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A Capital Budgeting Analysis of Life Insurance Costs in the United States: 1950-1979

DAVID F. BABBEL and KIM B. STAKING*

ABSTRACT

A capital budgeting procedure is applied in developing a real price index for life insurance over three decades. Individual life policies of three types are analyzed. The analysis reveals that although the cost of whole life insurance, measured in nominal values, has decreased over the past thirty years, when properly measured in present value or constant dollar terms, the cost has risen substantially. Term life insurance has been characterized by decreasing costs in both nominal and real terms. The amounts of the cost variations attributable to improving survival rates, changing policy terms, varying discount rates and differing tax status are identified.

RECENTLY THE LIFE INSURANCE industry has come under the fire of the Federal Trade Commission for failing to convey properly to consumers that the rates of return provided by the "investment" portion of whole life insurance policies are low (averaging 1.3 percent per year) relative to other investments, resulting in effectively higher insurance costs to consumers when market interest rates are rising. The life insurance industry has publicly attacked the FTC report as "irresponsibly misleading," contending that the cost of life insurance has been going down, industry-wide, for the past thirty years. Among the objections raised by the life insurance industry with regard to the methodology employed by the FTC in evaluating the life insurance policies were: (1) that the rate of return concept is an investment-industry tool inappropriately applied to the insurance industry; (2) that the value of forced savings for those who otherwise find it difficult to save is overlooked by the FTC; and (3) that it is unfair to separate the savings portion of a life insurance policy from the death protection aspect, as did the FTC in arriving at its conclusions, because the two are intertwined as a unitary contract, and cash benefits are only an incidental byproduct of having a policy.[1]

The purposes of this paper are to present a model that is appropriate for measuring and comparing the cost of life insurance at differing points in time and to apply the model in examining the contention of the life insurance industry that the cost of life insurance offered by companies in the United States during

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[1] Synopses of the FTC's and the industry's positions are provided in [1].

the past thirty years has been declining. Care is taken to select a cost measurement model that takes into account the reservations the industry expressed regarding rates of return models and models that separate insurance and savings aspects of a policy. After applying the model to a large sample of insurance companies to determine the trend in life insurance costs over time, additional analyses are performed to indicate the extent to which cost changes may be attributed to tax effects, changing interest rates, mortality rate trends, policy term revisions, and policy loan usage. Finally, implications of the findings are discussed with respect to insurance rate regulatory focus and industry competition.

I. The Model

Numerous methods have been developed for determining the costs of life insurance policies. With few exceptions, these methods have been applied in ranking the costs of policies offered by competing companies at a given moment in time.[2] Babbel [3] has shown that some of the more popular of these models are not appropriate, however, if used in comparing the cost of life insurance at different points in time, because money illusion in some form is implicit in the formulation of these models.[3] Lin [16] has adopted a model virtually free of money illusion in developing a price index for life insurance sold in the United States from 1925 through 1965. His calculation of the historical yearly price of life insurance protection was based on the equation[4]

$$\frac{(BCV + GP)(1 + i) - DIV - ECV}{FACE - ECV} \times 1000 \qquad (1)$$

where

BCV: Cash value at the begining of the year, if any;
DIV: Dividend for the year, if any;
GP: Gross annual premium;
i: Interest rate representing opportunity cost of investing BCV and GP in the policy;
ECV: Cash value at the end of the year, if any; and
$FACE$: Face amount of the policy.

Using this method, Lin showed that the price of life insurance, based on a sample of six participating whole life policies, has exhibited a substantial and general decline from 1925 to 1965, although during the last half of this period the decline was accompanied by two moderate rises in price.

One major and two minor concerns arise in using Lin's model. The first and most serious concern is that because the mortality rate has exhibited a downward

[2] For a discussion of several different methods of calculating the price of life insurance, see [15].

[3] The essence of his argument is that the numeraries to which costs are related in the various methodologies represent decreasing benefit values over time. Inferring cost trends from such models is akin to saying the price of oranges has remained the same over time, even if the average size and quality of oranges have been diminishing.

[4] His method of calculating the price is based on the level-price method developed by Belth [15].

trend over the time period considered, a fall in the price of a given amount of "insurance in force" may be offset by a lower expected insurance benefit. Second, the focus of the policy is limited to a single year, which is neither likely to coincide with the planning horizon of a consumer who purchases whole life policies nor accurately reflect the true policy costs over time. Finally, it is subject to the same criticism that the life insurance industry raised against the FTC's model in that it relies too heavily upon separation of a policy into protection and savings elements [15, p. 14].[5]

The benefit-premium ratios [8] and net cost-benefit ratios [3] do not give rise to the concerns expressed for Lin's model. While the mathematics of these models are somewhat tedious, they essentially focus on the present values of expected premiums and insurance benefits. The latter of these models is obtained by taking first the present value of the expected net cost of an insurance policy, per thousand nominal dollars of insurance in force.[6]

$$PV[E(C)]_{/\$1000\ ins.\ in\ force} - PV[E(B)]_{/\$1000\ ins.\ in\ force} \tag{2}$$

where

B: insurance death benefit over time;
C: outflow of premiums, net of dividends and surrender cash value;
PV: present value operator; and
E: expectations operator

Then dividing this expression by the present value of expected receipt of insurance indemnification results in:

$$\frac{PV[E(C)]}{PV[E(B)]} - 1 \tag{3}$$

Two items are of note in this formulation. First, the nominal numeraire of \$1000 insurance in force to which the present values of expected costs and benefits were attached has disappeared through the process of division, rendering expression (3) devoid of a lingering source of money illusion [3]. Second, the expression is consistent with the notion of a percentage markup over the actuarially fair cost of insurance. Since insurance that is actuarially fair is costless in the sense that the present values of expected costs and benefits are equal, subtracting unity from the ratio gives an expected net (or excess) cost-benefit ratio (Ehrlich and Becker [11]). As long as people are risk averse (Friedman and Savage [13]), and/or attach different levels of utility to wealth in different states of nature (Hirshleifer [14]), a positive amount of life insurance may be rationally purchased even when the expected net cost-benefit ratio is greater than zero.[7]

[5] Belth's original method is not subject to the first two limitations; Lin's abridged version of Belth's model is. The model is thus fraught with the problem expressed in footnote 3.

[6] Policy rates are typically quoted on a per thousand dollars of insurance in force basis.

[7] Two other models which are free of money illusion and meet the concerns expressed earlier are a net present cost method, corrected for depreciation in the purchasing power of the numeraire, and the present expected cost-benefit ratio. The first of these is simply given by subtracting the present values of expected insurance benefits from the present value of expected premiums, where the benefits and premiums are adjusted to reflect a given *real* level of expected insurance in force. This adjustment

In the construction of a cost index over time, aggregate mortality rates are used; accordingly, a particular individual may have differing expected cost and benefit flows than those represented by the index.[8] To promote cost comparability and conform to life insurance industry practice, the ratios incorporate the assumption that the individual intends to persist with the policy for five, ten, or twenty years after which, if the individual continues to survive, (s)he will surrender the policy for its cash value.[9]

Notation used in a formal presentation of (3) is listed below.

i_t: appropriate discount rate in year t for after-tax cash flows occurring during year, adjusted only for default risk;
p_t: premium payable at beginning of year t, per $1000 insurance in force;
cv_t: cash value at end of year t, per $1000 insurance in force;
$t = T$: year of intended policy surrender;
d_t: dividend payable in year t, per $1000 insurance in force;
td_t: terminal dividend payable at end of year t (or during year t) in the event of policy surrender (or death);
s_t: probability of survival through end of year t; and
q_t: probability of death in year t given survival through year $t - 1$

Formally, the expected net cost-benefit ratios I are computed in accordance

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is necessary to avoid the "policy illusion" discussed in [3]. The method produces absolute constant dollar markup numbers for a given amount of insurance in force, rather than a percentage markup number per present-valued unit of expected insurance receipts. This method also highlights the erosion of the real value of insurance in force over time, as the numeriare focuses on an amount of real-valued insurance expected to be in force during the life of a policy. Naturally, if inflation rates are positive, one would need to purchase a policy having a higher nominal level of insurance in force at the outset if it is to produce an expected level of real insurance in force over time equal to that which would prevail under stable prices.

The second of these, preferred by some economists, differs from (3) in that it is an expectation of ratios rather than a ratio of expectations. Thus, this ratio is an average of the numerous different patterns of premium and benefit flows that could actually result for an insured, each weighted according to its probability of occurring. In this formulation, the benefit streams are each explicitly associated with the premium streams necessary to produce them. However, unlike (3), this ratio has no simple relationship to the actuarially fair price of insurance.

[8] Indeed, the mortality rates applicable to those who purchase term insurance may be higher than those applicable for whole life purchases if consumers select among these policies according to their individual death rate probabilities. A person who feels that he or she is relatively more likely to die prematurely than others in the same age class may be more inclined than otherwise to purchase term insurance; conversely, a person in excellent health may be more inclined to "bet" on survival and purchase whole life insurance. Using the same death rates for term and whole life insurance may be a distortion.

It has been suggested by Neumann [17] that insurance will not be purchased unless the policyowner has personal mortality expectations that exceed considerably those of society at large. This contention overlooks utility considerations. While the ratio presented here is independent of individual utility considerations, it should be viewed in conjunction with utility considerations in order to fully explain insurance purchases. For instance, higher moments of the return and cost distributions may be important to insurance consumers, or the pattern of returns over different states.

[9] Notationally it is a straightforward extension to incorporate a vector of lapse rates into the ratio computation [4, 7]. Our treatment of lapse rates is discussed later in this section.

with the following formula:

$$I_T = \left[\frac{\sum_{t=1}^{T} \dfrac{s_{t-1}p_t}{\dfrac{1}{(1+i_0)}\prod_{\tau=0}^{t-1}(1+i_\tau)} - \sum_{t=1}^{T} \dfrac{s_{t-1}\,d_t}{\prod_{\tau=1}^{t}(1+i_\tau)} - \sum_{t=1}^{T} \dfrac{s_{t-1}q_t td_t}{\prod_{\tau=1}^{t}(1+i_\tau)} - \dfrac{s_T td_T}{\prod_{t=1}^{T}(1+i_t)} - \dfrac{s_T cv_T}{\prod_{t=1}^{T}(1+i_t)}}{\sum_{t=1}^{T} \dfrac{s_{t-1}q_t 1000}{\dfrac{\sqrt{1+i_t}}{(1+i_0)}\prod_{\tau=0}^{t-1}(1+i_\tau)}} - 1 \right] \quad (4)$$

In Equation (4), all of the cash flows, be they in the form of premiums, dividends, terminal dividends, surrender cash values, or death benefits, are adjusted in accordance with the probability of the insured incurring or receiving them. The first term in the numerator represents the present value of premiums to be paid up through the year of intended policy surrender, adjusted for the probability of survival to the beginning of each policy year. The second term in the numerator gives the present value of expected dividends, if any, to be paid in each policy year for which a premium was paid, adjusted for the probability of having paid the premium for each policy year. The third and fourth terms give the present value of the expected terminal dividend, which is available in some policies that have been in force for ten or fifteen years and received either upon death of the insured or policy surrender. The final term in the numerator is the present value of the cash value to be received upon policy surrender, adjusted for the likelihood of survival through year T.[10]

In this formulation, the numeraire to which expected net present costs are attached is a present-valued unit of expected insurance indemnification. Thus, the ratio (1) is insensitive to possible manipulations by an insurance company;[11] (2) is independent of the number of present-valued units of expected indemnification desired;[12] (3) is free of money or policy illusion [3]; (4) is devoid of

[10] Other assumptions implicit in (4) are that if the insured dies during a policy year, death will occur approximately midway during any given year and that any dividend and terminal dividend received during the year of death are reduced by the interest that could be earned for half a year. In reality, practices may differ among companies. For example, some companies prorate the dividend and return a prorated portion of the premium if death occurs before the end of a policy year.

[11] Alternative cost-benefit ratios have been proposed which define benefits to include dividends, terminal dividends, and cash values, as well as the death benefit, rather than subtracting the first three of these items from the premium costs in the numerator. The advantage of using a ratio with net costs in the numerator is that the ratio is less amenable to manipulation. For instance, adding a present-valued dollar of expected dividends or cash value to a policy, balanced by increasing the premium levels would render our index unchanged, while generally lowering the alternative cost-benefit ratios that define dividends as a benefit rather than a reduction in net cost but providing a somewhat dubious advantage to the insured. Another advantage of using the kind of ratio proposed here is that the numeraire is the same whether the policy is term or whole life, allowing for easier comparisons.

[12] This is only true within fairly wide ranges. Beyond a certain level of life insurance in force, a different rate per thousand may be applicable for some companies.

individual utility considerations; and (5) evaluates the policy benefits as an intertwined package. While no term is included to represent the value of forced savings, the cost-benefit ratio does indicate when the net cost of the forced savings service varies; to explicitly include such an expression would evoke individual utility considerations, which are inappropriate in a general cost index.

One assumption implicit in the above model is that the policyowner will not incur any policy loans. While this may be true for a majority of insurance consumers [2], an increasing number have been incurring policy loans [21]. One strategy for utilizing the policy loan option to reduce effective insurance costs, described at length by Black [9] and Scholes [20], will be modelled here. In this strategy, the policyowner borrows systematically against the cash value of the policy, and makes all interest payments on the policy loans without borrowing. Additionally, by making four of the first seven premium payments in full without borrowing against the cash value, the interest paid is deductible from income for tax purposes. The strategy involves modifications to the surrender cash value and death benefit expressions of (4). The modified expressions are:

$$\sum_{t=1}^{T} \frac{s_{t-1}[(cv_t - cv_{t-1}) - (1-\kappa)rcv_{t-1}]}{\dfrac{1}{(1+i_0)} \prod_{\tau=0}^{t-1} (1+i_\tau)} \tag{5}$$

$$\sum_{t=1}^{T} \frac{s_{t-1}q_t(1000 - cv_t)}{e\dfrac{\sqrt{1+i_t}}{(1+i_0)} \prod_{\tau=0}^{t-1} (1+i_\tau)} \tag{6}$$

where κ is the effective tax bracket of the policyowner, r is the interest rate charged on policy loans, and the cash values for the first four years are ignored for purposes of obtaining policy loans.

Essentially, this strategy of systematic policy loans simply is a way of obtaining use of each increment in cash value as it accrues over time. While this strategy could be improved, where policy loans would be incurred only at such times when the relationship between after-tax policy loan rates and opportunity costs of funds justifies the transaction, this refinement has generally been moot during the past fifteen years. Cost indices using (4) and (4) modified by (5) and (6) are compared later.[13]

A second assumption utilized in the cost-benefit ratios, involving the treatment of policy lapses, merits further explanation. The surrender or lapse of life insurance policies by policyowners prior to death or maturity figures as an important factor in the pricing of policies. Expected lapse rate tables [7, 10] based

[13] In modelling the policy loan strategy, we follow Black and Scholes who did not fully value the policy loan options; rather, its present value was computed under the assumption that the option to take out loans would always be exercised. The true value of the policy loan option would actually be higher, because if interest rates fell sharply enough, the policyowner could "put" the accumulated cash values to the insurer, who guaranteed to pay a prespecified (implicit) rate of interest on the cash values, while avoiding interest costs of policy loans. Note that in our formula, cash values are available virtually immediately for policy loans upon payment of the premium. This assumption conforms to widespread practice.

upon lapse rate experience are widely used by actuaries for asset share, gross premium, and agents' compensation calculations.

While it is reasonable, from the companies' viewpoint, to use historical lapse experience in estimating future lapse rates, it appears unlikely that the historical record is an appropriate approximation of the probability distributions that rational consumers might attach to various possible times of their policy surrender. Experience has shown repeatedly that a disproportionately large number of policies lapse in the first or second policy year, often before any surrender cash values accumulate or dividends are paid.[14] Clearly, it is not rational to purchase permanent insurance, if one intends to let the policy lapse in the first or second year, when similar coverage is available from term insurance at approximately ¼ the cost.

As the aim of this paper is to construct rationally perceived cost indices from the consumers' point of view, it was decided that the time patterns of lapse rates exhibited in published tables were inappropriate to use. Rather, our formula was designed so that it can be used to compute the cost of a policy surrendered in any policy year T; moreover, it can be applied to examine the cost of insurance at any point in time during the life of an existing policy. However, for purposes of this report, only policy holding periods of 10 and 20 years (5 years for term policies) are highlighted, and only the costs of newly issued policies are examined.[15]

II. The Data

To compute the net cost-benefit ratios, the model requires data input on policy terms, survival rates, and discount rates.

Policy data were obtained for the 30-year period beginning in 1950 on the ordinary whole life policies of 22 stock and 5 mutual insurance companies and on the term policies of 16 stock companies.[16] The aggregate net cost-benefit ratios

[14] The rate of voluntary policy surrender during the first two policy years has hovered around 20 percent during the past 10 years.

[15] Even though lapse rates are high in the first two policy years, the median duration of whole life policies has been fairly long (21 years using lapse rates in [7] and 19 years using the more recent lapse rates in [10]). Hence, our presupposed surrender periods of 10 and 20 years provide information that can be considered fairly representative. In cost computations that have been made using vectors of lapse probabilities (e.g., [4, 7]), the cost figures are distorted due to the practical necessity of truncating the probability distribution at 20 or 35 years, beyond which published dividend and cash value schedules are difficult to obtain. Were one to include the probabilities of persistance up to these old ages, the policy costs would exhibit interest rate sensitivity similar to that shown here.

[16] Policy data (premiums, dividends, cash values, etc., per \$1000 insurance in force) for the years 1950–1979 were obtained from *Best's Flitcraft Compend* and *Life Rates and Data.* In keeping with common practice among insurance analysts, a \$10,000 policy (or \$25,000 in the case of term policies) for a male age 35 was selected for standardization, as well as for the allocation of fixed costs such as policy fees on a cost-per-thousand basis. The projected dividends that appear in data on contracts, and which were used in the calculations of insurance costs, are not actually estimates of future dividends, but rather the amounts that would be paid if the company did not change its dividend calculation formulae. See Winter [23] for an explanation.

The 22 stock companies used in nonparticipating whole life cost computations were selected at random from 66 companies for which comparable data were continuously available. The 5 mutual companies used in participating whole life cost calculations are among the 6 analyzed by Lin, who computed for each year consist of an equally weighted average of the ratios of all companies in the sample offering a particular type of policy (participating or nonparticipating whole life or term) during that year to males of age 35.

Mortality rate data from the annual *Vital Statistics of the United States* publications, representing the actual U.S. mortality experience for white males,[17] were used instead of the more traditional 1958 CSO estimates that have a conservative bias designed to enable life insurance companies to build up policy reserves. Moreover, using actual data over time allows adjustments for mortality rate trends in the cost measurement model. Projected mortality rates over the life of a policy were defined as the vector of mortality rates for ages 35 to 55 that prevailed at the beginning of the first policy year. Thus, 30 vectors of mortality rate data were used, where a unique vector was used for policies beginning each year from 1950 to 1979. The assumption in terming these "projected rates" is that they represent a reasonable assessment of the rates that will prevail for the duration of the contract. While this assumption is questionable, surely it is preferred over assuming that the 1958 CSO estimates prevailed throughout each of the policy years over time.

The matter of appropriate discount rates for use in the formula is more complex. Two questions arose in selecting these rates. First, should tax-free or taxable discount rates be used? Second, to what extent should the discount rates be risk-adjusted?[18]

With regard to the first question, it is recognized that all cash flows used in the formula are after-tax flows,[19] and thus should elicit after-tax discount rates. The after-tax opportunity cost of the funds committed to life insurance will depend upon the tax bracket of the individual. A minimal benchmark rate of return is attainable from municipal bonds, regardless of the individual's tax bracket.

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selected them based on size. Northwestern Mutual was excluded due to data interruptions that occurred subsequent to the Lin study. The 16 term policies analyzed comprised the entire population of companies featured in the aforementioned policy data sources for which nonrenewable 5-year term policies were virtually continuously available. Most of these policies were convertible. In cases where nonrenewable policy data were interrupted, renewable policy data were used after making adjustments to reflect the average differential premium between the two types of policies.

[17] The only category for which mortality data were continuously available was comprised of white males; although it would be preferable to use mortality data reflecting survival rates of all for whom the insurance rate quotations were applicable, the largest single category of insurance purchasers was that consisting of white males. The population mortality rates used may differ from the rates germane to *insurable* white males; presumably, the insurables have lower mortality rates due to medical screening. On the other hand, mortality rates of the group purchasing insurance may reflect a moral hazard or self-selection bias and thereby elicit higher mortality rates.

Mortality rate data were only available through 1977 at the time of this writing. Therefore, the 1977 vector of mortality rates for white males of ages 35 through 55 was also used for 1978 and 1979.

[18] A third question that arose was whether the discount rates should reflect the opportunity cost of money or merely its purchasing power. Cost-benefit ratios using expected and realized inflation rates are provided in a lengthier version of this paper [6].

[19] In some countries outside the United States, life insurance premiums are deductible from taxable income. In the United States, they are not deductible directly from personal income. In general, benefits effectively are not taxed in the U.S., except in some unusual circumstances, where a small portion of the dividend or cash value may be subject to taxation. Also, if a beneficiary elects to receive a death benefit over time in the form of an annuity, the interest is subject to taxation.

However, by investing in taxable bonds, individuals in modest tax brackets can achieve after-tax returns that considerably exceed those attainable on municipals of similar quality. A high benchmark, then, would be the before-tax yield offered on taxable bonds, which would also equal the after-tax yield for individuals whose tax brackets are effectively zero. Presumably, this latter benchmark is closer to the discount rates that are relevant for a large segment of consumers who are able to shelter effectively their investment income from taxes and/or who find themselves in moderate or low tax brackets that do not render investments in municipals attractive.

In keeping with the maxim of excluding individual utility considerations from the cost index, the discount rates were not risk-adjusted except to the extent that prime grade bonds incorporate default premia in their promised yields to maturity.[20] The default premia in the discount rates are small, as the bond instruments are top grade, and are roughly comparable to default premia applicable to life insurance companies. Companies under financial distress are often acquired by stronger companies that honor the policy commitments of the weaker companies, so that default of policies is rare.

Before proceeding to the results of the cost estimations, it is necessary to stress the importance of using good forecasts of the parameters that comprise the inputs for our model. It may be objected that the projections (of mortality rates, dividends, and interest rates) are biased and/or would misrepresent consumer expectations. While acknowledging that these reservations may be well founded, we were unable to develop other projections that were not subject to similar criticisms. To determine if our cost estimates were robust to various forecasting models, we experimented with a number of different techniques and found that the cost estimates were indeed fairly robust, irrespective of the techniques employed, with the figures and trends differing somewhat in precise magnitude but not in direction. In fact, the cost trends are so pronounced that these methodological reservations pale relative to the magnitude of cost movements over time.

[20] The annual average 10-year yields to maturity on prime grade municipal bonds and double-A-rated medium term industrial bonds were used to represent the opportunity costs of funds. These were obtained from Salomon Brothers' *An Analytical Record of Yields and Yield Spreads* for the years 1950 through 1979. The medium term of these instruments was selected as roughly reflective of the life of an insurance policy. A preferred procedure would be to develop estimates of the term structure of interest at each point in time and use the resulting forward interest rates, rather than the simple yield to maturity, to discount future policy cash flows. Although the formula could easily accomodate these estimates, project constraints did not permit us to pursue this course. Nonetheless, any distortion from using yields to maturity rather than forward rates is likely to be very minor relative to the fluctuations in the net cost-benefit ratios produced by changes in the levels of various formula parameters. One objection to using the Salomon Brothers' yield data is that while the municipal and industrial bond yields were certainly accessible to life insurance companies, they were largely inaccessible to the insurance consuming public, especially during the early years before money market funds emerged, and thereby do not properly represent opportunity costs to the typical consumer. The approach taken by Lin was to use the interest rates offered on deposits at savings and loan associations and mutual savings banks. The result was to view the cost of one regulated instrument (life insurance) in terms of the returns available on another regulated instrument (savings deposits with rate ceilings). For those who take issue with the alternative presented here of using unregulated rates, we have offered elsewhere an analysis in terms of purchasing power, using inflation rates to render costs in constant dollar terms [6].

III. Research Results

A. Tax Status and Holding Period Horizon

The effects of individual tax status and expected holding period upon the projected net cost-benefits ratios of participating and nonparticipating whole life and term policies can be seen in Tables I, II, and III. These tables contain the cost-benefit ratios computed from Equation (4). In each of these tables, the projected costs are reported both where tax-free municipal bond yields and corporate bond yields are used in the discount factors.

In Table I, the cost projections are given for nonparticipating whole life policies with expected holding periods of 20 (columns 2 and 3) and 10 (columns 11 and 12) years. Several items revealed in this table are of interest. First, the expected cost (or, more precisely, present value net expected cost-benefit ratio, hereafter termed simply "cost" or "markup" for brevity) of life insurance is much lower for an individual taxed at high rates (columns 2 and 12) than for one taxed at low rates (columns 3 and 11). Second, the fluctuations in cost are generally greater in both absolute and relative terms for the individual subject to low tax rates. Third, the cost of life insurance appears fairly stable for the 1950–1965 period but then soars during the following fifteen-year period. In present value terms, and for expected holding periods of 20 years, the real cost has more than quintupled since 1950 using the corporate rate (from .48 to 2.79) and almost quintupled using the municipal rate (from .27 to 1.30); most of this increase has occurred since 1965. In columns 11 and 12 it can be seen that for 10-year holding periods, the cost patterns are similar in direction but much less volatile. The full effects of the compounding discount rates, improving mortality rates, and changing policy terms are less pronounced over these shorter periods.

In Table II it can be verified that these cost patterns were very similar for participating whole life policies as well. With an expected holding period of 20 years, the markup in present value terms using the corporate rate increased \$1.84 (column 3, from .09 to 1.93) and \$0.49 using the municipal rate (column 2, from −.15 to .34) per present-valued dollar of expected indemnification. Once again, over the shorter 10-year holding periods the trends were the same but the magnitudes of increase were more moderate (columns 11 and 12). The increase in real costs of participating policies also appears to have occurred, in large measure, in the final 15 years.

For both nonparticipating and participating whole life policies, the projected markups associatetd with a longer holding period were lower than those associated with a shorter holding period (see Tables I and II). This is consistent with rational pricing of insurance policies (see Scholes [20]).

The cost of individual term policies, as shown in Table III, has registered significant declines in present value terms over the same 30-year period.[21] Another

[21] It should be noted that the net cost-benefit ratios of the term policies are not directly comparable to the net cost-benefit ratios of the whole life policies, as the holding periods are different. However, the ratios of participating and nonparticipating whole life policies may be compared, while keeping in mind the relative risks of these two policy types.

item of note is that unlike the cost of whole life insurance, the cost of term insurance is nearly the same for a high tax bracket individual as a low tax bracket individual (compare columns 2 and 3). In other words, the cost figures using the corporate and municipal discount rates are very close.

The aforementioned cost trends reflect the joint impact of changes in policy provisions, movements in the discount rates, and improving survival rates. In the three subsections which follow, the contributions of each of these factors to the total expected cost trends will be analyzed separately. Following these analyses, the projected costs, which were derived under the assumption that policy loans would not be incurred, will be compared to the costs that would be expected under a systematic plan to incur policy loans.

B. Interest

The impact of fluctuating interest rates upon the expected cost of life insurance (in present value terms) can be adjudged by examining columns 4 and 5 of Tables I, II, and III, and comparing the cost figures with those of column 3 where projected costs are given without constraining any of the variables to their 1950 values. Discussion beyond this point will highlight those computations that use both a 20-year holding period (5 years in the case of term policies) and the corporate rate in the discount factor, as the corporate rate is associated with larger cost fluctuations that facilitate analysis and exposition while policy holding periods of 20 years allow for a fuller impact of parameter variations to be observed.

Several items are noteworthy. An examination of Tables I, II, and III reveals that interest rate fluctuations appear to be the primary force in driving up the cost of whole life insurance in present value terms, but only exerted minor impact upon the cost of term insurance. For example, the projected markup on nonparticipating whole life insurance was about \$0.48 per dollar of expected indemnification in present value terms, during 1950. By 1979, the markup had increased to about \$2.79 per dollar of expected indemnification. However, had the policy terms and mortality rates remained stable at their 1950 levels, while interest rates followed their historical ascending path, the markup would have increased to approximately \$2.62; thus, the joint effect of improving policy terms (which lower the cost) and improving survival rates (which raise the cost) was to raise the markup on insurance by only \$0.17 beyond what otherwise would have occurred through interest effects alone (see column 4). Another view of interest rate impact is to note that if policy terms and mortality rates were to have improved as they did over the period of 3 decades, while interest rates remained at 1950 levels, the markup on insurance would have declined from \$0.48 to \$0.13 over the 30-year period (see column 5). The fact that the markup actually increased to \$2.79 means that the \$2.66 difference (\$2.79 minus \$0.13) was attributable to increasing interest rates. A similar analysis for participating whole life insurance reveals that increasing interest rates were responsible for adding about \$2.83 per dollar of expected indemnification to its markup. The effect of increasing opportunity costs on the term insurance markup was swamped by the favorable changes in policy terms that worked in the opposite direction.

Table I

Nonparticipating Whole Life Insurance — Net Expected Cost-Benefit Ratio Analysis

	Average Projected Cost, New Policies										
	20-Year Holding Period									10-Year Holding Period	
			Corporate Bond Yield Used As Discount Rate								
			Variables Held Constant at 1950 Levels:								
Year	Municipal Bond Yield = Discount Rate	Corporate Bond Yield = Discount Rate	Mortality Rates Policy Terms	Interest Rate	Mortality Rates Interest Rate	Policy Terms	Policy Terms Interest Rate	Mortality Rates	Incurring Policy Loans	Corporate Bond Yield = Discount Rate	Municipal Bond Yield = Discount Rate
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1950	.27	.48	.48	.48	.48	.48	.48	.48	1.05	1.61	1.44
1951	.36	.63	.60	.51	.48	.63	.51	.60	1.12	1.75	1.54
1952	.36	.72	.69	.52	.48	.73	.52	.68	1.16	1.89	1.60
1953	.46	.80	.74	.53	.47	.81	.54	.73	1.20	1.98	1.71
1954	.31	.56	.49	.55	.43	.61	.61	.44	1.18	1.88	1.68
1955	.45	.74	.64	.57	.44	.79	.62	.60	1.26	2.01	1.78
1956	.63	1.08	.93	.58	.44	1.13	.63	.89	1.38	2.31	1.95
1957	.63	1.08	1.06	.45	.35	1.23	.60	.92	1.24	2.12	1.77
1958	.24	.54	.69	.32	.21	.84	.61	.41	.96	1.54	1.30
1959	.49	1.02	1.15	.29	.18	1.38	.63	.83	1.08	1.99	1.55
1960	.34	.81	1.07	.19	.11	1.25	.60	.66	.92	1.75	1.35
1961	.19	.61	.86	.20	.09	1.08	.65	.44	.88	1.58	1.23
1962	.20	.67	.94	.18	.08	1.15	.63	.52	.87	1.58	1.18
1963	.18	.69	1.02	.12	.03	1.23	.63	.53	.81	1.54	1.11
1964	.26	.80	1.14	.10	.00	1.39	.64	.61	.82	1.61	1.17
1965	.26	.81	1.23	.03	−.06	1.49	.64	.63	.75	1.57	1.11
1966	.54	1.12	1.53	.02	−.06	1.82	.63	.91	.84	1.80	1.33
1967	.44	1.03	1.44	.02	−.07	1.73	.64	.82	.81	1.71	1.23
1968	.50	1.22	1.64	.01	−.07	1.93	.62	1.00	.85	1.85	1.27
1969	.86	1.72	2.10	.02	−.07	2.48	.64	1.42	1.04	2.22	1.54
1970	.81	1.74	2.10	.02	−.08	2.51	.65	1.42	1.05	2.26	1.53
1971	.44	1.13	1.48	.04	−.08	1.86	.69	.85	.87	1.80	1.25
1972	.39	1.01	1.38	.03	−.10	1.77	.71	.73	.83	1.77	1.26

1973	.75	1.82	2.09	.03	−.10	2.68	.73	1.38	1.11	2.37	1.53
1974	.04	2.36	2.48	.05	−.11	3.32	.79	1.71	1.36	2.92	1.87
1975	.83	1.64	1.80	.08	−.12	2.57	.84	1.08	1.12	2.39	1.75
1976	.64	1.41	1.54	.11	−.11	2.33	.90	.85	1.09	2.28	1.66
1977	.58	1.47	1.57	.12	−.12	2.44	.94	.86	1.12	2.36	1.66
1978	.99	2.15	2.12	.12	−.12	3.21	.94	1.34	1.37	2.91	2.00
1979	1.30	2.79	2.62	.13	−.12	3.93	.94	1.79	1.64	3.40	2.25

Note: Ratios given in columns 2–12 were computed using Equation (4). Column 10 reflects the modifications in equation (4) given by Equations (5) and (6), with a tax rate of 25%.

Table II

Participating Whole Life Insurance — Net Expected Cost-Benefit Ratio Analysis

	Average Projected Cost, New Policies										
	20-Year Holding Period									10-Year Holding Period	
		Corporate Bond Yield Used As Discount Rate									
			Variables Held Constant at 1950 Levels:								
Year	Municipal Bond Yield = Discount Rate	Corporate Bond Yield = Discount Rate	Mortality Rates Policy Terms	Interest Rate	Mortality Rates Interest Rate	Policy Terms	Policy Terms Interest Rate	Mortality Rates	Incurring Policy Loans	Corporate Bond Yield = Discount Rate	Municipal Bond Yield = Discount Rate
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1950	−.15	.09	.09	.09	.09	.09	.09	.09	76	.73	.52
1951	−.08	.22	.22	.08	.07	.24	.10	.20	.79	.86	.59
1952	−.14	.26	.31	.03	.01	.34	.11	.23	.74	.90	.54
1953	−.13	.25	.38	−.05	−.08	.43	.13	.20	.68	.90	.55
1954	−.38	−.11	.10	−.12	−.18	.18	.17	−.17	.59	.55	.29
1955	−.28	.04	.27	−.15	−.21	.37	.18	−.04	.55	.69	.39
1956	−.14	.35	.59	−.19	−.25	.75	.19	.23	.56	.97	.52
1957	−.07	.42	.73	−.27	−.31	.87	.17	.32	.52	.96	.52
1958	−.36	−.04	.32	−.29	−.33	.43	.18	−.11	.46	.54	.24
1959	−.09	.51	.84	−.30	−.35	1.03	.19	.37	.52	1.06	.52
1960	−.14	.39	.74	−.31	−.35	.89	.17	.28	.51	.97	.47
1961	−.33	.14	.51	−.32	−.37	.68	.20	.03	.50	.74	.30
1962	−.33	.21	.60	−.35	−.40	.77	.19	.10	.43	.81	.32
1963	−.32	.26	.69	−.39	−.43	.86	.19	.15	.37	.89	.35
1964	−.23	.40	.82	−.41	−.45	1.03	.20	.26	.37	1.10	.54
1965	−.20	.44	.92	−.47	−.50	1.14	.20	.30	.30	1.14	.57
1966	.12	.79	1.26	−.49	−.52	1.52	.19	.61	.37	1.43	.83
1967	−.05	.63	1.16	−.53	−.56	1.41	.20	.47	.37	1.26	.65
1968	.01	.84	1.39	−.56	−.58	1.64	.18	.66	.39	1.43	.70
1969	.40	1.40	1.90	−.58	−.60	2.26	.20	1.15	.52	1.90	1.03
1970	.33	1.39	1.90	−.58	−.60	2.28	.20	1.12	.83	1.89	.98
1971	−.12	.67	1.21	−.58	−.60	1.54	.23	.46	.75	1.29	.60
1972	−.20	.52	1.09	−.61	−.63	1.43	.24	.31	.70	1.22	.59

1973	.20	1.43	1.89	−.63	−.65	2.43	.26	1.05	.73	1.97	.92
1974	.40	1.93	2.33	−.72	−.73	3.13	.29	1.37	.83	2.40	1.09
1975	.15	1.08	1.56	−.72	−.73	2.25	.33	.65	.91	1.69	.88
1976	−.17	.70	1.27	−.76	−.76	1.96	.37	.32	.79	1.48	.73
1977	−.33	.69	1.30	−.86	−.83	2.07	.40	.29	.69	1.52	.65
1978	.14	1.48	1.92	−.86	−.83	2.94	.40	.86	.80	2.19	1.06
1979	.34	1.93	2.49	−.90	−.87	3.74	.40	1.17	.70	2.52	1.23

Note: Ratios given in columns 2–12 were computed using Equation (4). Column 10 reflects the modifications in Equation (4) given by Equations (5) and (6), with a tax rate of 25%.

Table III

Nonrenewable Term Life Insurance — Net Expected Cost-Benefit Ratio Analysis

	Average Projected Cost, New Policies							
	5-Year Holding Period							
			Corporate Bond Yield Used as Discount Rate					
			Variables Held Constant at 1950 Levels:					
Year	Municipal Bond Yield = Discount Rate	Corporate Bond Yield = Discount Rate	Mortality Rates Policy Terms	Interest Rate	Mortality Rates Interest Rate	Policy Terms	Policy Terms Interest Rate	Mortality Rates
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1950	1.49	1.50	1.50	1.50	1.50	1.50	1.50	1.50
1951	1.54	1.55	1.51	1.54	1.48	1.58	1.57	1.48
1952	1.60	1.62	1.51	1.61	1.47	1.65	1.64	1.48
1953	1.66	1.67	1.51	1.66	1.44	1.74	1.73	1.45
1954	1.70	1.71	1.50	1.71	1.38	1.86	1.86	1.38
1955	1.67	1.69	1.51	1.68	1.35	1.86	1.85	1.36
1956	1.75	1.77	1.52	1.74	1.33	1.97	1.94	1.35
1957	1.62	1.65	1.53	1.62	1.30	1.88	1.85	1.32
1958	1.54	1.55	1.51	1.54	1.19	1.92	1.91	1.19
1959	1.47	1.49	1.53	1.46	1.07	2.00	1.96	1.10
1960	1.30	1.32	1.53	1.29	.94	1.99	1.95	.96
1961	1.26	1.28	1.52	1.26	.87	2.06	2.03	.88
1962	1.20	1.22	1.52	1.20	.87	1.97	1.94	.89
1963	1.16	1.19	1.53	1.16	.87	1.93	1.89	.89
1964	1.17	1.20	1.53	1.16	.85	1.97	1.92	.87
1965	1.11	1.14	1.54	1.10	.81	1.96	1.91	.83
1966	1.04	1.06	1.55	1.01	.75	1.96	1.88	.78
1967	.97	1.00	1.54	.95	.72	1.91	1.84	.75
1968	.92	.96	1.55	.90	.68	1.91	1.83	.72
1969	.88	.92	1.58	.85	.64	1.94	1.82	.68
1970	.91	.95	1.58	.87	.63	1.99	1.87	.68
1971	.91	.94	1.55	.90	.63	1.98	1.91	.66
1972	.93	.96	1.54	.92	.58	2.10	2.03	.61

1973	.82	.87	1.58	.79	.51	2.09	1.97	.56
1974	.92	.97	1.59	.88	.48	2.32	2.16	.54
1975	.96	.99	1.56	.93	.48	2.36	2.26	.52
1976	1.01	1.04	1.55	.99	.46	2.51	2.42	.49
1977	.93	.96	1.55	.91	.40	2.51	2.42	.43
1978	.89	.93	1.58	.85	.36	2.55	2.42	.40
1979	.85	.91	1.60	.81	.33	2.60	2.42	.38

Note: Ratios given in columns 2–9 were computed using Equation (4).

C. Policy Terms

The effect of introducing new policies over time with revised policy values (premiums, projected dividend schedules, cash values) can be seen by comparing columns 6 and 7 with column 3 of Tables I, II, and III. In general it can be said that policy terms improved (i.e., premiums were reduced relative to benefits, in nominal values), ceteris paribus, whether for whole life or term insurance. Unfortunately, other things were not equal. Rising interest rates and improving survival rates worked in the opposite direction, with the result that policy terms did not improve sufficiently to hold down the cost of whole life insurance (in present values), although terms did improve sufficiently to produce impressive reductions in the cost of term insurance. A perusal of Tables I, II, and III (column 6) reveals that insurance companies offer substantially better terms now than in 1950; however, the economic conditions are such that these more favorable terms are more than offset by other factors (excepting term insurance), rendering whole life insurance more costly in present value terms. Even policy values that were not contractually constrained (e.g., dividends) did not adjust sufficiently to compensate for the economic conditions facing the insurance consumer.[22]

D. Mortality Rates

In comparing columns 8 and 9 with column 3 of Tables I, II, and III, it becomes evident that improving survival rates resulted in only modestly higher whole life costs, but in substantially higher term insurance costs. Notwithstanding, in the case of term insurance, the effect of lowered mortality rates was more than offset by lower premium charges, resulting in lower overall costs. Ex post, the mortality experience was lower than what was used in the various projections. Consequently, the effect of mortality rate reductions was to increase the cost of life insurance above the levels projected, ceteris paribus.[23]

E. Policy Loans

Utilization of the policy loan option featured by whole life policies can result in substantially altered insurance costs. Column 10 of Tables I and II gives the projected costs generated by the modified version of (4), where it is assumed that the policyowners exercise their policy loan options to the limit during all but the first four policy years, as described earlier. The figures given are for intended holding periods of 20 years, where the corporate rate is used in the discount factor, and where the effective tax bracket of the policyowner κ was set equal to 25 percent.

Beginning in the mid-sixties, the systematic borrowing strategy generally produced lower expected insurance costs than those associated with not taking out policy loans (compare columns 3 and 10). Before the mid-sixties, the figures in column 10 overstate insurance costs, as the policyowners were never forced to exercise their loan options; thus, the strategy associated with the lower of the two

[22] The ex post analysis is given in [6], where realized mortality, interest, and inflation rates, and actual dividends are used.

[23] Ibid.

figures is always the better, a priori. Ex post, however, the cost of the policy loan strategy would have been even lower, as the policyowner could have decided during each policy year upon a strategy optimal for that particular year, given the economic environment at the time. Indeed, when combined with the rising trend in interest rates that occurred, the realized costs of using this strategy were also lower for the early years.

The magnitude of the cost differences associated with the two strategies is also noteworthy. In the final two years under study, the policy loan strategy has provided expected insurance costs about half as high as those related to the no loan strategy. Although only a small portion of policyowners have availed themselves of the loans in the past, there is evidence of an ever rising fraction who are doing so [2, 21].

IV. Epilogue

The findings of rather sizable increases over time in the real cost of whole life insurance and reductions in the real cost of term insurance are applicable, in a strict sense, only under the conditions assumed in the analysis. Among the conditions were the assumed holding period horizons of 5 years for term and 10 or 20 years for whole life insurance. Other holding period horizons may give rise to entirely dissimilar cost trends. In checking for this possibility simple regressions were run on the 10-year whole life cost-benefit ratios against the 20-year ratios. The various ratios were highly and positively correlated. This observation leads us to suspect that cost patterns for widely differing holding period horizons are similar, at least in trend.

One factor that seriously limits the generalizability of our findings is the focus on the costs of newly issued policies. Indeed, if the model were applied to outstanding policies, the net cost-benefit ratios would often be much lower or even negative for policyowners considering persisting with a policy for additional time periods [9, 16, 20].

An assumption that was made which is less likely to cause serious differences in the cost patterns reported here is the use of policy rates for 35-year-old males. Actuarial practices and conventions are likely to produce roughly similar cost patterns for consumers initiating policies at different ages, provided that the holding period horizons are the same.

Finally, it should be kept in mind that the cost patterns reported in the tables are averages over all companies in the sample. Although our samples were large enough to reasonably reflect insurance market conditions, an analysis of individual company cost indices revealed substantial cost differences across companies.

Mindful of these limitations, some interesting implications of this study can nevertheless be drawn. An examination of the first two tables reveals that the expected cost of whole life insurance has been substantially lower with mutual companies in our sample than it has been for stock companies in our sample, whether planned holding periods are 10 or 20 years. This finding holds true for any year during the 30 years that were examined. Exacerbating the spread between the cost series is the fact that the mutual companies in our sample paid much higher dividends than those contained in the illustrated dividend schedules which were used for the expected cost computations [6]. However, at least some of the spread was to be expected. A significant portion of the insurance benefits derived from participating policies, comprised of the annual dividends, is not guaranteed in the insurance contract. Indeed, no dividends need be paid at all, if the profit situation of the insurer does not permit. On the other hand, all policy values of the nonparticipating policies in our sample were contractually fixed. Thus, it might be concluded that in a risk-return space, the spread between the cost of these two types of whole life policies could be justified by the risk aversion of insurance consumers. Further analysis, however, shows that as interest rates rose over time, dividend schedules were increased ex post, thereby mitigating some of the value erosion associated with accompanying inflation. Thus, in a real sense, participating policies have been less risky than might have appeared at first blush.

In light of this sizable spread that has persisted for so long in the ex ante cost measures (and even more sizable spread in the ex post measures due to dividend schedule adjustments), one might ask why the demand for nonparticipating policies has not disappeared over the years. An alternative explanation is that perhaps consumers of insurance are attracted to nonparticipating policies because of their generally lower premium charges, and do not consider the costs in terms of all of the benefits. We suspect, however, that the cost spreads, together with the high lapse rates for the early policy years that have been a feature of the whole life insurance market for an equally long time, would not be observed if consumers were both rational and well-informed. These phenomena are mainly a consequence of the distribution system.[24]

One might suspect that because the cost-benefit ratios have increased so much for the popular whole life policies, the profitability of insurance business would increase, as high net costs to consumers imply high net profits to the companies. This conclusion is not warranted for several reasons. First, there is evidence that insurance demand has slackened due to these higher perceived costs [5]. To the extent that operating costs did not experience corresponding declines, the costs would need to be allocated among fewer policies than otherwise, rendering each policy less profitable than the cost-benefit ratios might lead one to believe.[25] Second, lapse rates have increased, causing profitable policies to be lost [2]. Third, policy loans have increased over time [21, 22], lessening the profit potential of outstanding policies as the interest paid by policyowners on their loans has usually been lower than the rates available to the insurance companies on alternative investments. Fourth, the long-term duration of fixed income investments typically made by insurance companies exposes them to capital losses when interest rates rise. Thus, at the same time that profitability is expected to increase (as higher net cost-benefit ratios face potential insurance consumers during high interest periods), many companies have experienced large capital losses on their financial assets held to meet their reserves [18]. Fifth, there has been a shift in recent years towards the less profitable term policies [2, 5].

[24] We are indebted to Phelim Boyle for pointing out this problem.

[25] Published accounting data did not permit us to determine the validity of this supposition. The primary problem is that in the published data, operating costs are not allocated among the specific types of insurance policies offered.

Another implication of the analysis is that in view of the erratic behavior of the real price of insurance over time, it is not appropriate to either ignore or assume a smooth linear trend in the supply price of life insurance when conducting empirical examinations with time series data on the demand for life insurance [12, p. 596].

The increase in the real cost of whole life insurance over time may be attributed, in part, to insurance regulators. Policy values are computed at very low interest rates such as 3 to 3.5% p.a. The statutory valuation regulations stipulate very conservative valuation bases to ensure that insurance companies are able to meet their long term fixed dollar guarantees and options. These constraints have clearly had a large role in higher prices. Much of this increase could have been alleviated by consumers, however, had they chosen to take advantage of the policy loan options offered them by the insurance companies.

The insurance industry has already begun to get the message that some of its traditional products are no longer suitable in today's economic environment coupled with the regulatory constraints they face—witness the spate of new products with either no investment guarantees or else short term guarantees; e.g., equity linked products, variable life, adjustable life, new-money life and universal life. An alternative that has been adopted elsewhere is the inflation-index-linked policy, which has been shown to be capable of leaving the real cost of life insurance relatively unaffected by annual rates of inflation as high as 40 percent [4]. If changes of this kind are not made, the whole life policy may merely revert to a hybrid of the long-horizon term policy (e.g., term to age 65) where policy loans are continually incurred so as to leave no cash value available to the consumer in the event of eventual policy surrender. Presumably, however, as more people avail themselves of the policy loan option, insurance companies will be forced to adjust policy terms, resulting in a reduced advantage of this practice. Indeed, as this paper was being written, legislation was pending that would make the policy loan option a variable rate instrument.

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