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NONPARTICIPATING ADJUSTABLE INDIVIDUAL LIFE POLICIES

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ABSTRACT

Walter L. Chapin's paper "Toward Adjustable Individual Life Policies" (*TSA*, XXVIII, 237) and the adjustable life policies that have been developed and sold are creating a great deal of discussion in the industry. For his contribution to the insurance industry and the actuarial profession, Mr. Chapin should be recognized as the pioneer of this new and highly imaginative product.

In his discussion of the paper, Allan S. Edwards stated: "I read with some alarm that 'the basis of gross premiums and nonforfeiture values is guaranteed by the policy even though a very considerable expansion of premium and insurance may be anticipated.' With rapid inflation in expenses in the past few years, and the possibility of more to come, this provision makes me uneasy. Although the high interest rates traditionally linked with inflation might provide a sufficient offset to increased expenses on a company-wide basis, this offset approach is unlikely to prove equitable for individual ages and plans. The problems associated with a change in mortality table are discussed briefly, but I am not convinced that they have been adequately resolved. This guarantee of gross premium basis makes the plan unsuitable for nonparticipating use and could be uncomfortable on a participating basis. Is this guarantee necessary?"

Other discussion of the adjustable policy has also focused on the problem of the guarantees of premiums and values inherent in Mr. Chapin's approach vis-à-vis the desire to make the product "replacement-proof."

This paper will consider in more detail the differences between provisions necessary for nonparticipating and those necessary for participating adjustable life policies and will provide a possible means of designing nonparticipating policies that can adjust directly to future changes in mortality and interest valuation bases. This approach would eliminate the need referred to by Mr. Edwards to provide extraordinary guarantees beyond those of conventional policies. Examples of its application to a hypothetical series of changes are provided in an appendix. While the paper deals with nonparticipating policy characteristics and guarantees, the method developed is one with significant advantages that are equally applicable to participating policies.

Mr. Chapin's paper covered adequately the description of the adjustable life policy concept, so such a description will not be repeated here. Discussions of concepts or techniques that are identical with those of Chapin are also omitted. For example, the underwriting and service requirements of an adjustable policy do not change with the basis of calculation of premiums and values.

NONPARTICIPATING POLICIES

THERE are several characteristics peculiar to nonparticipating policies that require special treatment if an adjustable version is to be developed. First, the valuation basis for a nonparticipating policy must be more in line with current conditions than that for a participating one. This is because in the case of a participating policy the dividend scale can be adjusted to reflect the difference between the valuation basis and current conditions. This same flexibility is not available with a nonparticipating policy. If standards of mortality, interest, or expense have improved since the adoption of the prior valuation basis, the company selling nonparticipating policies must reflect these improved standards by changes in the premiums or cash values (or both) of its new contracts in order to remain competitive. On the other hand, if these conditions have deteriorated, the nonparticipating policy must provide for increased premiums or lower values in order to remain profitable to the company. Because an adjustable policy permits the owner to increase the face amount subject to underwriting considerations but not to current economic conditions, a single valuation basis for the entire life of the policy does not seem feasible.

A second characteristic of nonparticipating policies is the need to recover the initial underwriting, issue, and sales expenses by the use of a lower early-cash-value scale than might be provided in a participating policy. Thus, while it may be acceptable to offer a participating policy with cash values calculated according to the Commissioners Reserve Valuation Method immediately from the first duration (compensating for these higher early values by lowering the early-year dividend scale), the asset share calculation for a nonparticipating policy may not permit the payment of such high cash values in the early policy years. It is, therefore, more common to observe closer to minimum cash values in nonparticipating policies.

A third characteristic of nonparticipating policies is the fact that the desired gross premium scale may not necessarily bear a logical relation-

ship to the scale of valuation net premiums. For participating policies, a direct relationship can be established simply by adjusting the dividend scale. In fact, there is a convenient means of developing a dividend formula in this case.

These special features of nonparticipating policies cause us to reexamine the approaches to developing reserves, cash values, premiums, and benefits in light of the guarantees that may be offered in a nonparticipating adjustable policy.

The following is a system for calculating nonforfeiture and reserve values that will permit the company to reflect current conditions directly when a change in face amount is made. The system is based upon the principle that, when the policyholder increases his face amount, the reserve basis and nonforfeiture law in effect at the time of such increase, including the mortality and interest rates and the maximum expense allowance, control the values associated with that increased face amount. Previously elected face amounts will continue to be valued on the mortality and interest basis in effect at the time of election. If only the plan changes, the basis of calculating values is not affected.

This method will provide a treatment that is consistent for all policyholders and that reflects the conditions at the time of any increase in face amount.

It may be useful to view the operation of the adjustment provision as using the existing cash value for the purchase of a reduced paid-up policy for whatever amount the cash value will buy under the new plan of insurance. A new premium will be computed for the previous face amount (or the adjusted amount, if less) on a net level basis. An additional net premium will be computed for any increased face amount; the premium will be the same for this adjustment as for a separate policy using an identical expense allowance.

NOTATION

I_{x_1} = Face amount of insurance before change;

β_{x_1} = Revised renewal net premium per dollar for amount I_{x_1} on the revised plan of insurance;

I_{x_2} = Increase or decrease in face amount of insurance as a result of change at attained age x_2;

β_{x_2} = Increase or decrease in renewal net premium per dollar for amount I_{x_2} as a result of change;

${}_{x_2}V$ = Reserve at time of change, attained age x_2;

${}_1E_{x_2}$ = Increased statutory expense allowance as a result of change;

x_2 = Attained age at time of change;

n = Remaining premium-paying period after change;
m = Remaining coverage period after change;
$P_{x_1}^{\text{Adj}}$ = Revised adjusted net premium per dollar for amount I_{x_1};
$P_{x_2}^{\text{Adj}}$ = Increase or decrease in adjusted net premium as a result of change corresponding to I_{x_1};
${}_{x_2}CV$ = Cash value at time of change, attained age x_2;
${}_1E_{x_2}^{\text{Adj}}$ = Additional statutory nonforfeiture expense allowance as a result of change.

Note that I_{x_1}, β_{x_1}, $P_{x_1}^{\text{Adj}}$, and ${}_{x_2}CV$ actually may represent a series of amounts and premiums corresponding to prior status changes, and each status may be based on a unique mortality table and interest rate. The values in this series will be denoted as ${}^rI_{x_1}$, ${}^r\beta_{x_1}$, ${}^rP_{x_1}^{\text{Adj}}$, and ${}_{x_2}^{r}CV$, respectively.

CASH VALUES

For the current standard nonforfeiture law, a scale of cash values for a nonparticipating adjustable insurance policy could be developed as follows:

$$I_{x_1}P_{x_1}^{\text{Adj}} = \frac{I_{x_1}A^{1}_{x_2:\overline{m}|} - {}_{x_2}CV}{\ddot{a}_{x_2:\overline{n}|}}, \tag{1}$$

or, for multiple prior statuses,

$$\sum_{1}^{r} {}^rI_{x_1}\,{}^rP_{x_1}^{\text{Adj}} = \sum_{1}^{r} \frac{{}^rI_{x_1}A^{1}_{x_2:\overline{m}|} - {}_{x_2}^{r}CV}{\ddot{a}_{x_2:\overline{n}|}}. \tag{1a}$$

In order to maintain the full effect of prior expense allowance(s), negative cash values are *not* set to zero.

$$I_{x_2}P_{x_2}^{\text{Adj}} = \frac{I_{x_2}A^{1}_{x_2:\overline{m}|} + {}_1E_{x_2}^{\text{Adj}}}{\ddot{a}_{x_2:\overline{n}|}}, \tag{2}$$

where

$${}_1E_{x_2}^{\text{Adj}} = 0 \qquad \text{if } I_{x_2} \leq 0$$

$$= I_{x_2}\left[0.4\left\{\begin{matrix} P_{x_2}^{\text{Adj}} \\ 0.04 \end{matrix}\right\} + 0.25\left\{\begin{matrix} P_{x_2}^{\text{Adj}} \\ P_{x_2}^{\text{AOL}} \\ 0.04 \end{matrix}\right\} + 0.02\right] \qquad \text{if } I_{x_2} > 0\,;$$

here $P_{x_2}^{\text{AOL}}$ is the adjusted premium per \$1 for a whole life policy issued at age x, and braces indicate the least quantity contained therein. For future nonforfeiture laws, ${}_1E_{x_2}^{\text{Adj}}$ shall not be greater than the maximum per-

mitted by law at the time of any increase in face amount for the plan of insurance applied for.

If more than one basis (interest, mortality, or both) of cash values were used prior to the current change, then equation (1) actually would be the sum of several similar expressions, one for each prior basis, using the corresponding face amounts and cash values.

If the basis of cash values changed after the previous change in the policy, equation (1) would continue to be computed on the prior basis (or bases). Equation (2) is not used when I_{x_1} is negative or zero.

When I_{x_1} and $P_{x_1}^{\text{Adj}}$ are positive, the cash value calculated according to the formula

$$I_{x_2}(A^{\,1}_{\overline{x_2+t:m-t|}} - P_{x_2}^{\text{Adj}}\ddot{a}_{\overline{x_2+t:n-t|}}) \tag{3}$$

will never be less than zero (except for calculating further changes in adjusted premium on subsequent adjustments).

If equation (1) produces a negative $P_{x_1}^{\text{Adj}}$, or equation (1a) produces a negative ${}^{r}P_{x_1}^{\text{Adj}}$ for any r, then any such ${}^{r}P_{x_1}^{\text{Adj}}$ will be set equal to zero and equation (2) will be restated as

$$I_{x_2}P_{x_2}^{\text{Adj}} = \frac{1}{\ddot{a}_{\overline{x_2:n|}}}[I_{x_2}A^{\,1}_{\overline{x_2:m|}} + {}_{1}E_{x_2}^{\text{Adj}} - \Sigma\,({}_{x_2}^{r}CV - {}^{r}I_{x_1}A^{\,1}_{\overline{x_2:m|}}) \not< 0]\,, \tag{4}$$

using the same definitions as before.

In order that the subsequent cash values in such cases be not lower than the single premium purchasable by $({}_{x_2}CV - I_{x_1}A^{\,1}_{\overline{x_2:m|}})$, the cash value calculated according to the formula

$$I_{x_2}(A^{\,1}_{\overline{x_2+t:m-t|}} - P_{x_2}^{\text{Adj}}\ddot{a}_{\overline{x_2+t:n-t|}})$$

will not be less than

$$\sum\left[\frac{({}_{x_2}^{r}CV - {}^{r}I_{x_1}A^{\,1}_{\overline{x_2:m|}}) \not< 0}{A^{\,1}_{\overline{x_2:m|}}}\right]A^{\,1}_{\overline{x_2+t:m-t|}}\,.$$

If the change in status involves a large enough decrease in the face amount (I_{x_2} negative) to cause a previous valuation basis to disappear totally, special provision must be made. An example follows:

Status 1, valuation basis 1, amount	\$20,000
Status 2, valuation basis 2, amount increased	10,000
Total amount	\$30,000
Status 3, amount decreased	15,000
Total amount	\$15,000

The cash value associated with status 2 would be used to purchase reduced paid-up on the new plan on valuation basis 2. The remaining amount of insurance would be calculated using the valuation basis associated with status 1. A LIFO (last in, first out) system of reducing amounts would be adopted.

Consistent application of this system will avoid arbitrary discrimination against policyholders but also will protect the company against unreasonable antiselection through potential policyholder manipulation.

These formulas are not necessarily applicable only to nonparticipating policies. Note that at issue formula (2) would be the only formula needed. In other words, all the x_1 amounts would be zero at time of issue. The resulting policy would have minimum cash values for the plan, issue amount, and age at issue. At each subsequent increase in face amount, the system provides a new expense allowance equivalent to that for a separate policy issued for the increased face amount at the attained age on the new plan of insurance. No additional expense allowance would be permitted for the original amount of insurance in force prior to the change.

In the extreme example of a change from short-period term insurance to short-period endowment, or to short-premium-period whole life for the same amount, presumably the company would load the term premium for the full underwriting costs at issue. No additional underwriting would be necessary at the time of change. However, there would be no statutory expense allowance available to cover increased commissions, and this might cause some problems for the company. It is thought, though, that the rarity of any such extreme change and the desirability (because of improved persistency, cash flow, etc.) of accommodating such a change would offset this disadvantage. Of course, the company could protect itself by loading its endowment premiums to reflect properly this inability to recover the cost directly from the increased expense allowance, or by incorporating policy language to prohibit such extreme adjustments.

The previous formulas are not tied directly to a specific nonforfeiture law. Each time the standard nonforfeiture law changes, a different mortality, interest, and expense allowance basis could be used for the increased face amount and increased premium. In the above formulas, I_{x_1} represents the amount of insurance in force prior to the change. In the event that there has been more than one valuation/nonforfeiture basis used prior to the change, I_{x_1} actually could represent the sum of several amounts, one on each of the different bases used previously. Each different amount could have associated with it the mortality, interest,

and expense allowance basis in effect at the time the increased insurance was purchased.

For example, if a policyholder originally bought \$10,000 of insurance when the valuation/nonforfeiture basis was 1958 CSO at 3 percent and subsequently increased his insurance to \$25,000 at $3\frac{1}{2}$ percent interest, I_{x_1} would represent \$10,000 at 3 percent and \$15,000 at $3\frac{1}{2}$ percent. Formula (1) would be applied twice to find two $P_{x_1}^{\text{Adj}}$'s, one for \$10,000 at 3 percent and one for \$15,000 at $3\frac{1}{2}$ percent.

It should be noted that, in the case where the amount of insurance is increased and the plan of insurance is unchanged, $P_{x_1}^{\text{Adj}}$ is the same as the total of the prior P_x^{Adj}'s on the policy before the change. $P_{x_1}^{\text{Adj}}$ then will be the same as the adjusted premium for a new policy at the insured's attained age. In other words, when the policyholder maintains the same plan of insurance for the life of the policy, this method is equivalent in terms of increased premiums and values to the purchase of a separate policy at the attained age of the insured.

Because the expense allowance permitted on an increase is identical with that for a separate policy of the same plan, attained age, and amount, the increased cash value that results is also identical and therefore is not less than the minimum required by law. Of course, any other expense allowance formula for ${}_1E_{x_1}^{\text{Adj}}$ that produces a lower expense allowance could be used.

The approach requires the maintenance of more than one mortality/interest basis for policies for which the basis has changed since original issue. The system of administration would need to handle two or possibly more nonforfeiture valuation bases on a single policy. This is discussed later in the paper. The total nonforfeiture value would be the sum of the values calculated on the individual bases.

This aspect presents no additional problem for paid-up values. For extended term insurance, the existence of several valuation bases would result in different extended term periods for each face amount associated with each basis. Thus, if, at attained age y, CV_y^1 and I_y^1 represent the cash value and face amount, respectively, associated with the earliest valuation basis, CV_y^2 and I_y^2 the cash value and amount on the next basis, and so on, then there would be several extended term periods calculated as follows:

$$I_y^1 A^1_{y:\overline{t_1}|} = CV_y^1 \tag{5}$$

$$I_y^2 A^1_{y:\overline{t_2}|} = CV_y^2 , \tag{6}$$

and so on.

Alternatively, a single t could be calculated such that

$$I^1_y A^1_{y:\overline{t}|} + I^2_y A^2_{y:\overline{t}|} + \ldots = CV^1_y + CV^2_y + \ldots, \tag{7}$$

where $A^1, A^2, \ldots$, represent single premium functions calculated on the valuation basis in effect at the time of purchase of $I^1, I^2, \ldots$. However, t could be determined only by a series of trial-and-error calculations.

The caveat in formula (3) is necessary under the current standard nonforfeiture law to guarantee that cash values under this method are equal to the minimum required. The standard nonforfeiture law currently being considered by the Society of Actuaries would permit a reduction in cash value with the increase in face amount. However, for competitive reasons companies may choose not to reduce cash values under these circumstances. If a prospective policyholder could obtain for the same price (excluding a policy fee) a separate policy that did not have the effect of negative cash values, or if he sees that initially he is obtaining less cash value for an increased premium, such increases may not be attractive to him.

RESERVES

For the calculation of reserves,

$$I_{x_1}\beta_{x_1} = \frac{I_{x_1}A^1_{x_2:\overline{m}|} - {}_{x_2}V}{\ddot{a}_{x_2:\overline{n}|}}, \tag{8}$$

or, for multiple prior statuses,

$$\sum_1^r {}^rI_{x_1}\,{}^r\beta_{x_1} = \sum_1^r \frac{{}^rI_{x_1}A^1_{x_2:\overline{m}|} - {}_{x_2}V}{\ddot{a}_{x_2:\overline{n}|}}; \tag{8a}$$

$$I_{x_2}\beta_{x_2} = \frac{I_{x_2}A^1_{x_2:\overline{m}|} + {}_1E_{x_2}}{\ddot{a}_{x_2:\overline{n}|}}, \tag{9}$$

where

$${}_1E_{x_2} = 0 \qquad \text{if } I_{x_2} \leq 0$$

$$= \text{lesser of} \begin{Bmatrix} I_{x_2}(\beta_{x_2} - c_{x_2}) \not< 0 \\ I_{x_2}({}_{19}P_{x_2+1} - c_{x_2}) \end{Bmatrix} \qquad \text{if } I_{x_2} > 0$$

for the current standard valuation law. For future valuation laws, ${}_1E_{x_2}$ should not be greater than the maximum permitted by law at the time of any increase in face amount.

If more than one valuation basis has been used prior to the current change, equation (8) represents the sum of several similar equations

using the corresponding face amount and reserve for each basis as shown in equation (8a).

If the valuation basis has changed since the previous change in the policy, the prior valuation basis should be used in equation (8). Equation (9) is not used if I_{x_1} is negative or zero.

When I_{x_1} and β_{x_1} are positive, the reserve calculated according to the formula

$$I_{x_2}(A^1_{x_2+t:\overline{m-t}|} - \beta_{x_2}\ddot{a}_{x_2+t:\overline{n-t}|})$$

shall never be less than zero.

If the result of equation (8) is a negative β_{x_1} or of equation (8a) a negative ${}^r\beta_{x_1}$ for any r, then ${}^r\beta_{x_1}$ should be set to zero and equation (9) restated as

$$I_{x_2}\beta_{x_2} = \frac{1}{\ddot{a}_{x_2:\overline{n}|}}\{I_{x_2}A^1_{x_2:\overline{m}|} + {}_1E_{x_2} - \Sigma[({}^rV_{x_2} - {}^rI_{x_1}A^1_{x_2:\overline{m}|}) \lessdot 0]\}, \quad (10)$$

using the same definitions as before.

Just as in the case of the cash-value formulas, the above reserve formulas permit the use of a separate valuation basis for each combination of increased face amount and premium. The other comments relative to the cash-value scale also apply. The increased reserves according to this method would be identical to those for a separate policy of the same plan, attained age, and amount, and therefore would be equal to the minimum permitted by law. Of course, any other formula that contains a lower expense allowance or provides higher reserves could be used.

SURPLUS STRAIN

The expense allowance formula inherent in Mr. Chapin's paper will not provide for an increased statutory expense allowance in certain cases where the face amount and premium are increased as a result of a change in a policy. Specifically, this occurs when a policyholder first decreases his coverage and premium and subsequently increases his coverage but to a lower premium level.

This comes about by virtue of Mr. Chapin's rule that

$$I_{x_m}\Delta_{x_m} = I_{x_m}(\pi_{x_m} - c_{x_m}) - I_{x_{m-1}}(\pi_{x_{m-1}} - c_{x_{m-1}}),$$

where

I_{x_m} = Amount of insurance in force during the mth status;

$I_{x_m}\Delta_{x_m}$ = Allowance for statutory expense in first year of status m; and

$I_{x_m}\pi_{x_m}$ = CRVM net premium during the mth status.

However, where $I_{x_m}\Delta_{x_m}$ is negative by the above formula, $I_{x_m}\Delta_{x_m}$ is taken as zero, and the total of statutory expenses through the $(m-1)$st status, $\Sigma_{r=1}^{m-1} I_{x_r}\Delta_{x_r}$, is treated as the total in the mth status for the purpose of computing $I_{x_{m+1}}\Delta_{x_{m+1}}$. Thus, where $I_{x_m}\Delta_{x_m} = 0$, $I_{x_{m+1}}\Delta_{x_{m+1}}$ is not the full increase in statutory expenses normally available for the plan and increase in amount of insurance at the attained age, and, in fact, still could be zero.

As an example, if a policyholder bought $100,000 of whole life insurance, decreased it to $10,000, and shortly thereafter increased it back to $75,000, the above formulas would not permit any additional statutory expense allowance. However, the company undoubtedly will incur added expenses of underwriting and perhaps will pay an increased first-year commission. The result would be a significant strain on surplus, especially for nonparticipating policies. The company may be inclined not to encourage subsequent increases in face amount in these circumstances.

Formulas (1), (2), (8), and (9) provide the company with an increased expense allowance for reserves and cash values at the time of each increased face amount. As a result, it would be able to recoup some increased expenses under the circumstances described previously.

To avoid the possibility that an agent might find it advantageous, in order to obtain additional first-year commissions, to persuade the policyholder to reduce and increase his face amount periodically, the company would want to establish rules that deny first-year commissions whenever a policyholder lowers and then shortly afterward raises his face amount. It probably is easier to control this situation with the adjustable policy than with conventional policies, since a conventional policy may replace coverage previously lapsed in other policies and the company may not connect the two events as readily.

DETERMINATION OF GROSS PREMIUM

Premiums for nonparticipating insurance generally do not bear a logical relationship to valuation premiums. The company issuing nonparticipating insurance likely will base its gross premium scales on asset shares or other profitability studies. These scales would form the basis of premiums for new increases in amounts on existing adjustable life insurance policies as well as for new issues. However, for an adjustable life policy, it is desirable to have the gross premium bear some formula relationship to the net premium, even if it is arbitrary. Therefore, with some testing, a formula based on the age at issue, net or adjusted premiums, term of insurance, or any other determinable feature of the policy can be developed for current issues of insurance. The company would

want to maintain the previous amounts of insurance at the gross premium scale in effect at the time they were issued and therefore must maintain records of all prior premium scales. The formula in effect at the time of purchase of a particular face amount would determine the formula to be used in the event of a subsequent plan change.

OTHER FEATURES

Benefits such as options to purchase additional insurance, automatic increases in insurance based on cost-of-living changes, waiver of premium disability benefits, accidental death benefits, and so forth, can be incorporated in a nonparticipating policy as well as a participating policy through this approach to cash values, reserves, and premiums. Substandard insurance also may be issued using the company's substandard scale at the time of issue. Thus, the premium for a policy may combine a standard premium for the original issue and a substandard premium for a subsequent increase in insurance if the insured's health has deteriorated, or vice versa. If the company maintains records showing substandard extra premiums and substandard amounts, all the required valuation, premium, and other information can be developed.

ADMINISTRATION

The use of separate nonforfeiture, valuation, and gross premium bases requires an administrative system capable of maintaining this information. This type of system is not unduly burdensome with current computer capabilities, although the already lengthy policy record will need to be expanded further.

There are, in fact, several other administrative advantages to maintaining separate data on each increased face amount of the policy as it is purchased. For one thing, it is possible that more than one agent will be involved in a particular policy after it has been in effect for many years. The older the policy becomes, the more likely is this possibility. The separate-piece administrative system, by keeping track of the amounts and premiums on each piece separately, permits the direct payment of commissions based on separate schedules. The approach also is advantageous if the insured changes from a standard to a substandard premium class. In this event, the separate ratings can be maintained directly instead of requiring the calculation of an "average" class based on the original premium class and the current premium class.

Also, if the company maintains GAAP financial statements, it can keep separate records of initial acquisition cost on each piece as it is sold. The computer space and calculation requirements should not represent a significant burden, and the resulting direct computation capability

should offset any perceived disadvantage. Annual statement, lapse, mortality, and audit data also will be obtainable more directly under this approach. It is not necessary for the policyholder to be aware of the separate calculations made for each face amount, and presumably the schedule of cash and nonforfeiture values could be prepared as the sum of all individual pieces without showing each piece separately. However, for the purposes of the incontestable and suicide provisions, it would be helpful for the company to prepare a schedule showing the effective data of each increase in face amount. A similar schedule for the loan and the waiver of premium provisions also may be advantageous.

TESTING FOR ANOMALIES

If the method selected for adjustable life cash-value calculations is to be considered sound, it should not permit the policyholder to manipulate his timing of purchases of coverage in order to obtain a higher cash value for the same coverage while having paid less in premiums. As an example, if a policyholder aged 35 purchases term to age 55 insurance and then, one or more years later, adjusts it to endowment at age 55, the premium at the time of conversion should be higher and the cash values for the converted policy should be less than those for endowment at age 55 issued at age 35. As another example, a person aged 35 who buys term to age 55 and adjusts one year later to endowment at age 55 should have a lower premium and better cash values than a person who initially buys endowment at age 55, at age 36. These conditions always will hold algebraically when the first-year expense allowance is a linear, positive function of the premium and face amount associated with the coverage. Table 1 illustrates the impact of various purchase patterns on the cash values. All purchases are originally at age 35 nearest birthday, and all values are based on the 1958 CSO Table at 3 percent. If the scale is appropriate, we would want, for a specific attained age, the cash values during the endowment period to follow the patterns that meet the two types of tests described previously. We would want the cash values to be highest under A, to be greater under B than under D, and to be greater under C than under E. Table 1 indicates that these relationships hold.

GUARANTEES

While this approach does not guarantee the premium rates for future increases in the amount of insurance, the total cost of insurance on the initial piece is guaranteed. Purchases pursuant to the adjustability feature may be compared to elections under a guaranteed insurability rider of the type currently available. In neither case is the premium rate

guaranteed; rather, the premium rates and the plans available at the time of purchase of the additional insurance govern.

A company could guarantee a particular cash value, valuation, and premium basis for limited amounts of insurance for a relatively short period of time, perhaps five or ten years following issuance of the policy, as an additional guarantee feature. Under current conditions for life insurance products, however, this probably is not a very attractive guarantee.

Another guarantee inherent in traditional life insurance policies is the policy loan rate. Currently there is a maximum rate of 6 percent in some states and 8 percent in others. A company issuing an adjustable life policy must consider whether it is willing to guarantee the current maximum loan rate for all future increases in face amount and cash value. If interest rates remain at the present high levels, it is possible that the statutory limit on loan interest rates might be increased and that companies, in order to keep their premium and cost indexes at the lowest possible level, may adopt these higher rates. If this occurs, an adjustable policy with a lower guaranteed interest rate may not be able to compete with new policy issues for future increases in coverage.

One possible solution consistent with the approach outlined in this paper is to have a separate loan rate associated with each increase in

TABLE 1

RELATIONSHIP OF CASH VALUE TO PURCHASE PATTERN

Attained Age	Purchase Endowment at Age 55 (A)	Purchase Term to Age 55			
		Adjust to Endowment at Age 55		Lapse Policy and Purchase Endowment at Age 55	
		One Year Later (B)	Two Years Later (C)	One Year Later (D)	Two Years Later (E)
	Cash Value				
36	−$ 1.77	−$20.70	−$20.70	−$20.70	−$20.70
37	38.02	19.84	− 16.97	0.73	− 16.97
38	78.96	61.56	26.31	43.26	3.51
	Endowment Adjusted Premium				
	$41.15	$42.47	$45.17	$43.87	$46.91

face amount, based on the statutory maximum at the time of the increase. This would not add materially to the administrative cost, since, for purposes of future changes, the company must maintain records of each value associated with each change. Presumably, the policyholder would be given a loan first at the lowest rate available on his policy, then at the next lowest rate, and so forth, in order to provide the same flexibility he would have if he had purchased separate policies.

SUMMARY

If, for conventional policies, nonparticipating insurance is a viable alternative to participating insurance, it would seem that it also should be viable for adjustable policies. The implicit guarantees and the lower initial outlay associated with nonparticipating policies are desirable features to certain prospects. In this paper, a method of designing competitive nonparticipating adjustable life policies has been described. While this approach also could be used for participating insurance, it is not as necessary for those policies as it is for nonparticipating policies. The method employs a separate policy approach that gives the policyholder the full advantage of current conditions where they are favorable and the company the ability to provide for conditions that may turn unfavorable. It also gives the policyholder as much flexibility as he would have by purchasing separate policies.

APPENDIX

This appendix shows examples of the application of the method described in the paper to a hypothetical policy. The plan changes from coterminous term to whole life to limited payment life as the premium increases.

Mortality basis (valuation): 1958 CSO Table, age last birthday—male.

Gross premium: 110 percent of CRVM renewal net premium plus \$2 per \$1,000 with a \$20 maximum policy fee. Although an actual formula probably would be more complex, this simplified formula is used for illustrative purposes.

INITIAL POLICY

Age: 20.
Face amount: \$10,000.
Plan: Whole life.
Gross premium: To be determined.
Interest basis: 3 percent.

From formula (2),

$$10{,}000P_{20}^{\text{Adj}} = \frac{10{,}000A_{20}^{3\%} + {}_1E_{20}}{\ddot{a}_{20}^{3\%}}$$

and

$$
\begin{aligned}
{}_1E_{20} &= 10{,}000[0.65(\min\{P_{20}^{\mathrm{Adj}}, 0.04\}) + 0.02] \\
&= 269.93948 .
\end{aligned}
$$

We then have $10{,}000P_{20}^{\mathrm{Adj}} = 107.5992$, which is, of course, the adjusted premium for a conventional ordinary life policy. From formula (9),

$$
\begin{aligned}
10{,}000\beta_{20} &= \frac{10{,}000(A_{20}^{3\%} + \beta_{20} - c_{20}^{3\%})}{\ddot{a}_{20}^{3\%}} \\
&= 100.3294 ,
\end{aligned}
$$

as it also would be for a conventional policy.

$$
\begin{aligned}
\text{Gross premium} &= 1.10(100.3294) + 20 \\
&= 130.36 .
\end{aligned}
$$

FIRST CHANGE

Age: 25 (policy year 5).
Face amount: \$20,000.
Plan: To be determined.
Gross premium: \$250.00.
Interest basis: $3\frac{1}{2}$ percent.

$$
\begin{aligned}
{}_5CV &= 10{,}000A_{25}^{3\%} - 107.5992\ddot{a}_{25}^{3\%} \\
&= 176.17 ;
\end{aligned}
$$

$$
\begin{aligned}
{}_5V &= 10{,}000A_{25}^{3\%} - 100.3294\ddot{a}_{25}^{3\%} \\
&= 355.22 ;
\end{aligned}
$$

$$
\begin{aligned}
10\,000(\beta_{20} + \beta_{25}) &= (250 - 20)/1.10 \\
&= 209.0909 ;
\end{aligned}
$$

$$
I_{20} = \$10{,}000 ;
$$

$$
I_{25} = \$10{,}000 .
$$

From equations (8) and (9),

$$
10{,}000\beta_{20}\ddot{a}_{25:\overline{n}|}^{3\%} = 10{,}000A_{25:\overline{n}|}^{3\%} - 355.22 ;
$$

$$
10{,}000\beta_{25}\ddot{a}_{25:\overline{n}|}^{3\frac{1}{2}\%} = 10{,}000(A_{25:\overline{n}|}^{1\,3\frac{1}{2}\%} + \beta_{25} - c_{25}) .
$$

The case where the plan of insurance is unknown is the most complex. Successive approximation to the benefit and premium-paying period is necessary. The solution can be performed by computer, beginning with whole life to see whether the plan is coterminous term or limited payment life.

For whole life (first test),

$$10{,}000\beta_{20}^{\text{Test}}\ddot{a}_{25}^{3\%} = 10{,}000A_{25}^{3\%} - 355.22$$

and

$$10{,}000\beta_{25}^{\text{Test}}\ddot{a}_{26}^{3\frac{1}{2}\%} = 10{,}000A_{26}^{3\frac{1}{2}\%}.$$

Solving,

$$10{,}000\beta_{20}^{\text{Test}} = 100.3294 \quad \text{(same as before)}$$

and

$$10{,}000\beta_{25}^{\text{Test}} = 107.3934.$$

Note that $10{,}000\beta_{20}^{\text{Test}} + 10{,}000\beta_{25}^{\text{Test}} = 207.7228 < 209.0909 = 10{,}000\beta_{20} + 10{,}000\beta_{25}$. Since the premium for the plan is greater than the premium for whole life, the plan is limited payment life and the premium-paying period needs to be determined.

If a computer program were being developed, the next test probably would be to determine whether the plan is more or less expensive than twenty-payment life (in order to determine the expense allowance formula to use for the next test).

After successive approximation, it will be found that the plan of insurance is life paid up at age 83 and that

$$10{,}000\beta_{20} = 100.94407$$

and

$$I_{25}\beta_{25} = 209.0909 - 100.94407$$

$$= 108.14683.$$

These values produce a face amount of \$10,018 for I_{25}. The difference is due to the fact that $10{,}000\beta_{25}$ for life paid up at age 83 is actually 107.94989, but there would not be sufficient premium to provide \$20,000 of life paid up at age 82.

Adjusted net premiums then may be developed from formulas (1) and (2) as follows:

$$10{,}000P_{20}^{\text{Adj}} = \frac{10{,}000A_{25}^{3\%} - 176.17}{\ddot{a}_{25:\overline{58}|}^{3\%}}$$

$$= 108.2583;$$

$$10{,}018P_{25}^{\text{Adj}} = \frac{10{,}018(A_{25}^{3\frac{1}{2}\%} + 0.4P_{25}^{\text{Adj}} + 0.25P_{25}^{\text{AOL},3\frac{1}{2}\%} + 0.02)}{\ddot{a}_{25:\overline{58}|}^{3\frac{1}{2}\%}}$$

$$= \frac{10{,}018(A_{25}^{3\frac{1}{2}\%} + 0.25P_{25}^{\text{AOL},3\frac{1}{2}\%} + 0.02)}{\ddot{a}_{25:\overline{58}|}^{3\frac{1}{2}\%} - 0.4}$$

$$= 116.4248 .$$

SECOND CHANGE

Age: 30 (policy year 10).
Face amount: To be determined.
Plan: Twenty-year term.
Gross premium: $250.00.
Interest basis: 3 percent.

$$_{10}CV = (10{,}000A_{30}^{3\%} - 108.2583\ddot{a}_{30:\overline{53}|}^{3\%})$$
$$+ (10{,}018A_{30}^{3\frac{1}{2}\%} - 116.4248\ddot{a}_{30:\overline{53}|}^{3\frac{1}{2}\%})$$
$$= 694.35 + 210.32 ;$$

$$_{10}V = (10{,}000A_{30}^{3\%} - 100.94407\ddot{a}_{30:\overline{53}|}^{3\%})$$
$$+ (10{,}018A_{30}^{3\frac{1}{2}\%} - 108.14683\ddot{a}_{30:\overline{53}|}^{3\frac{1}{2}\%})$$
$$= 863.77 + 387.85 .$$

From the gross premium formula,

$$I_{20}\beta_{20} + I_{25}\beta_{25} + I_{30}\beta_{30} = (250 - 20)/1.1$$
$$= 209.09091 .$$

To begin, assume that $I_{20} = 10{,}000$ and $I_{25} = 10{,}018$. Since $10{,}000A_{30:\overline{20}|}^{3\%} = 546.46 < 694.35$, we must invoke the conditions of formulas (4) and (10).

$$10{,}000\beta_{20} = 0 ;$$

$$10{,}018\beta_{25} = \frac{10{,}018A_{30:\overline{20}|}^{3\frac{1}{2}\%} - 387.85}{\ddot{a}_{30:\overline{20}|}^{3\frac{1}{2}\%}}$$

$$= 9.01413 .$$

Therefore,

$$I_{30}\beta_{30} = 209.09091 - 9.01413 - 0$$
$$= 200.07678 .$$

From equation (10),

$$I_{30}\beta_{30} = \frac{I_{30}A^{3\%}_{\overline{30:20}|} + I_{30}\beta_{30} - I_{30}c^{3\%}_{30} - (863.77 - 546.46)}{\ddot{a}^{3\%}_{\overline{30:20}|}}$$

$$= \frac{I_{30}A^{3\%}_{\overline{31:19}|}}{\ddot{a}^{3\%}_{\overline{31:19}|}} - \frac{863.77 - 546.46}{\ddot{a}^{3\%}_{\overline{30:20}|} - 1} ;$$

$$200.07678 = I_{30}(0.003769177) - 22.75955 ;$$

$$I_{30} = 59{,}121 .$$

The total face amount is $I_{20} + I_{25} + I_{30} = 10{,}000 + 10{,}018 + 59{,}121 = 79{,}139$.

$$10{,}000P^{\text{Adj}}_{20} = 0 ;$$

$$10{,}018P^{\text{Adj}}_{25} = \frac{10{,}018A^{3\frac{1}{2}\%}_{\overline{30:20}|} - 210.32}{\ddot{a}^{3\frac{1}{2}\%}_{\overline{30:20}|}}$$

$$= 21.38444 .$$

From equation (4),

$$59{,}121P^{\text{Adj}}_{30}\ddot{a}_{\overline{30:20}|} = 59{,}121(A^{3\%}_{\overline{30:20}|} + 0.02 + 0.65P^{\text{Adj},3\%}_{30}) - (694.35 - 546.46) ;$$

$$59{,}121P^{\text{Adj}}_{30} = \frac{59{,}121(A^{3\%}_{\overline{30:20}|} + 0.02) - (694.35 - 546.46)}{\ddot{a}^{3\%}_{\overline{30:20}|} - 0.65}$$

$$= 298.44148 .$$

THIRD CHANGE

Age: 35 (policy year 15).
Face amount: $40,000.
Plan: Whole life.
Gross premium: To be determined.
Interest basis: 3½ percent.

To provide a face amount of $40,000, set $I_{20} = 10{,}000$, $I_{25} = 10{,}018$, and $I_{30} = 19{,}982$.

$$
\begin{aligned}
{}_{15}CV &= 10{,}000A^{3\%}_{\overline{35:15}|} - 0 \\
&\quad + 10{,}018A^{3\frac{1}{2}\%}_{\overline{35:15}|} - 21.38444\ddot{a}^{3\frac{1}{2}\%}_{\overline{35:15}|} \\
&\quad + (59{,}121A^{3\%}_{\overline{35:15}|} - 298.44148\ddot{a}^{3\%}_{\overline{35:15}|}) \\
&\quad\quad < 147.89\frac{A^{3\%}_{\overline{35:15}|}}{A^{3\%}_{\overline{30:20}|}} \\
&= 518.30 + 248.28 + 140.27 \\
&= 906.85 ;
\end{aligned}
$$

$$
\begin{aligned}
{}_{15}V &= 10{,}000A^{3\%}_{\overline{35:15}|} - 0 \\
&\quad + 10{,}018A^{3\frac{1}{2}\%}_{\overline{35:15}|} - 9.01413\ddot{a}^{3\frac{1}{2}\%}_{\overline{35:15}|} \\
&\quad + 59{,}121A^{3\%}_{\overline{35:15}|} - 200.07678\ddot{a}^{3\%}_{\overline{35:15}|} \\
&= 518.30 + 392.41 + 660.49 \\
&= 1{,}571.20 ;
\end{aligned}
$$

$$
\begin{aligned}
10{,}000P^{\text{Adj}}_{20} &= \frac{10{,}000A^{3\%}_{35} - 518.30}{\ddot{a}^{3\%}_{35}} \\
&= 142.44511 ;
\end{aligned}
$$

$$
\begin{aligned}
10{,}018P^{\text{Adj}}_{25} &= \frac{10{,}018A^{3\frac{1}{2}\%}_{35} - 248.28}{\ddot{a}^{3\frac{1}{2}\%}_{25}} \\
&= 141.62968 ;
\end{aligned}
$$

$$
\begin{aligned}
19{,}982P^{\text{Adj}}_{30} &= \frac{19{,}982A^{3\%}_{35} - 140.27}{\ddot{a}^{3\%}_{35}} \\
&= 325.59063 ;
\end{aligned}
$$

$$
\begin{aligned}
10{,}000\beta_{20} &= \frac{10{,}000A^{3\%}_{35} - 518.30}{\ddot{a}^{3\%}_{35}} \\
&= 142.44511;
\end{aligned}
$$

$$10{,}018\beta_{25} = \frac{10{,}018A_{35}^{3\frac{1}{2}\%} - 392.41}{\ddot{a}_{35}^{3\frac{1}{2}\%}}$$

$$= 134.54243 ;$$

$$19{,}982\beta_{30} = \frac{19{,}982A_{35}^{3\%} - 660.49}{\ddot{a}_{35}^{3\%}}$$

$$= 301.79498 ;$$

$$\text{Gross premium} = (142.44511 + 134.54243 + 301.79498)1.1 + 20$$

$$= 656.66 .$$

FOURTH CHANGE

Age: 40 (policy year 20).
Face amount: $20,000.
Plan: Whole life.
Gross premium: To be determined.
Interest basis: $3\frac{1}{2}$ percent.

$$_{20}CV = 10{,}000A_{40}^{3\%} - 142.44511\ddot{a}_{40}^{3\%}$$

$$+ 10{,}018A_{40}^{3\frac{1}{2}\%} - 141.62968\ddot{a}_{40}^{3\frac{1}{2}\%}$$

$$+ 19{,}982A_{40}^{3\%} - 325.59063\ddot{a}_{40}^{3\%}$$

$$= 1{,}239.04 + 933.96 + 1{,}648.51$$

$$= 3{,}821.51 ;$$

$$_{20}V = 10{,}000A_{40}^{3\%} - 142.44511\ddot{a}_{40}^{3\%}$$

$$+ 10{,}018A_{40}^{3\frac{1}{2}\%} - 134.54243\ddot{a}_{40}^{3\frac{1}{2}\%}$$

$$+ 19{,}982A_{40}^{3\%} - 301.79498\ddot{a}_{40}^{3\%}$$

$$= 1{,}239.04 + 1{,}067.98 + 2{,}129.18$$

$$= 4{,}436.20 .$$

In this situation, the new amount is sufficiently low to eliminate the third status. The first step is to determine the amount of paid-up insurance purchased by the cash value of the third status. This results in

$$\frac{1{,}648.51}{A_{40}^{3\%}} = 4{,}005 = I_{30} .$$

Then I_{25} must be reduced to bring the total face amount to \$20,000. Thus,

$$\begin{aligned} I_{20} &= 10{,}000 ; \\ I_{25} &= 20{,}000 - I_{20} - I_{30} \\ &= 20{,}000 - 10{,}000 - 4{,}005 \\ &= 5{,}995 ; \\ 10{,}000P_{20}^{\text{Adj}} &= 142.44511 \end{aligned}$$

as before (no change in plan or face amount).

$$\begin{aligned} 5{,}995P_{25}^{\text{Adj}} &= \frac{5{,}995A_{40}^{3\frac{1}{2}\%} - 933.96}{\ddot{a}_{40}^{3\frac{1}{2}\%}} \\ &= 64.91996 ; \\ 19{,}982P_{30}^{\text{Adj}} &= 0 ; \\ 10{,}000\beta_{20} &= 142.44511 \quad \text{(as before)} ; \\ 5{,}995\beta_{25} &= \frac{5{,}995A_{40}^{3\frac{1}{2}\%} - 1{,}067.98}{\ddot{a}_{40}^{3\frac{1}{2}\%}} \\ &= 57.83241 ; \\ \text{Gross premium} &= (142.44511 + 57.83241)1.1 + 20 \\ &= 240.31 . \end{aligned}$$

DISCUSSION OF PRECEDING PAPER

THOMAS C. POWELL:

This paper is well organized and certainly will be helpful to companies that embrace the adjustable life concept. Since my remarks tend to be negative, let me begin by admitting that I am not very enthusiastic about this product.

Neither this paper nor Mr. Chapin's presents a compelling case demonstrating the need for adjustable life insurance. The product is treated as a natural step in the evolution of life insurance, but repeated allusions to modern computer capabilities suggest that adjustable life is as much a symptom of software fever as a response to the marketplace.

Adjustable life provides impressive flexibility in that the face amount or premium or both may be changed in either direction. Under some plans, changes may take place automatically through a cost-of-living provision, while for others changes are facultative, requiring a specific decision from the policyholder. Most would agree that the automatic-increase mechanism fulfills a need for inflation-linked protection, and that a similar approach could be used in individual policy pension plans, which have plagued the industry with small additional policies. Such cost-of-living provisions represent an expansion of the guaranteed insurability option that has been used widely for more than twenty years. Facultative changes, however, generally represent a response to changes in the policyholder's particular circumstances and can be handled adequately, if not elegantly, with traditional products.

Sometimes we forget that those outside the industry have other things besides life insurance on their minds. To the consumer who wishes to have his problems simplified, adjustable life presents too many choices that have little meaning. Because the customer's life insurance needs are difficult to quantify, we risk overcharging him for the illusion of being able to fine-tune his insurance program. I realize that there are many agents who could and would provide service commensurate with the adjustable life policyholder's expectations, but there are many others who would rather sell a good story than supply needed protection.

Nonparticipating Policies

In the first section of the paper the author discusses the reasons for his approach, which develops premiums and values appropriate to "current conditions." As the heading suggests, he is addressing differences

between participating and nonparticipating plans and identifying those features of nonparticipating plans that must be adjusted to overcome the participating plan's inherent advantage—the ability to adapt to changing circumstances through the dividend scale rather than through repricing. Actually, the relationship between participating and nonparticipating insurance is more dynamic than the author suggests; over the last twenty years, the pricing environment has gradually shifted to the benefit of participating insurance.

Both forms stabilize the policyholder's mortality cost by pooling a large number of risks. From the policyholder's point of view, this is the primary function of life insurance. The insurance company must concern itself further with protection against actuarial "errors," that is, incorrect guesses about future levels of mortality, lapse, interest, and expense. In this context, nonparticipating insurance should derive a pricing edge over participating insurance from the latter's goal of generating a surplus gain from every dividend class in the company, while nonparticipating business need be profitable only in the aggregate. At one time this difference in approach produced substantial premium differentials and presented a meaningful choice to the consumer. This relationship has been changed by the economic unpredictability of the last two decades, which has led to pricing assumptions for nonparticipating insurance that have turned out to be very conservative.

The interest assumption is, of course, the key problem. Writers of nonparticipating insurance responded with frequent rate revisions and appeals for higher statutory interest rates. A more straightforward response might be one of the following:

1. Transfer the investment risk to the policyholder through variable life insurance or another plan with nonguaranteed cash values.
2. Price the product at a level that represents a real risk to the stockholders. This does not mean placing the company in harm's way, since the portfolio can be repriced if experience deteriorates. It *may* mean sacrificing stability of earnings, a traditional attraction of the life insurance business.

While the first course of action is fraught with regulatory problems, the second is feasible and could have stemmed the encroachment of participating insurance into the low-premium arena; nonparticipating insurance lost its edge when it lost its nerve.

Cash Values

The problem of a nonadditive extended term insurance benefit occurs under cost-of-living policies with annual increments. Some companies have eliminated the problem by dropping this benefit from the policy.

A close substitute is a provision allowing automatic premium loans to maintain the face amount until the cash value is exhausted. Most life insurance data processing systems will support this "automatic premium loan to no value" approach.

Reserves

What risk is the company taking with regard to deficiency reserves? This is an important consideration and the position of regulatory officials is unpredictable. Specifically, should the company base the deficiency reserve on the current "plan" even though other plans (or amounts) could be adopted by the policyholder at guaranteed rates?

Administration

Many companies have found themselves in trouble because of undue reliance on "current computer capabilities." In our business there rarely is a clear indication that the computer cannot handle a product. Deterioration of expense ratios is likely to be insidious and difficult to quantify. After all, everyone in a life insurance company processes data, and when the data processing department is overwhelmed, the so-called data processing budget diffuses throughout the company to the policyowners service and the accounting, actuarial, and other departments. The computer is an absolute gem when it comes to doing simple jobs rapidly, but it rarely should be asked to perform production tasks that a high school graduate could not master in two weeks.

For the record, I concede that the author's "separate-piece" administrative system probably is the most workable approach from the systems point of view. Is this separation maintained throughout the policy's history, even at claim time? For example, does each addition requiring evidence of insurability carry its own incontestable period so that some "pieces" of a claim may be paid while others are denied?

Testing for Anomalies

The typical nonparticipating portfolio is riddled with anomalies, many of which are downright astounding. This situation has been exacerbated in recent years by the piecemeal repricing of ratebooks to keep pace with the rapidly changing competitive and economic environment. Am I correct in assuming that adjustable life is intended to be the only product in the ratebook, other than term riders? If so, the overall administrative situation of the company actually might be simplified, and the adoption of this product would force much-needed attention to ratebook inconsistencies. On the other hand, the company will find it difficult to respond to price competition from traditional products.

Summary

Some prominent actuaries have questioned the continued viability of nonparticipating life insurance as an alternative to the mutual product. In the long run it will depend on the buyer's perception of the value of the "implicit guarantees" in the nonparticipating contract. I suspect that nonparticipating life insurance has a bright future as a "no-frills" product, priced at a level that involves some risk to the company. Adjustable life is going in the opposite direction, providing more service and less risk.

SOLOMON GOLDFINGER:

Keeping the reserve basis up to date is undoubtedly important if an adjustable life program is to be successful, and Mr. Koppel's paper presents one method for doing this. I would like to comment on the approach presented and compare the expense allowances given in Koppel's paper with those described in my paper on the same subject.

I am sure I am not alone in questioning the legality and/or acceptability of providing increases in face amount on a reserve basis, policy loan basis, or premium basis that differs from the one at original issue. The original policy assumes one basis and provides the right of adjustability. It is a little difficult to envision one contract providing different reserve bases for various parts of the total coverage being provided.

One way around this problem is to provide a separate policy form for the increase in face amount, corresponding to the separate tabulation of reserves, cash values, and premiums of each piece, as described by Koppel. However, calculating policy values separately and issuing separate policy forms seems a lot closer to issuing a new separate policy than to adjusting the first one. Even if a separate policy form is deemed not necessary, an administrative system that keeps track of increases in face amount separately for the life of the policy seems to negate one of the main supposed advantages of adjustable life—having *one* policy record be flexible enough to change over the insured's life. If an increase in face amount is considered to be separate both administratively and acturially, why not simply provide it in a separate policy?

Koppel's decision that increases in face amount, but not increases in premium, may be computed on a new reserve basis seems somewhat arbitrary. Why shouldn't an increase in premium with no increase in coverage also justify the use of a new reserve basis?

The author feels that a decrease in face amount followed by an increase back to the original level does justify a new expense allowance at the time of increase. I recognize that in practice this may be desirable, but

actuarially I find it somewhat difficult to justify. When a policy is issued for $100,000 of whole life at age 25, then the full statutory expense allowance for $100,000 of coverage for life is granted immediately. No further expense allowance is warranted unless the coverage later is increased so that the total expense allowance is larger than that attributable to $100,000 of whole life.

Although Koppel permits changes in reserve bases, his expense allowance formulas are equally applicable to adjustable life policies that do not assume any such change. It may be instructive to compare Koppel's expense allowance formulas, assuming no change in reserve basis, with those presented in my paper. Our basic approaches are similar: the main criterion for the appropriateness of an adjustable life expense allowance formula is that it produce the same expense allowance for an increase in face amount (with no plan change) as would apply to a newly issued separate policy for the new amount at that age.

The main difference between my formulas and those of Koppel is that the latter do not allow an additional expense allowance for an increase in premium with no increase in face amount (for example, a change from $100,000 whole life to $100,000 life at age 65), and Koppel does recognize this in his paper. It would seem that as long as the law permits larger expense allowances for larger-premium policies, changes to larger-premium policies should generate additional expense allowance. In practice, an increase in premium normally would produce a first-year commission, which would call for an additional expense allowance.

My formulas, because of their unitary approach, do not lend themselves to the use of several reserve bases for various segments of coverage, as described by Koppel. Assuming that this segmentation is considered acceptable and desirable, I think that my formulas still could be used in this situation, but for each piece of coverage (and its reserve basis) separately.

For example, the first change described in the appendix to Koppel's paper is a change from $10,000 whole life at 3 percent to $20,000 life at age 83, with the new coverage at $3\frac{1}{2}$ percent. Using Koppel's approach, the $20,000 of life at age 83 is separated into two pieces. One is, in effect, $10,000 of newly issued life at age 83 valued at $3\frac{1}{2}$ percent. The other is $10,000 of whole life, which is changed to $10,000 of life at age 83 and remains on the 3 percent basis. Koppel's formulas produce an additional expense allowance on the new coverage, but they do not provide any additional allowance on the second piece, despite the increase in premium, because there was no increase in coverage. Therefore, I would suggest that my formulas for the additional expense allowances could be applied

to each of these pieces separately. Then the new coverage would receive the same expense allowance as that described by Koppel (equal to that for a new issue), and the old coverage would receive an additional expense allowance attributable to the increase in premium (even though there was no increase in coverage).

Mr. Koppel's paper is undoubtedly an important contribution to the further development of adjustable life products, and he is to be congratulated for his lucid exposition of a complicated subject.

(AUTHOR'S REVIEW OF DISCUSSION)

SPENCER KOPPEL:

Mr. Powell, appropriately, questions the need for adjustable life insurance. The recent proliferation of products and concepts, in addition to adjustable life, that accommodate changes in face amount and premium as the policyholder's needs change seems to confirm the desirability of these products. While policyholder needs could theoretically be handled adequately with traditional products, the fact that a policy directly provides for such changes must be an attractive feature to a prospect. Ultimately, the marketplace is the judge of the need for a product. The acceptance to date of the adjustable life policy by the consumer (and the agency force) for companies that have offered it has apparently been favorable.

While the adjustable life policy permits (as do the other flexible products) many choices at any time, a company offering the policy is generally better off showing the customer only a few choices at the time a change is requested. The customer can pick the choice closest to his desired change and can, if desired, fine-tune from that choice. Frequently the policyholder is able to make a very specific request, generally stating the face amount and premium desired and letting the company determine the plan of insurance.

The need for service to existing adjustable life policyholders is significant. The automatic cost-of-living provision serves as a reminder to the company and agent that it has been some period of time since the customer's coverage has been reviewed. An opportunity is created to service the policyholder's needs at that time.

Nonparticipating Policies

It was not my intent to discuss the relative merits of nonparticipating and participating policies in this paper. I do not believe that economic unpredictability results in an inherent advantage of participating over nonparticipating insurance. Rather, it affords a challenge to both types

to meet the situation through product modifications, guarantees, or other means. One element of the environment that does favor participating over nonparticipating insurance is the regulation of minimum nonforfeiture levels and the requirement of deficiency reserves using outdated mortality and unrealistically conservative interest assumptions. Much has been and is being done to alleviate this problem, and these efforts should improve the position of nonparticipating products.

Cash Values

I agree with Mr. Powell that it is possible to eliminate the problem by dropping the extended term insurance provision from the policy. However, I thought it was interesting to explore what could be done if a company wanted to retain the provision.

Reserves

Mr. Powell raises an interesting question in the case where, for any option the policyholder might adopt, the premium guaranteed by the contract is below the valuation net premium. This is not a problem if the premium guaranteed is always greater than or equal to the valuation net premium for any segment of the policy purchased, and perhaps the company would want to protect itself by never guaranteeing a premium less than the valuation net.

Administration

A sophisticated computer system, like service, is absolutely essential to the successful administration of an adjustable life policy. The life insurance industry cannot permit the current level of its systems capability to restrict it in product development. It is necessary to design products that will give the industry a competitive advantage over other forms of savings, provision for estates, and so forth.

The growth of the airline industry was accomplished in part by utilizing the full capabilities of the computer. The growth of the life insurance industry has been limited, at least in part, by its failure to utilize the full capabilities of the computer. The industry has been successful only in getting the computer to perform production tasks and has not been successful in capitalizing on its capabilities beyond that.

Mr. Powell asks whether it is possible to pay a part of a claim while other (presumably later) parts are denied. If the company takes an application for additional insurance, it would seem only logical that each separate piece have its own incontestability and suicide provision. The policy wording used to accomplish this is important, since it must both

protect the company and ensure that the policyholder understands what his coverage is.

Adjustable life could be the only product in a company's portfolio except, perhaps, for some products designed for very specific situations. Once one gets over the initial shock of the adjustable life policy and, more specifically, the building block approach, it becomes relatively easy to conceive of an adjustable life policy that can take the form of cash-value coverage, decreasing term, renewable term, and even annuities, all in the same policy document. The segment approach permits the combination of benefits such as this into a single policy document.

For example, a policyholder may have single policy that provides $50,000 whole life, $100,000 decreasing term, and $1,000 per month deferred annuity. Each might have its own valuation and nonforfeiture basis and its own premium basis, and might be adjustable as well. This illustrates the level of total flexibility that can result from the separate-piece approach to the adjustable life policy.

Rather than feel that adjustable life runs counter to the desired direction for nonparticipating insurance, I feel it may well provide a resolution to the nonparticipating actuary's challenge to develop a product that can be adapted to the changes in socioeconomic conditions. Even though the formulas in the paper do not provide for a change in the premium, interest, or mortality basis on previously purchased face amounts, there is nothing that would prevent the company, with the policyholder's agreement if necessary, from changing the basis to a more generous one. The adjustability concept may make the policyholder more aware of the flexibility he has to tailor his coverage to his needs, thereby eliminating the existence of a lot of old, outdated, policies in a "shoebox."

I do not believe that adjustable life is inherently more costly than traditional products. For example, the cost of the service element of an adjustable policy can be thought of as being paid for by the savings on replacement costs. The ability to combine coverages, at least for billing purposes, may, with such costs ever increasing, result in added savings. Savings also would be realized in the claim payment function, and future adjustments would reduce the need for replacements, commission payments, and general record-keeping (changes of address, beneficiary, and the like).

Mr. Goldfinger raises the question of the legality or acceptability of using, at the time of an increase in face amount, bases for reserves, loans, premiums, and presumably cash values that differ from the ones at original issue. First, the company does not have the right to change the bases on any previous face amount issued. It is, however, in the case of a

nonparticipating policy, necessary to give the company the option of offering added face amount at more current valuation bases. Otherwise, the original company would not be able to compete with companies that are able to offer a product having better values or premiums, and, if current rates or values are *less* attractive than at time of issue, the original company would have little choice but to deny the policyholder the right to increase his face amount (except, of course, for any guaranteed automatic-increase options).

Furthermore, I have some question about the reverse issue, namely, the right of the company to issue additional face amounts on the same reserve or cash-value basis in effect at the time of original issue if, in the meantime, the law regulating these bases has changed.

The question of administration of the separate-segment approach is interesting. I believe that regardless of how a company approaches adjustable life, it will find it desirable to maintain records of each piece purchased, for purposes of commission records, incontestability, suicide, and so forth.

There are some practical problems associated with increasing the expense allowance when there is no increase in the face amount. In such circumstances, the policyholder might find that, if his plan were changed from, say, whole life to endowment, his cash value actually would be reduced as a result of the added expense allowance. In this paper I have tried to establish a consistent approach to the various possibilities for changes. I would consider it inconsistent, for example, to permit an increased expense allowance for an increased premium only (with no increase in face amount), and not to increase the expense allowance where a decrease occurred followed by an increase back to the original level. For the former, Mr. Goldfinger argues that we have incurred an extra expense due to added first-year commission, and therefore should be entitled to an increased allowance. For the latter, even though we will have paid two sets of initial commission and two sets of underwriting exams, he does not believe we are entitled to an extra allowance.

I wrote my paper without the benefit of having seen Mr. Goldfinger's paper on adjustable life policy expense allowances. I did feel, as does Mr. Goldfinger, that the expense allowance afforded an increase in amount (with no plan change) should be exactly the same as that which would apply to a newly issued separate policy for the new amount at the attained age.

It is clear that there is no precise answer to the question of what the terms, conditions, values, and so forth must be for an adjustable policy or any "life cycle" product. Also, the current laws were in effect prior

to the development of such products. I tried in my paper to develop a reasonable, practical approach to adjustable life that provides the policyholder with the added benefits and guarantees desired and also permits the company to sell and administer it on a reasonable basis and at a reasonable price. As the industry gains more experience with this type of product, "standard" provisions undoubtedly will emerge just as they did when the traditional products were first developed. I would hope, in the meantime, that companies are allowed reasonable latitude in designing these products so that the products that emerge will give the insurance industry a strong competitive advantage over other options available to consumers.

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