$ 35.59	\$ 7.59
2.....	50.00	36.85	72.44	(21.35)	72.44	51.09
3.....	50.00	38.14	110.58	(15.39)	110.58	95.19
4.....	50.00	39.46	150.04	(10.06)	150.04	139.98
5.....	50.00	40.81	190.85	(5.40)	190.85	185.45
10.....	50.00	48.11	416.40	7.94	416.40	424.34
15.....	50.00	56.85	682.35	6.96	682.35	689.31
20.....	50.00	68.63	1,000.00	0	1,000.00	1,000.00

Col.

(1) $$50.00(t)\,A_{45+t:\overline{20-t}|} - 50.00(t-1)\,A_{45+t-1:\overline{20-t+1}|}$$

$$= 50.00\,A_{45+t:\overline{20-t}|} + 50.00(t-1)(A_{45+t:\overline{20-t}|} - A_{45+t-1:\overline{20-t+1}|})\,.$$

(2) $$50.00(t)\,A_{45+t:\overline{20-t}|}\,.$$

(3) $${}^{\mathrm{NU}}{}_{t}V^{\mathrm{CRV}}_{45:\overline{20}|} = [1{,}000.00 - 50.00(t)]A_{45+t:\overline{20-t}|} - 1{,}000.00\,\beta^{\mathrm{CRV}}_{45:\overline{20}|}\ddot{a}_{45+t:\overline{20-t}|}\,.$$

(4) $${}^{\mathrm{U}}{}_{t}V^{\mathrm{CRV}}_{45:\overline{20}|} = 50.00(t)\,A_{45+t:\overline{20-t}|}\,.$$

(5) $${}_{t}V^{\mathrm{CRV}}_{45:\overline{20}|} = {}^{\mathrm{U}}{}_{t}V^{\mathrm{CRV}}_{45:\overline{20}|} + {}^{\mathrm{NU}}{}_{t}V^{\mathrm{CRV}}_{45:\overline{20}|}$$

$$= 1{,}000.00(A_{45+t:\overline{20-t}|} - \beta^{\mathrm{CRV}}_{45:\overline{20}|}\ddot{a}_{45+t:\overline{20-t}|})\,.$$

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