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LIFE INSURANCE SAVINGS AND THE AFTER-TAX LIFE INSURANCE RATE OF RETURN

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Abstract

This paper presents a calculation of the time series of the after-tax rate of return to whole life insurancy. When compared to the after-tax return on an alternative portfolio of similar risk, more than 60% of the decline in life insurance savings (suitably defined) in the past two decades can be attributed to a widening after-tax rate of return differential.

Both the existence and importance of this result depend on the characteristics of life insurance savings. Life insurance saving is intimately connected to life insurance coverage and therefore is long-term and quasi-contractual in nature. Furthermore (and, in part, because of the above characteristics), the interest earned on the fixed income portfolio of life insurance intermediaries has been taxed under a special set of rules. From 1958 to 1981, these rules have taken the rather complicated form of the Menge formula. This formula is very sensitive to changes in nominal interest rate levels and in particular, during inflationary periods it acts so as to dramatically increase the tax burden of life insurance savings.

Life insurance savings is therefore an example of the non-neutrality of monetary policy. This is important for studies of flow of funds and capital accumulation using the historical record.

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LIFE INSURANCE SAVINGS AND THE AFTER-TAX LIFE INSURANCE RATE OF RETURN

The relative place of life insurance in United States household savings has declined since the mid 1950s and indeed this decline has accelerated in recent years.[1] Combined with the phenemona of the increased use of policy loans, the net savings flow through the life insurance intermediary as a percentage of personal disposable income has been reduced.

Table 1

LIFE INSURANCE SAVINGS AS A PERCENTAGE OF INCOME

Year	Gross (%)	Net of Policy Loans (%)	Premium Savings(%)*
1952-56	1.14	1.07	0.43
1957-61	0.92	0.79	0.17
1962-66	0.96	0.82	0.18
1967-71	0.80	0.56	0.07
1972-76	0.75	0.58	0.06
1977-81	0.70	0.44	0.05

*Defined in text.

Any explanation of the reasons for, and financial/non-financial effects of this decline must, at least in part, depend on the peculiar characteristics of life insurance savings. As will be explained in this paper, life insurance savings are intimately connected with the provisions of the permanent life insurance policy. Namely, it is a policy that provides life insurance coverage in addition to savings, is quasi-contractual in nature and whose return is taxed (through the intermediary) under a special set of rules known as the Menge formula. As a result of these peculiarities, among possible reasons for the decrease in life insurance are decreased demand for the life insurance coverage component of an individual life insurance policy. Decreased insurance demand might be due to sociological considerations such as smaller family size and the increased economic independence of women, or to increased exogeneous insurance protection in the form of group life insurance from employers, and survivors benefits from the Social Security Administration. Alternatively, the increased exogeneous provision of contractual savings in the form of pensions and Social Security retirement benefits lessens the need for savings of the type connected with the life insurance contract. Finally, any increase in the after tax rate of return differential between alternative endogenous savings vehicles and life insurance savings such as might occur due to differential tax treatments (and in particular, as will be explained, under the Menge formula in inflationary periods) can be a reason for the decline in life insurance savings.

While there is an element of truth in all three explanations of life insurance's relative decline, this paper exphasizes and explicitly tests for the effect of differential taxation of life insurance savings. There are two reasons for this choice. One is practicability. With a proper understanding of the life insurance intermediary and its taxation, it is possible to specify the after-tax return on life insurance savings and compare it to the returns on alternative forms of household savings.2 It is much more difficult to explicitly formulate and test models incorporating the first two explanations. The second reason is a judgment, based in part on some casual empiricism and in part on econometric evidence presented in the last part of the paper, that the trend and variability in the after-tax rate differential explains the major share of the trend and variability of the propensity to save through life insurance. An example of casual empiricism debunking the decreased life insurance coverage demand theory is the introduction (in 1965) and subsequent popularity of term (pure) life insurance coverage policies.

The reasons for the decline in life insurance savings should have more than parochial or academic interest. Shifts in savings patterns affect the term structure of interest rates and the configuration of portfolios, thus indirectly and directly affecting the size and nature of capital formation. This has been shown to hold especially in the case of life insurance savings.[3] If life insurance savings has been subject to increased (differential) taxation, there are further implications. Before-tax long-term interest rates, ceterus paribus, should rise[4], thereby lowering optimal debt/equity ratios and capital formation. Finally, if increased (differential) taxation caused a reduction in life insurance savings and if life insurance is the only endogeneous contractual savings contract available to households, then in addition to the above occurences, there will have been a drop in the savings rate of the economy and therefore in the steady-state capital labor ratio.[5] The magnitudes of these effects, of course, depend on the relevant magnitudes of life insurance and other savings flows.

1. Positive Reasons for Life Insurance Savings

Along with commercial banks, life insurance companies were the first financial intermediaries in the American economy.[6] There were, no doubt, many reasons why this form of intermediation occurred in the late 1800's and early 1900's, some of which may still exist today (see below). Even if the positive economic reasons for life insurance savings no longer exist, however, life insurance companies would continue to have an important place in personal savings simply by virtue of their previous existence. Thus if the industry is flexible in its reactions to economic changes, and is not impeded by any competitive disadvantages imposed externally, there is sufficient reason to explain the phenomenon of savings through life insurance by institutional factors alone. Implicit in any institutional explanation of nonatomization and status quo is the industrial organization theory of high initial start-up costs and scale economies. These costs, in the case of financial intermediation, may include gaining a trustworthy reputation, forming consumer habits, necessary scale economies in the assumption of financial risk, and scales in production of inside financial information and transactions. The implication of this non-specific approach is that explanations for variations, trends, and/or structural changes in life insurance savings are the same as those for changes in the economy-wide savings rate -- national income (in a Keynesian interpretation), after-tax interest rates (in a classical interpretation) and other variables that come up in the life cycle-liquidity constraint context.

Before mentioning the possible specific economic reasons for life insurance savings it will be helpful to go over some of the particulars of life insurance contracts. The following 2x2 matrix exhibits the four main categories of policy contracts.

Table 2

SAVINGS STATUS	PARTICIPATION STATUS: Participating	PARTICIPATION STATUS: Non-Participating
Saving	Participating Permanent (Cash-Value)	Non-Participating Permanent (Cash-Value)
Non-Saving	Participating Term	Non-Participating Term

A life insurance policy is a contract between the policyholder and the life insurance company that entitles the holder to certain benefits under certain life contingencies in exchange for a premium payment to the company. Under a constant term life policy, the insurance company agrees to pay a fixed amount (the face value of the policy) to the named beneficiary upon the death of the insured, in exchange for payment of a premium that increases with the age of the insured. The increases represent increasing mortality probabilities. There are no other benefits and in particular no cash value. A permanent life policy provides in addition to death benefits, the lifetime benefit of a cash value. In return for payment of a usually constant premium, the insurance company agrees to pay a fixed amount (the face value) to the named beneficiary upon the death of the insured, to pay an accumulating cash value (less than the face value until the policy's maturity) anytime the policyholder lapses the policy, or to lend up to the accumulated cash value to the policyholder if the policy remains in force and interest payments are paid at an interest rate as set forth and fixed in the policy at the time of sale. The most fruitful way, therefore, of looking at a permanent life policy is as a combination of an accumulating savings account and a declining term life insurance contract. Part of each premium pays for term insurance and part enters a savings account. Since the cash value of the policy and the amount that corresponds to actual term life insurance always add up to the fixed face value, as the amount in the savings account accumulates, the term component must decline. Therefore, as a permanent policy ages, it becomes more and more a savings account.

Still another categorization is used for life insurance contracts. In a participating policy, the holder participates in improvements in the company's mortality experiences and interest income via payments of dividends by the company. In a non-participating policy, the implicit interest and mortality rates are fixed at the time of the policy sale and no payments are ever made to reflect improvements in these rates. Most permanent policies are participating.7

The close institutional connection between the term life insurance and savings components of a permanent life contract suggest several positive economic reasons for savings through life insurance. Since term life insurance premiums are paid annually (or even more frequently), from the point of view of both policyholder and insurance company, average transaction costs can be reduced if a savings plan is tacked onto the life insurance policy. More specifically, the policyholder economizes on time, effort, and check clearance costs if he invests at the same time as he pays his insurance premiums. The marginal costs for the insurance company of initial bookkeeping record maintenance, and investing premium payments (both direct brokerage costs and financial research-management fees) are almost zero once a term life contract has been made. Therefore the life insurance company can afford to (implicitly) charge less for its investment sevices than other financial intermediaries and certainly less than direct investment bonds with high commercial brokerage fees. This argument is especially true for small investors.

A second reason for saving through life insurance is economic self-control.[8] In other words, permanent life insurance operates as the life-cycle version of a Christmas Club. The features of a permanent life policy -- constant, periodic required payments whose neglect results in the cancellation of life insurance protection -- mesh well with the characteristics of a forced life cycle savings plan -- highly regular installments with a large penalty for disruption. While other long-term private savings plans can be designed, any enforcement besides cancellation of a service connected with the regular payment is probably illegal. In the case of life insurance the penalty of temporary lapse of insurance protection is augmented by the possibility that through the usual underwriting process, subsequent life insurance will be impossible or more expensive to obtain. There is also a further fianncial penalty for early lapsation, as will be mentioned below. Of course, it is possible to maintain life insurance coverage, avoid lapsation and still disrupt the savings plan by borrowing against one's cash value via a policy loan. There are no legal or other restraints against doing so, and when interest rates are above the policy loan rate, there are addi tional interest and tax arbitrage incentives to such behavior. Such an occurrence has become more commonplace, but considering, for example, the rate differential between a 5% policy loan rate and 15% yield on AAA bonds in 1981, it is remarkable that such behavior is not more widespread.9

The first two reasons for the relative attractiveness of saving in a life insurance company depend on the peculiar existence of the life insurance component of the contract. It is also possible that the existence of the savings component reduces the cost and ensures the existence of the pure life insurance coverage. It has been recognized that the singular problem of competitive insurance markets is anti-selection.10 A company may offer term insurance at the average mortality rate for a particular age-sex combination in the population, only to have low risk individuals avoid the purchase of insurance or drop it soon after purchase, and high-risk individuals rush in to buy and maintain the favorably priced policies. The result, of course, is that the insurance company will lose money and there is a distinct possibility that the entire market will disappear. The theoretical mechanism proposed to ensure an insurance equilibrium -- the simultaneous control of insurance price and quantities allowed to be purchased -- is subject to two attacks, however.11 It is not robust to all forms of strategic behavior and does not seem to be empirically founded. Rather, the real world devices of underwriting (thereby removing the underlying informational asymmetry), high pressure sales, group insurance and permanent insurance have arisen. It is relatively easy to see why the device of high pressure sales helps alleviate the problem of anti-selection. If insurance is "sold," instead of "bought," a more representative mortality sample is thereby assured. This is confirmed when it is noted that those companies who most carefully underwrite their policies have the lowest key "soft sell" sales teams.12 To explain why permanent insurance alleviates the problem of anti-selection, more background is needed. Due to a large initial commission paid to the agent upon the sale of a permanent policy and the savings with penalty nature of the plan, legal and competitive conditions allow insurance companies to delay the natural accumulation of cash value several years into the life of the policy. In other words, a policyholder is severely penalized if he lapses his permanent policy early in its lifetime. Thus permanent policyholders are less likely than term policyholders to lapse their policies either after a hard sale or after further information about one's own mortality prospects becomes available. In this manner, anti-selection is avoided and the existence of life insurance markets is ensured (at lower average cost).

It should be parenthetically remarked that life insurance savings have a slight advantage over other forms of savings as a bequest. Since 1840, the law provides that the proceeds of a policy made out to a widow as beneficiary would be paid to her and are exempt from claims of creditors.

The implication of this highly specific approach is that short of examining trends in relative transaction costs, the psychological necessity for self-control, the existence of other forms of contractual savings such as pensions, or the complicated issue of variation in mortality risk within demographic groups, the close connection between life insurance savings and life insurance coverage indicates that explanations for variations, trends and/or structural changes in life insurance savings are the same as those for life insurance coverage demand. These variables might include life insurance-in-force under Social Security, real income, and sociological considerations such as number of children and their age distribution, future prospects for the widow (or widower), extended family structure, and so on.

While both the non-specific and the above-mentioned specific approaches to life insurance savings are interesting and appropriate, we look at another aspect of the problem here. We investigate the after-tax return to life insurance savings and compare it to the after-tax return on a "home-made" bond fund of similar maturity and risk. This is a specific approach that can be specified. Furthermore, if there are no other savings instruments available in the economy that have the characteristics of a quasi-forced savings plan with low transaction costs, it is clear that a change in the third specific characteristic -- the after-tax interest rate differential -- will result in a one-for-one corresponding change in the savings rate.

There are three reasons why there would be an after-tax interest rate differential between buying a permanent life insurance policy with full expectations of keeping it in force and buying a series of long-term bonds.

1) The interest rate implicit in the life insurance policy differs from that available in the long-term bond market. By law and by conservative business practice, life insurance companies themselves buy bonds for their portfolios. Therefore, any interest rate difference as perceived by the prospective life insurance investor must be due to the institutional practices of the life insurance intermediary. In particular, when someone purchases a life insurance policy, he receives the current average rate of return on the company portfolio, and not the marginal rate of return on new money. When market rates suddenly increase and the average maturity of the company portfolio is fifteen years, a small wedge appears between the return from purchasing the life policy and paying premiums for the next twenty years and constructing one's own bond portfolio by periodic purchases over the next twenty years. Furthermore, if the life insurance company is constrained to earn below market rates on part of its portfolio even in the future (for example, on policy loans), the wedge is enlarged.

2) The interest rate differential may also be due to differences in costs. While we mentioned several reasons why transaction costs might be lower for life insurance, there are other costs to consider. In particular, sales agents receive a large initial sales commission and smaller renewal commissions for the life of the policy, as long as they work for or are vested with the life insurance company.

3) Finally, an after-tax interest rate differential might appear if the two forms of investment are taxed differently. Interest income on directly held bonds is taxed under the individual income tax. Interest income on life insurance is exclusively taxed through the company under the federal life insurance company income tax acts (we study the 1952 and 1959 Acts) and state premium taxes. It is not surprising that there should be a difference arising from these different forms of tax treatments. In fact, the difference is large and has changed dramatically over time.

2. Some Actuarial Mathematics

Our goal is a variable defined as the after-tax interest differential between paying premiums on a permanent life insurance policy for twenty years and similar investment in a AAA long-term bond fund. We introduce some actuarial notation that will be helpful in approaching the life insurance rate of return computation. The standard references for actuarial mathematics are Kellison (1970) and Jordan (1975).

i_c - the effective rate of interest; that is, the amount of money that $1 invested at the beginning of the year will earn during the year, where interest is paid at the end of the year.

$\nu = \frac{1}{1+i_c}$ - discount factor

$d = i_c \nu$ - effective rate of discount

$\ddot{a}_{\overline{n}|} = 1+\nu+\nu^2+\ldots+\nu^{n-1}$ - n-year certain annuity-due

$\ddot{s}_{\overline{n}|} = (1+i_c)+(1+i_c)^2+\ldots+(1+i_c)^{n-1}+(1+i_c)^n$

x - age

(x) - person of age x

$s(x)$ - probability that a new life, aged 0, will survive to attain x.

$\ell_x = ks(x)$ (where $k=\ell_0$) - number from a cohort of ℓ_0 initial members surviving to age x

$d_x = \ell_x - \ell_{x+1}$ - number of deaths in the x^{th} year

w - the first age at which there are no survivors; that is, w is the smallest x for which $\ell_x=0$; $w=100$ in most life tables

$$C_x=\nu^{x+1}d_x$$

$$M_x=\sum_{t=0}^{\infty} C_{x+t}$$

$$D_x=\nu^{x}\ell_x$$

$$N_x=\sum_{t=0}^{\infty} D_{x+t}$$

Commutation Functions

$$\ddot{a}_x=\frac{\nu^{x}\ell_x+\nu^{x+1}\ell_{x+1}+\ldots+\nu^{w-1}\ell_{w-1}}{\nu^{x}\ell_x}$$

- a life annuity-due payable annually by (x)
- a series of annual payments of \$1 commencing at the beginning of one year and continuing throughout his lifetime;

$= N_x/D_x$

$$A_x=\frac{1}{\ell_x}\sum_{t=0}^{\infty}\nu^{t+1}d_{x+t}$$

- the present value of a payment of \$1 at the end of the year of the death of (x); the present value of permanent (whole life) insurance;

$= M_x/D_x$

$$P_x=A_x/\ddot{a}_x$$

- net level premium required so that the present value of the sequence of net premiums equal the present value of the insurance

It can be shown that $P_x = \frac{1}{\ddot{s}_{\overline{w-x}|}} + P$

where

$$P = \frac{(1-\frac{\ddot{s}_{\overline{1}|}}{\ddot{s}_{\overline{w-x}|}})C_x + (1-\frac{\ddot{s}_{\overline{2}|}}{\ddot{s}_{\overline{w-x}|}})C_{x+1} + \ldots + (1-\frac{\ddot{s}_{\overline{w-x}|}}{\ddot{s}_{\overline{w-x}|}})C_{w-1}}{N_x}$$

i.e., that the net level premium is a combination of a savings fund level premium and a premium for decreasing term insurance.

$_tV_x = A_{x+t} - P_x\,\ddot{a}_{x+t}$ - the insurer's net obligation at time t for a insured at age x -- or the policy reserve -- the excess of the present value of the future benefits over the present value of the future net premiums.

$_tCV_x = A_{x+t} - P_x^A\,\ddot{a}_{x+t}$ - the policy's cash value where

$$P_x A = \frac{A_x + E'}{a_x}$$

E' - initial loading for expenses. A policy's value is therefore close to its reserve amount, especially in the later years of the policy.

It can also be shown that

$$_{t+1}V_x - (1+i_c)\,{}_tV_x = P_x(1+i_c) - \frac{d_{x+t}}{\ell_{x+t}}(1 - {}_{t+1}V_x)$$

that is, the real change in reserves equals premiums paid at the beginning ofthe period (both for the savings fund and for the declining term insurance) accumulated at interest less the cost of insurance based upon the net amount at risk for the $(t+1)^{th}$ year. The total real change in insurance reserves is the real change for the aggregate of all groups x insured.

$$_{t+1}V - (1+i_c)\,{}_tV = \sum_{x=0}^{w} {}_{t+1}V_x - (1+i_c)\,{}_tV_x$$

Therefore, if the "life insurable" (adults with families) population is growing at a constant and savings through life insurance is a constant positive function of income, then the total real change in insurance reserves (premium savings) would be

$$ {}_{t+1}V-(1+i_c)\,{}_tV=(1+m)\alpha Y_t $$

where m is the differential growth rate between the life insurable population and the income producing population, and α is the life insurance savings rate. If all life insurance were term insurance, then α would be zero.

In this paper, i_c, the current after-tax life insurance rate of return is calculated based on knowledge of the current average earnings rate on investments as reported to the National Association of Insurance Commissioners (NAIC) and the federal tax law in effect. It is hypothesized that α is a behavioral function of the after-tax interest rate differentials mentioned above. In other words, net premiums paid for permanent life insurance, depend on alternative after-tax yields. (Life insurance is assumed actuarially fair and m is assumed constant.) The rate differential, which is really the heart of the paper, derives from the expected after-tax level effective life insurance return, as computed below, and the expected after-tax level effective long-term bond return, also computed below.

3. A History of Life Insurance Company Taxation

Even though our study starts in the 1950's, it will be useful to review the trends in life insurance company taxation from 1921 forward. The account here derives from Valenti (1957). The main issues that legislators have had to deal with are whether life insurance is a service (and thus should be taxed like other businesses) or a savings institution (and therefore should be taxed similar to banks), whether mutual (participating) life insurance companies are profit making ventures or not, how to deal with for-profit stock (non-participating) companies, how to tax the income from new life insurance company products (e.g. pensions, health insurance, term life), and how to recognize the long-run nature of the business. From 1921 to 1941, the "free investment income" tax approach was used. The assumptions were that there could be no true underwriting income since, in the aggregate, from any group of policies the premiums collected would actuarially be sufficient only to meet loading costs (administrative and acquisition costs) and present and future claims under this group of policies. (Correct actuarial procedures and either competitive pricing or fair participating dividends are assumed.) The only taxable income was investment income after deduction of 1) investment expenses and 2) additions to policy reserves of interest earnings on such reserves. The interest income deductible was 4% applied to the mean of the reserve amounts for the years 1921 to 1931 and 3-3/4% for 1931 to 1941. Any interest earned above that amount was taxed at regular corporate tax rates. This formula eliminated underwriting profits completely, as was reasonable when most life insurance companies were participating. In point of fact almost <u>no</u>

federal taxes were paid throughout this period due to a retroactive legal ruling in 1928 and low market interest rates for the rest of the period.

The "industry ratio" method was used in the tax formulas applicable to the years 1942 through 1957. Under this method, the allowance for interest requirements was computed as the product of the company's net investment income (excluding tax-exempt interest) and a percentage either fixed by statute (as in 1951 through 1957) or determined according to a formula specified in the law (the "Secretary's ratio" for 1942-1950). The Secretary's ratio increased slowly from 92% in 1943 to 96% in 1946, but then suddenly it rose to over 100% in 1947 and 1948; i.e. life insurance companies paid no federal tax for the years 1947 and 1948. Although the 1942 formula remained on the books as the "permanent" tax formula through 1957, it was superseded on a year to year basis after 1948 by various stop-gap measures. In the formula applicable to the years 1951 through 1957, the allowance for interest requirements permitted each company was, in effect, 87-1/2% of its investment income.

In 1958 and continuing until 1982, a new, more complicated, method of taxation was adopted. It is basically an "adjusted reserve" method. The adjusted reserve is determined by adjusting the company's total reserves to the amount of reserves which would have been held using the interest rate on which the statutory credit for reserve interest is to be based (while retaining the use of the mortality and morbidity tables actually employed by the company). Thus, if the statutory credit is based on the assumption that, on the average, 3% reserves are being held, each company would compute its credit as the product of (i) 3% and (ii) the amount of reserves it would have held if all of its reserves had been based on a 3% interest assumption. By providing for this sort of adjustment of reserves before the application of the interest deduction rate, the "adjusted reserve" method corrects one of the principal deficiencies of the "free interest" method: the defect that companies with otherwise similar operations might pay significantly different amounts of tax solely because of differences in the average reserve interest rates employed. In particular, it eliminated the differential tax treatment of participating (low reserve interest rate) and non-participating (higher reserve interest rate) permanent policies.

Obviously, if the "adjusted reserve" method were to be applied on an exact basis, a company would have to make one valuation for annual statement purposes and another for federal income tax purposes. There is, however, an actuarial rule of thumb which can be used in approximating changes in reserves arising from changes in the assumed interest rate. This rule provides that for typical distributions of life insurance policies by plan, age at issue, and policy year, an increase (decrease) of 1% in the reserve interest rate will result in a decrease (increase) of 10% in the amount of the reserve. Under this rule, known as the "ten-for-one" or "Menge" rule, if the average required interest rate for a company's reserves is 2-1/2%, for example, the amount of reserves which would have been held on a 3% interest assumption can be approximated by multiplying the reserves actually held by 95% (100% minus 1/2 of 10%). For small differences in interest rates, the condition prevailing in the 1950's, the rule works well. As the difference increases, the approximation becomes less and less accurate. For large differences the poor approximation can result in a very heavy tax assessment. This certainly occurred in the 1970's since the interest rate used under the "adjusted reserve" method is defined as a function of the individual company's interest earnings rate, which increased dramatically from the interest used in the original reserve calculations.

4. The 1959 Life Insurance Company Income Tax Act

A mathematical representation of the 1959 tax law was first given by Fraser (1962). The main results are reproduced here. Under the law, a tax at the regular corporate rates is imposed on the company's "life insurance company taxable income." This taxable income is the sum of three parts, called phases in the law, as follows:

i) $\min [T, G]$

ii) $1/2\ (G-T) < 0$

iii) W

T is the Taxable Investment Income

G is the Gain from Operations, and

W is the Amount Withdrawn from the Policyholders' Surplus Account.

T is basically computed under the "adjusted reserve" approach. In regard to G, the aggregate deductions for dividends to policyholders and for certain other items have been limited to $250,000 plus the excess, if any, of the Gain from Operations G (before taking account of these deductions) over the Taxable Investment Income T (i.e. the underwriting gain, U), $G = T + U - \$250{,}000$. Thus, under the 1959 law, a mutual company generally is not able, by increasing the amount of dividends paid to policyholders, to reduce its taxable income below Taxable Investment Income minus $250,000. For most mutual companies, therefore, the "life insurance company taxable income" will, under present conditions (i.e. reasonable dividends), be equal to the $T - \$250{,}000$. For a stock company, $1/2(G-T) < 0$, is also taxed, and the other half is added to the policyholders' Surplus

Account. Additions to the Surplus Account are not treated as taxable income until withdrawn from this account either to pay dividends to stockholders or to reduce the amount held in the account to the maximum permitted under the law. In point of fact, no Phase 3 tax has ever been levied. Furthermore, we will only investigate Phase 1 taxation, since only nominal amounts of interest income are taxed under Phase 2.

$$T = [I(CS)_T - I^{nt} - S] \nless 0$$

Where:

I is the Investment Yield, which is equal to the company's gross investment earnings less the deductions permitted for investment expenses and taxes, real estate depreciation, etc. Investment Yield includes fully and partially tax-exempt interest and all dividends received on corporate stocks.

$(CS)_T$ is the Company's Share (defined below).

I^{nt} is the amount of tax-exempt interest and the tax-exempt portion of dividends received on corporate stocks.

S is the small business deduction, which is min (.1I, $25,000).

$$(CS)_T = 1 - \frac{i'V' + iP + K}{I}$$

Where:

i is the current earnings rate and is computed by dividing the company's Investment Yield by the mean of the company's "assets" at the beginning and end of the year. (Except for taxes and certain accounting differences, it is identical to i_c used in the actuarial calculations above.)

i' is the adjusted reserves rate; it is the smaller of (a) the current earnings rate and (b) the average of the current earnings rate for the present year and those for the four preceding years.

P is the mean amount of pension plan reserves.

V' is the amount of adjusted life insurance reserves other than pension plan reserves (see below).

K is the amount of direct interest paid during the year.

I is the Investment Yield.

$$V' = V(1 + 10\,\bar{r} - 10i')$$

Where:

V is the mean amount of life insurance reserves other than pension plan reserves.

$\bar{r}$ is the average assumed interest rate for such life insurance reserves; it is equal to

$$\sum_k \frac{V_k r_k}{V}$$

Where:

V_k is the mean amount of reserves valued at the rate r_k. (r_k depends on the rate allowed in the state non-forfeiture law in effect at the time the policy is issued. It has hardly changed over time.)

For example, if the adjusted reserves rate is 6% and the average valuation interest rate is 3%, the adjusted life insurance reserves would be equal to $V[1 + 10(.03) - 10(.06)] = .7V$. It will be recognized that this reserve adjustment represents an approximate adjustment based on the "Menge" rule.

The tax function is homogeneous in the first degree, aside from the constant statutory deductions and limitations. Therefore, a company that is, say, exactly twice the size of another company in the same tax situation will pay exactly twice the tax (except to the extent of the tax effects attributable to the constant statutory deductions and limitations). This is a fortunate result; it means that we can aggregate over different size companies without having to know the size distribution of companies to compute the effective after-tax life insurance return.

5. Formulas for Current and Expected Future Life Insurance Rates of Return

Under the following assumptions T, taxable investment income, simplifies.

a) The company correctly assigns interest and tax liability to its pension and non-pension accounts. Therefore, we can ignore P in the formula.

b) The company does not invest in tax-exempt securities. Until recently, it would not have done so, since the marginal after-tax return from taxed securities was higher than the marginal after-tax return from tax-exempt securities. (This is due to a quirk in the law, as can be shown.)

c) S and K can be ignored.

d) $I = i(V+\delta) = iA$. Assets defined in the 1959 law include assets resulting from surplus funds and other life insurance company obligations, such as incurred expenses, mandatory reserves for fluctuations in security values and insurance premiums paid in advance. These assets are denoted by δ. The ratio $V/V+\delta$ is assumed to be constant throughout the period studied at .85. This assumption is supported by examining the life insurance industry balance sheet.

e) t is the corporate tax rate. Therefore

$$T = t\left[iA\left(1 - \frac{i'V(1+10r-10i')}{iA}\right)\right]$$

$$= t[iA - i'V(1+10\bar{r}-10i')].$$

The current after-tax life insurance return is

$$i_c = \frac{I-T}{A} = \frac{iA-tiA+ti'V(1+10\bar{r}-10i')}{A}$$

$$= i - ti + ti'\frac{V}{A}(1+10\bar{r}-10i')$$

$$= i - ti + .85ti'(1+10\bar{r}-10i')$$

If we further assume a steady-state result

f) $i' = i$,

then

$$i_c = i - .15ti + 8.5t\bar{r}i - 8.5ti^2$$

The marginal after-tax return with respect to a steady state increase in i is:

$$\frac{di_c}{di} = 1 - .15t + 8.5t\bar{r} - 17ti$$

If $t = .50$, $\bar{r} = .03$ and $i = .12$, then the elasticity is $\xi_i = \frac{i}{i_c}\frac{di_c}{di} = .0599$, that is an increase in interest rates, has at the margin and under reasonable conditions, a much less than one for one proportional increase in the current life insurance rate of return.

We have found the i_c^T to be used in the construction of the dependent variable. It is possible to proceed from here to the construction of i_E^T, the expected level after-tax life insurance rate of return on a policy held for twenty years, or 80 quarters.[13] The approach taken is to solve for implicit i_E^T that satisfies $\ddot{S}_{\overline{80|}} = b^T$, where b^T has been calculated by algorithm. This is done numerically, as an explicit analytical solution of an 80-degree polynomial is imposible. It is done for every quarter (denoted T) from 1952:1 to 1982:2, based on the interest and tax rates then prevailing and expected to prevail.[14]

It is probably easiest to write out the algorithm explicitly and explain the assumptions afterwards.

(1) $$i_t^T = (i_{BAAt}^T - .002)(1 - \theta_t^T) + (i_{PLCYLt}^T)(\theta_t^T) \qquad -60 \leq t \leq -1$$

$$i_o^T = i_{NAIC}^T$$

$$i_e^T = (i_{BAAo}^T - .002)(1 - \pi_o^T) + (i_{PLCYLe}^T)(\pi_o^T)$$

(2) $$i_O^T = i_{NAIC}^T$$

$$i_{t+1} = \frac{(i_t^T-(1/90)i_t^T-60)}{1.013} + .0238\ i_e^T \qquad 0 \leq t \leq 59$$

$$i_t^T = i_e^T \qquad 61 \leq t \leq 79$$

(3) $$i'^T_t = \min[(i_t^T + i_{t-4}^T + i_{t-8}^T + i_{t-12}^T + i_{t1-16}^T)/5,\ i_t^T]$$

(4)
$$E_t = .60 + .022 \qquad 0 \le t \le 3$$
$$= .08 + .022 \qquad 4 \le t \le 15$$
$$= .04 + .022 \qquad 16 \le t \le 39$$
$$= .03 + .022 \qquad 40 \le t \le 79$$

(5)
$$i^T_{Et} = i^T_t - t^T i^T_t + t^T i'^T_t(.85)(1 + 10\bar{r}^T - 10i'^T_t) - \frac{1}{\operatorname{mod}(\frac{t+1}{4})} E_t$$

$0 \le t \le 79$; for $1957{:}1 \le T \le 1982{:}2$

$$i^T_{Et} = i^T_t - t^T i^T_t + t^T i^T_t(.875) - \frac{1}{\operatorname{mod}(\frac{t+1}{4})} E_t$$

for $1952{:}1 \le T \le 1956{:}4$

(6)
$$b^T = (1 + i^T_{E79})^{1/4} + [(1 + i^T_{E79})(1 + i^T_{E78})]^{1/4} + \ldots$$
$$+ [(1 + i^T_{E79})(1 + i^T_{E78})\ldots(1 + i^T_{E2})(1 + i^T_{E1})(1 + i^T_{E0})]^{1/4}$$

$1952{:}1 \le T \le 1982{:}2$

We start our explanation with equation (1), building the structure from the ground up. i^T_{NAIC} is the same rate used in constructing i^T_c above. i^T_{BAAo} is the rate on new long-term BAA bonds, the primary security that life insurance companies have purchased for their portfolio. .002 is subtracted out because of the costs due to investment expenses and expected default. i^T_{PLCYLe} is the rate the company will currently receive from policy loans on newly issued policies. π_0^T is the current proportion of policy loans outstanding to reserves. It is assumed that all these rates and proportions will continue into the future -- basically the assumption of a flat yield curve and stable insurance behavior. i_{BAAt}^T and i_{PLCYLt}^T are the actual rates prevailing $|t|$ quarters previous to T. θ_t^T is the proportion of new policy loans to reserve increase $|t|$ quarters previous to T. We include policy loans because, especially in recent years, they have been a drag on the ability of life insurance companies to get new market rates. Equation (2) exhibits the fact that the life insurance policyholder receives the average rate of return and therefore can expect to receive market (marginal) rates, i_e^T, only after some time. The specific assumptions imbedded here are that the portfolio turns over (on average) every fifteen years and is growing 1.3% per quarter. The securities retired in the current quarter are $1/90 \cdot \frac{1}{1.013}$ of the portfolio $(\sum_{i=0}^{59}(1.013)^i = 90)$ and those currently being purchased are $(1.013)^{59}/90 = .0238$ of the portfolio.

$$\left[\frac{\sum_{i=0}^{59}(1.013)^i}{(1.013)90} + \frac{(1.013)^{59}}{90} = 1.013\right]^{15}$$

The accuracy of these assumptions can be checked by comparing the rate of return on our hypothetical life insurance portfolio at a point of time with i_{NAIC}^T. For the several fourth quarters checked, the two rates were remarkably close.

Table 3

T	Hypothetical i_o^T	i_{NAIC}^T
1961:4	.0434	.0422
1966:4	.0478	.0473
1971:4	.0609	.0552
1976:4	.0696	.0668
1979:4	.0814	.0778

Equation (3) is self-explanatory and is necessary because of the tax formula. Equation (4) lists other expenses specific to life insurance. The first number in the E_t sum represents the sales agent's commission on premium paid for the t^{th} quarter after policy purchase. These are New York State legal maximums and they haven't changed over the period being investigated. .022 is the average state premium tax. This figure has also been steady over time. It should be noted that these percentages of premiums paid are absolutely large, and in periods of low interest rates, relatively large also. Equation (5) is self-explanatory in light of the "Menge" formula and represents the after-tax, after-expense expected rate of return t quarters after T. The form of expenses subtracted was chosen for analytical convenience. It basically says that a declining proportion of expenses is subtracted from total interest earned on an individual's life insurance account. While not technically correct, the correct formulation (adding still another subscript on i_{Et}^T to distinguish between positive commissions and state tax expenses subtracted from interest on new money and zero expenses subtracted from interest on old money) would have been impossible to program. Therefore an "on average" approach was chosen. Finally, Equation (6) represents the accumulated amount over 80 quarters.

i_E^T is the level effecive after-tax life insurance rate of return. Defining

$$(1 + i_E^T)^{1/4} = (1 + i^T)$$

and

$$f(i^T) = (1 + i^T) + (1 + i^T)^2 + \ldots (1 + i^T)^{80} - b^T = 0$$

we get

$$0 = \frac{[(1 + i^T)^{80} - 1](1 + i^T)}{i^T} - b^T$$

$$0 = \frac{[(1 + i^T)^{81} - (1 + i^T)]}{T} - b^T$$

Using a Newton-Raphson iteration

$$i_{n+1}^T = i_n^T - \frac{f(i_n^T)}{f'(i^T)}$$

with $(i_o^T = (1 + i_{NAIC}^T) - 1)$

i_n^T converges to i^T. Finally, $i_E^T = (1 + i^T)^4 - 1$.

The rate of return on the alternative bond portfolio is duck soup. It is simply

$$i_{AAA}^{T} = (1 - t^{T'})(i_{AAAo}^{T} - .003)$$

where $t^{T'}$ is the individual income tax on interest income, i_{AAAo} is the current yield on new-issue AAA long-term bonds, and .003 represents various, unspecified, investment expenses. Again, a flat yield curve has been assumed. The independent variable, therefore, is

** $$\boxed{RDIFF^{T} = i_{E}^{T} - i_{AAA}^{T}}\ .$$

** $$\boxed{LISRY = \frac{V^{T} - (1+i_{c}^{T})V^{T-1}}{Y^{T}}}$$

is the dependent variable,15 where Y^{T} is personal disposable income.

6. Empirical Results

The regression using these variables for the period 1959:1 to 1982:1, assuming $t'^{T} = .35, \forall T$, is

Dependent Variable: LISRY

	Coefficient	T-Stat	Independent Variable
	.00131	6.745	Constant
1)			PDL (RDIFF, 2, 4, NONE)
/0	.00051		
/1	.00026		
/2	.00015		
/3	.00017		
SUM	.00109	4.809	
2)	-.00023	-1.662	SEASON Q1
3)	-.00038	-2.380	SEASON Q2
4)	-.00031	-2.240	SEASON Q3
	.610	6.973	RHO
$\bar{R}^2$ =	.6853		
D-W =	1.66		

RDIFF dropped approximately 2.4 over the period, while LISRY dropped approximately .0040 over the period. Our regression explains

$$\frac{(.00109)(2.4)}{.0040} = 65.4\% \text{ of the drop in LISRY.}$$

In another regression (not shown here), a trend variable was included. The size of the RDIFF coefficient barely changed and it remained significant.

There is, therefore, econometric support for the original contention that the tax treatment of life insurance savings (in an inflationary environment) has been a significant determinant of the amount saved.

If life insurance savings is more traditionally defined as $V^T - V^{T-1}$, then the life insurance savings rate can be denoted as $LISY^T = (V^T - V^{T-1})/Y^T$ and the following regression results for the period 1959:1 to 1982:1

Dependent Variable: LISY

	Coefficient	T-Stat	Independent Variable
	.00850	38.99	Constant
1)			PDL (RDIFF, 2, 4, NONE)
/0	.00064		
/1	.00033		
/2	.00022		
/3	.00029		
SUM	.00148	5.733	
2)	-.00027	-1.940	SEASON Q1
3)	-.00030	-1.899	SEASON Q2
4)	-.00027	-1.986	SEASON Q3
$\bar{R}^2$ =	.7995		
D-W =	1.66		

This regression is not surprising when it is realized that $\frac{{}^{i}c_T V^{T-1}}{Y^T}$ has been added to the right hand side of the equation, which adds to the constant term and is colinear with $RDIFF^T$. LISY dropped approximately .0045 over the period. The second regression explains

$$\frac{(.00148)(2.4)}{.0045} = 78.9\% \text{ of the drop in LISY}$$

There are several caveats to this empirical work. The problem of simultaneity bias presumably lurks in the regressions. A proper specification of interest rate determination, such as might occur in a simultaneous equations flow-of-funds model with due consideration of taxes would solve that problem. The assumption of a constant personal tax rate is a weak one and ultimately should be replaced. This improvement, however, would likely support our results since marginal tax rates were very high in the 1950's and recent inflationary increases in personal tax rates in no way cancel the after-tax rate differential reported here. Indeed, improved specification would probably be enough to include the 1952:1 to 1958:4 period in the regressions. Further research on these points would seem desirable.

7. Conclusion

The main substantive results have already been stated in the introduction. One methodological point, however, has yet to be stated. As is emphasized in Feldstein (1982), a well specified fiscal framework is necessary for a complete analysis of monetary policy. Increases in the inflation rate are clearly not neutral in the case of life insurance savings due to tax considerations and it is reasonable to expect that similar non-neutralities induced by taxes exist. This is not logically surprising, because as in the history of life insurance taxation, there is a close connection between an industry's tax mechanism and its institutional characteristics and structure.

Footnotes

1. See Friedman (1980) for a discussion of these and related changes in post-war American financial markets.
2. Other studies of life insurance savings flows either assume that the flows are exogenous (Hendershott, 1977) or depend simply on the private placement yield (Cummins, 1975).
3. This is because life insurance companies mainly invest in long-term corporate bonds and mortgages. See Friedman (1982).
4. See Feldstein (1978a) for a general model.
5. For interesting (and different) macroeconomic implications of life insurance savings flows see Geren (1943) and Feldstein (1982).
6. See Keller (1963) for a detailed history of the early industry.
7. This institutional review is taken from Warshawsky (1982).
8. Thaler and Shefrin (1981) give a rigorous treatment of the idea. It is also connected to issues of the investor's horizon and holding period. See also Feldstein (1978b).
9. Warshawsky (1982) develops a model of policy loan demand where self-control is implicitly assumed to be the behavioral background.
10. Rothschild and Stiglitz (1976) introduced the problem into the literature.
11. The existence of equilibrium under different behavioral assumptions in a continuous parameter model is discussed in Riley (1979).
12. This is a personal observation.

13. The twenty year average persistency was computed as follows: $1/40 \sum_{T=1}^{40} T = 20.5$. I.e. the lapse rates are uniform throughout the hypothetical range of forty years. In 1971-72, the empirical average persistency was closer to fifteen years.

14. The year 1957 is included even though the tax law only applied to 1958 and beyond. Since the computation involves future interest rate expectations, it is reasonable to also make an assumption regarding expectations of the future tax law. It was known as early as middle 1956 that the Treasury Department was proposing an increase in life insurance company taxation. It is assumed that this information was widespread and furthermore that some knowledgeable guesses could have been made about the form of the new law.

15. The assumption of 1.3% quarterly growth in reserves derives from a regression of log V on time. It therefore implicitly includes interest earned and reinvested. The 1.3% figure is also relatively steady for the period studied.

16. In defining the dependent variable, i_c^T obviously must be the quarterly (and not annual) interest earned. This is because we are investigating quarterly increases (decreases) in life insurance savings flows and using quarterly reserve numbers. Furthermore, i_c^T is computed using actual interest rates and tax laws, not expected ones. Therefore, the 1959 law applies only back to 1958, and not 1957, as it does for i_E^T.

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Appendix

T	$LISRY^T$	$\bar{r}^T$	i_E^T	$RDIFF^T$
1952:1	--	--	2.40	.597
:2	.00499	--	2.51	.643
:3	.00548	--	2.50	.639
:4	.00597	-	2.45	.625
1953:1	.00567	--	2.56	.590
:2	.00495	--	2.88	.629
:3	.00439	--	2.82	.723
:4	.00389	--	2.54	.724
1954:1	.00407	--	2.34	.714
:2	.00430	--	2.36	.711
:3	.00465	--	2.42	.720
:4	.00477	--	2.33	.687
1955:1	.00449	--	2.44	.659
:2	.00390	--	2.48	.652
:3	.00366	--	2.60	.658
:4	.00372	--	2.57	.669
1956:1	.00388	--	2.57	.680
:2	.00376	--	2.87	.738
:3	.00343	--	3.13	.793
:4	.00255	--	3.41	.867
1957:1	.00174	2.70	3.06	.526
:2	.00081	2.70	3.23	.474
:3	.00063	2.70	3.31	.437
:4	.00099	2.70	3.27	.635
1958:1	.00200	2.70	2.87	.836
:2	.00239	2.70	2.83	.824
:3	.00243	2.70	2.90	.662
:4	.00211	2.70	3.00	.603
1959:1	.00210	2.70	3.20	.492
:2	.00184	2.70	3.29	.396
:3	.00249	2.70	3.34	.395
:4	.00362	2.70	3.48	.361
1960:1	.00323	2.70	3.48	.394
:2	.00223	2.70	3.42	.492
:3	.00090	2.70	3.30	.543
:4	-.00058	2.70	3.35	.503
1961:1	-.00017	2.70	3.21	.577
:2	.00075	2.70	3.29	.527
:3	.00206	2.70	3.30	.477
:4	.00319	2.70	3.21	.534

Appendix

(Continued)

T	$LISRY^T$	$\bar{r}^T$	i^T_E	$RDIFF^T$
1962:1	.00291	2.70	3.16	.518
:2	.00213	2.70	3.12	.606
:3	.00122	2.70	3.14	.590
:4	.00035	2.70	3.08	.600
1963:1	.00149	2.70	3.06	.600
:2	.00188	2.70	3.11	.570
:3	.00247	2.70	3.09	.520
:4	.00300	2.70	3.09	.483
1964:1	.00207	2.70	3.11	.482
:2	.00186	2.70	3.14	.480
:3	.00192	2.70	3.11	.464
:4	.00204	2.70	3.12	.436
1965:1	.00149	2.70	3.13	.457
:2	.00239	2.70	3.18	.466
:3	.00255	2.70	3.22	.456
:4	.00197	2.70	3.26	.409
1966:1	.00152	2.70	3.42	.367
:2	.00102	2.70	3.69	.365
:3	.00104	2.70	3.92	.270
:4	.00144	2.70	4.01	.339
1967:1	.00105	2.70	3.77	.480
:2	.00122	2.70	3.94	.442
:3	.00113	2.70	4.08	.338
:4	.00085	2.70	4.28	.177
1968:1	.00073	2.70	4.09	.061
:2	.00034	2.70	4.21	.021
:3	-.00105	2.70	4.13	.108
:4	.00172	2.70	4.23	-.010
1969:1	-.00018	2.70	4.35	-.231
:2	.00028	2.70	4.44	-.296
:3	.00033	2.70	4.57	-.403
:4	.00106	2.70	4.74	-.697
1970:1	.00023	2.70	4.92	-.560
:2	-.00028	2.70	5.06	-.788
:3	.00021	2.70	5.01	-.479
:4	.00147	2.80	4.95	-.266
1971:1	.00087	2.80	4.64	.252
:2	.00088	2.80	4.70	-.008
:3	.00114	2.80	4.81	-.034
:4	.00146	2.80	4.68	.102

Appendix

(Continued)

T	$LISRY^T$	$\bar{r}^T$	i_E^T	$RDIFF^T$
1972:1	.00111	2.80	4.60	.114
:2	.00096	2.80	4.66	.044
:3	.00103	2.80	4.67	.034
:4	.00116	2.80	4.59	.054
1973:1	.00135	2.80	4.61	-.045
:2	.00135	2.80	4.71	.025
:3	.00122	2.80	4.87	-.127
:4	.00071	2.80	4.77	-.081
1974:1	.00007	2.80	4.85	-.282
:2	-.00087	2.80	5.15	-.585
:3	-.00079	2.80	5.35	-.936
:4	-.00003	2.80	5.36	-.483
1975:1	.00066	2.90	5.35	-.228
:2	.00012	2.90	5.41	-.445
:3	.00122	2.90	5.41	-.508
:4	.00083	2.90	5.36	-.347
1976:1	.00027	2.90	5.18	-.028
:2	-.00045	3.00	5.19	-.131
:3	-.00017	3.00	5.11	-.134
:4	.00094	3.00	4.95	.012
1977:1	.00199	3.00	4.97	-.004
:2	.00188	3.00	5.01	-.011
:3	.00211	3.00	4.94	.003
:4	.00164	3.00	5.06	.021
1978:1	.00165	3.00	5.15	-.191
:2	.00130	3.50	5.46	-.092
:3	.00124	3.50	5.42	-.065
:4	.00120	3.50	5.49	-.204
1979:1	.00113	3.50	5.68	-.177
:2	.00096	3.50	5.76	-.117
:3	.00080	3.50	5.78	-.107
:4	.00045	4.00	6.30	-.609
1980:1	.00021	4.00	6.53	-1.418
:2	-.00010	4.00	6.46	-.565
:3	-.00035	4.00	6.47	-.967
:4	-.00068	4.00	6.66	-1.884

Appendix
(Continued)

T	$LISRY^T$	$\bar{r}^T$	i_E^T	$RDIFF^T$
1981:1	-.00121	4.50	6.94	-1.813
:2	-.00221	4.50	6.98	-2.344
:3	-.00193	4.50	7.00	-3.114
:4	-.00075	4.50	7.00	-2.794
1982:1	-.00158	4.50	7.00	-2.933
:2	-.00159	4.50	7.00	-2.67

Note: All interest rates have been converted to percentages. In the algorithms, decimals are used, while in the regressions, percentages in RDIFF, decimals in LISRY. Raw data was provided courtesy of Data Resources, Inc., (Flow of Funds) and the American Council of Life Insurance (annual Fact Book and other documents).