

**RECORD OF SOCIETY OF ACTUARIES
1981 VOL. 7 NO. 3**

**RELATIONSHIP OF PRODUCT DESIGN AND INVESTMENT
PHILOSOPHY**

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1. Have significant changes occurred in the past year or two in the maturity distribution of debt instruments?
2. At what intervals is the yield assumed to change in current pricing of new products and the setting of dividend scales?
3. What philosophy and methodology should be used for pricing products that necessitate greater asset liquidity due to terms of withdrawal privileges and their utilization?
4. What devices are being used to allocate specific classes of assets to specific products or product lines?
5. What practical impact has immunization theory had on product design?
6. How do current surplus objectives reflect the increased awareness of the need to match the maturity distribution of assets and liabilities?

MR. PETER F. CHAPMAN: A little more than three years ago, I testified before the Financial Accounting Standards Board on behalf of the Academy of Actuaries. At the conclusion of my testimony, one of the Directors of the FASB asked me why life insurance companies do not report realized capital gains as part of their gain from operations. Since the question had nothing whatever to do with the subject of my testimony, I had to recover from a brief period of bewilderment before responding. When I finally thought of something to say, I attempted to point out that since our chronically positive cash flow enables us to hold assets to maturity if we choose, transactional gains and losses are incidental to our primary enterprise. As a measure of how far we have come in three years, it is interesting to note that in 1978, such a statement made in a gathering like this would probably have achieved a substantial measure of concurrence. In 1981 it would be given the reception it deserves.

In the intervening years, we have learned some bitter facts about persistency, policy loans, and large scale disintermediation. We have learned about the effect of insufficient liquidity on financial results. The matching of benefit payments and asset maturities has stopped being an academic exercise and has become a real world discipline. The relevant question about the relationship between product cost and investment philosophy has gone from "should" to "how". Mike Rosenfelder, Corporate Vice President of Confederation Life Insurance Company, will address his remarks to topics 1 and 6 on the agenda: changes in maturity distribution of debt instruments and the impact of these changes on surplus objectives.

MR. MICHAEL ROSENFELDER: For reporting purposes to the Canadian regulatory authorities, there is a requirement to retain separate funds for the health, or accident and sickness business. Other than the separation of these health fund assets, all life and annuity general fund assets are treated as a single fund for insurance department reporting purposes. However, a number of companies, for internal management reasons, have chosen to carve out separate or segregated funds to support specific groups of products. There could be several motivations for doing this. For products which are very interest sensitive, the separation of assets can permit some further fine tuning of the pricing assumptions. Separate asset pools can enable companies to keep track of the performance of specific product lines, or of specific profit centers. The existence of separate pools of assets can make the reserve valuation procedure more precise. To clarify this last point it should be noted that Canadian legislation has no quantified reserve valuation standards, but rather requires the use of reserve valuation assumptions which, in the opinion of the valuation actuary, are "appropriate to the company and to the policies in force" and are acceptable to the Superintendent. A more precise matching of assets and liabilities by term to maturity reduces the potential reinvestment risk and, therefore, justifies the use of a lower new business strain.

The separation or segregation of assets can be either real or notional. A real or physical separation of the assets is probably more "pure" and, if carried through to keeping separate accounting records for the relevant investment transactions such as income received, can provide a very powerful management tool. A notional allocation is likely to be less precise, but is much easier to establish. There are also different general approaches. Some companies might attempt to match maturity dates or, alternatively, try to immunize the fund by having a mix of asset maturities designed to provide maximum protection to the company against loss from the reinvestment risk or from early liquidation.

The most widespread application of the allocation of specific assets to specific liabilities is almost certainly the single premium immediate annuity. Most of this business arises when accumulated pension monies, either individual or group, are applied at retirement towards the purchase of an annuity. This market is very price competitive and, of course, the price is, in turn, largely determined by the underlying yield assumption. Because the pattern of cash outflows arising from a specific block of annuity purchases tends not to be dissimilar from the cash inflow arising from the blended principal and interest payments under a conventional amortized mortgage, such investments represent a particularly good match to support the annuity liabilities. The attractiveness of this arrangement is further enhanced by the fact that mortgage yields tend generally to be slightly higher than corresponding bond yields. Conversely, this thesis will only work successfully when the company is protected against early repayments of the mortgage. While commercial or industrial borrowers are frequently "locked in" to a specific rate of interest for the lifetime of the mortgage, this is not always true of residential mortgages which, while amortized over periods ranging from 20 to 30 years, contain an option to mature at the end of five years or less. Subsequent renewals would be at the then current rates.

Specific pools of assets are also becoming popular in connection with the so-called "new money" products. In substance, these products are accumulation

plans emphasizing high current yields plus a guarantee of return of the capital at the end of a period such as five years. The life insurance industry has had to develop this type of product as a defensive mechanism against the growing competition of other savings vehicles, principally banks and trust companies. The source of deposits for these types of products could either be new money, arising from registered pension plans or otherwise, or from the rollover of traditional cash value insurance into what the policyholder perceives to be a more modern product. As with single premium immediate annuities, this market is highly competitive, with the emphasis almost solely on yield. Also, as with single premium immediate annuity business, again, the need for some mechanism to establish supporting pools of assets to support the pricing basis is fairly clear. However, the time horizon is generally somewhat shorter than for single premium immediate annuity business and, in this instance, residential mortgages renewing at the end of five years at then current rates, or possibly short term bonds, are excellent vehicles.

For other types of product lines, the ability or suitability of matching or immunization is less clear. Group long term disability annuity benefits are one instance where matching is desirable. It is a little more difficult, however, to see how this technique can be applied to the traditional cash value life line of business. The receipt of future premiums on existing contracts somewhat complicates the theory, and of course, the general trend toward disintermediation can cause unexpectedly high early surrenders. Higher than expected loan utilization rates, particularly at low interest, is another complicating factor. For participating business, on the other hand, the cushioning effect of a dividend scale which can be adjusted, if necessary, may protect the company against losses arising from the mismatching of assets and liabilities by term.

I have been unable to locate any specific statistics, but it seems fairly clear that a number of forces currently exist which are rapidly shortening the average term of a life company's policy liabilities. These forces, caused, among other things, by the uncertain economic environment, include the trend toward disintermediation and away from long-term obligations and the growing popularity of term insurance and short-term money accumulation plans. If a company is to protect itself against a major reinvestment or liquidity risk, it seems clear that its investment stance must lean very much toward rapidly shortening the term of its assets.

MR. STEVE P. COOPERSTEIN: With regard to real estate and equity kickers, how are these tied in with the shortening of maturity durations? Are they inconsistent with the matching of assets and liabilities?

MR. ROSENFELDER: In the present competitive market, every company is obviously striving to achieve the highest possible yield. It may well be that equity and real estate investments will ultimately produce higher yields, but it takes a very brave actuary to price a product with a very high yield assumption and put the money into real estate or common stocks which have a low immediate yield but long-term growth prospects. I suspect that interest sensitive products such as single premium immediate annuities and new money contracts tend to be supported by investments carrying a current high yield. This almost universally means mortgages, if you can find any in today's rather strange market, or short term bonds. This generally protects the company from an investment loss.

MR. CHRISTOPHER H. WAIN: Mike, if lapses, withdrawals, surrenders or loans run above your expectations, won't you have an investment loss in that branch or in that pool? And in that case, won't the loss have to be made up by a guarantee fund from the industry or from the rest of the company?

MR. ROSENFELDER: I did try to emphasize in my remarks that notional or actual separate pools of assets to support specific liabilities are techniques used most widely for products such as single premium immediate annuities or relatively short-term products with high interest guarantees. Single premium immediate annuity products have no exposure to lapse. You do have an exposure to mortality risk, but we are able to measure and predict that accurately so the matching of assets and liabilities can be accomplished fairly readily. This is also largely true for products which guarantee a rate of return on a single premium for a short period, say five years, or which provide for market value adjustment on early cash out. I do not know how you match assets and liabilities by term for conventional annual premium business when the lapse rates are relatively unpredictable. My comments on matching were intended to apply to these rather specialized new money type products.

The second part of your question dealt with guarantee funds. To the best of my knowledge there are no guarantee funds in Canada. The subject has received a little bit of publicity in recent months primarily because of problems in the casualty insurance business. While we are aware of developments in the United States, I have no idea whether or not such funds will come to be required in Canada.

MR. CHAPMAN: Mike, I think it would helpful to U.S. actuaries if you could enlighten us on two items. You were talking about the segregated funds that underlie specific benefits or specific coverage forms. Once segregated, are they valued on the same basis as other assets or is a different combination of book and market values used to value these assets? Secondly, if, as you indicated, Canadian companies are indeed going to short-term investments, this almost seems to imply more volatility between sales illustrations and product performance. Do you feel the Canadian public is willing to accept such volatility?

MR. ROSENFELDER: The establishment of separate pools of assets to support annuities or other specific lines of business is purely an internal management tool. As far as the regulatory process is concerned, all life and annuity general fund obligations are supported by a single pool of assets and there are asset valuation rules which apply to all such general assets, whether or not the company has notionally or actually allocated them.

In response to your second question, it seems that the general public is becoming less and less interested in long-term guarantees and far more interested in short-term performance. The industry's response to this surely has to be to provide such products and support them by appropriate investment strategies. Conversely, it is also true that it is becoming harder and harder to find long-term investments. Until relatively recently, mortgages advanced to a commercial or industrial borrower would almost inevitably have a fairly long-term locked-in rate. This is also changing, and many of the commercial borrowers are just not prepared to lock themselves into current rates for 20 to 25 years. The whole market is changing; both borrowers and lenders are looking short.

MR. CHAPMAN: Actuaries have had a long tradition of concern about the pricing implications of reinvestment during a period of declining interest yields. We are now beginning to focus our concern on the other dimension of the problem: forced liquidation of assets during periods of rising interest rates. Is it possible to develop techniques for matching the expected maturities of contractual obligations to the anticipated investment cash flow for maturities, interest, dividends and so forth? This technique, called immunization, was developed in the United Kingdom. Since its immigration to the U.S., a number of questions have arisen. There are no guaranteed surrender benefits in the U.K. Will this technique work when such benefits are provided? Does immunization have any value for separate account business where the entire investment risk is assumed by the policyowner? Does immunization in fact have any application aside from the group pension line of business? Mr. Daniel J. McCarthy of the New York office of Milliman and Robertson has tackled some of the implications of matching the maturities of assets and benefits. He will share with us some of his hard earned observations on the matching process as it occurs in the real world.

MR. DANIEL J. MC CARTHY: As Mike has already mentioned, the immunization theory, strictly interpreted, is of very limited use when you are considering strategies for products which provide for book value settlements at any time elected by the policyholder. Some strategies would appear to be safe for such situations. For example, investing everything in seven day commercial paper or money market funds, which typically have a maturity horizon of one month or less, would undoubtedly pass some safety tests. Such strategies, however, tend to be unsuitable over the long run for a number of other reasons, including the fact that their yield will often be considerably lower than those of other longer term investments.

The company's problems in book value settlements probably account, at least in part, for the current rise in popularity of variable annuities and flexible premium variable life insurance policies backed by funds which range from money market instruments to long-term bonds to equities of varying degree of risk and return. These products have in common the characteristic that the investment risk is returned to the policyholder rather than undertaken, wholly or in part, by the insurance company. It appears, however, that these products, despite their increased popularity, are still attracting only a fairly small portion of the total dollars going into insurance company products which stress investments. This may mean that either policyholders or agents, or both, have a fairly good understanding of the investment risks, and know which side of the risk they would rather have someone else take for them.

In the area of products which stress investment returns (principally deferred annuities and, more recently, single premium life insurance and various life insurance products with identifiable investment funds) the following innovations have been tested in an attempt to limit the upside investment risk to the insurance companies:

1. Surrender charges which remain quite substantial for long periods of time.
2. Bonus provisions which encourage persistency or annuitization by withholding a portion of the investment income either for a specified duration or until annuitization.

3. Provisions for flexible premium products which credit interest from the day of deposit. This feature, principally applicable to annuity contracts, addresses some problems but creates others. Substantial surrender charges and clear rules on the priority order of surrenders are required.
4. Contracts which allow one-way switching from interest rate guarantees backed by very short-term investments to longer guarantees presumably backed by longer term investments. This strategy, to be successful in the long run, must be accompanied by other significant incentives or disincentives, such as surrender charges.

Notwithstanding these experiments, one can also find products - in fact, widely sold products - which contain none of these features and, in fact, have features such as the following:

1. Surrender charges which grade off to zero after seven years or less and which, even while in force, do little more than fund the unamortized portion of acquisition expenses.
2. "Bail-out" provisions, which eliminate surrender charges entirely if the credited rate of interest drops below a certain threshold, often within 100 basis points or less of the original credited rate.
3. Provisions which permit the withdrawal of a certain percentage (perhaps 10%) of the accumulation value each year with no surrender charge.

Companies continue to sell these products for several reasons, presumably including the following:

1. They sell.
2. Nobody (at least in the U.S.) has yet gone broke selling them.
3. Companies believe that, through a variety of strategies, these products can be managed successfully, or at least within acceptable ranges of risk.

Clearly, products such as these, which account for billions of dollars of the assets of North American life insurers, pose potentially significant risks to the companies. In theory at least, the risks are not limited to profitability; they could also affect solvency. In addition to contract design, the risks depend on several other factors, including:

1. Future interest rate and economic scenarios. Given that the doomsday scenarios of a few years ago represent today's reality, it is difficult today even to define doomsday, let alone assign a probability to its occurrence.
2. The mix of investments that supports the company's liabilities.
3. The degree to which the money invested in these products is or is not "hot money" which will, in the absence of punitive disincentives, gravitate towards the highest available interest rate at a given moment.

4. The nature of the relationship between the company and its sales force, and the degree to which the company makes an ongoing commitment to be a factor in a particular market.

The last two of these factors - policyholder and agent incentives - are extremely difficult to quantify. For example, data that I have seen indicates that lapse rates on single premium deferred annuities, although highly sensitive to interest rate changes and somewhat sensitive to contract provisions, do not demonstrate that funds invested in these contracts necessarily flow to the highest available interest rates.

The first factor, the future interest rate environment, is, of course, not controllable by any one company. As a result, the second factor, investment strategy, is then of critical importance. Table 1* shows some illustrative relationships under various conditions. In each case, a block of single premium deferred annuities is assumed to be sold at a given time; the relationship between the progression of assets and liabilities is traced for ten years under various scenarios. It is assumed in all cases that, no matter what the interest rate environment, the credited interest rate is not changed. While other strategies are possible, they do not necessarily produce better results. The illustrations assume that if the fund's cash flow is not sufficient to pay surrender benefits, fund assets are liquidated, typically at a loss. Also, these simplified illustrations assume that all changes in the environment occur annually, not weekly or daily, as in the real world.

The two measures of lapse sensitivity are illustrative, but they do bear some relationship to data I have seen. The first case represents a "steady state" situation and serves as a benchmark for the others. The chart shows a very wide range of swings that can occur in certain environments (by no means more extreme than those we have seen in the last few years) when the underlying investments run for twenty or even for ten years. They also show the relative safety attainable with investments of shorter durations. The investment of shorter durations also makes it more feasible for a company to adopt different strategies for crediting interest rates to policyholders.

Now, if that proposition is so clear, why doesn't everybody do it? First, more companies are doing it. Maturities of investment portfolios have shortened noticeably over the past two years, especially when 1979 portfolios are compared to 1980. Secondly, however, it is usual to think of shorter term investments as having lower yields than longer term investments of similar quality, so a short-term strategy has meant a sacrifice of yield and hence of competitiveness. This has often been true in the past, and doubtless will be true again in the future, but it is not true today. Last week, for example, the yields on U.S. Treasury securities selling at or near par were:

<u>Period to Maturity</u>	<u>Yield</u>
1 year	15.88%
3 years	14.58
10 years	13.93
20 years	13.62

*See page number 1056.

If rates do go down, the pattern will undoubtedly reverse again, and the choice of strategies for companies at that time will become a great deal more complex and, at the same time, more risky.

MR. CHAPMAN: Thank you very much, Dan. How would you extend your remarks to the specific situation of a company with most of its reserves in single premium annuity contracts?

MR. MC CARTHY: This is a subject which has become of increasing interest for companies located in the United States and doing business in New York. The New York Insurance Department has had some recent concerns in this area, and I am aware of several companies who, as a result, have looked very hard at their mixture of maturities and have tried to analyze whether they could meet a run on the bank without having to take losses on longer term securities. Some of the analyses that I have seen suggest that a run on the bank could be absorbed if the withdrawal rates range from 20% to 35% or 40%. The worst annual single premium annuity lapse experience I have seen to date for a company with reasonably competitive interest rates has been in the 20 to 25% range. So in the cases we have seen, there does seem to be a substantial degree of protection. This protection is considerably greater today than it was two years ago; I do not believe the facts would have been as encouraging then.

MR. CHAPMAN: Our first two speakers have commented on the trend toward shorter maturity investments and on the difficulty of matching assets and liabilities. Our third speaker, Mr. Christopher H. Wain of the Prudential, will attempt to tie it all together by relating these concerns to our everyday work in preparing products for the marketplace. Chris has the unenviable task of discussing the assumptions we should make about the frequency of change of dividend scales and of indeterminate premiums in the current investment environment. He will also discuss the pricing of products which require an abnormal degree of liquidity. Finally, Chris will comment on topic four on the agenda: the allocation of specific classes of assets to specific products or product lines.

MR. WAIN: My comments reflect the viewpoint of an actuary primarily concerned with the pricing of individual products in a mutual company in the United States. I will first emphasize periodic payment products and then briefly consider single payment products. Comments will be fairly general, partly because of the ease with which this topic can get involved with the prohibitions of the anti-trust and similar laws in the United States.

In pricing periodic premium products where investment income is significant, a mutual company must distinguish between the interest assumptions used for contract guarantees and those used for dividends. Since it is obliged to conduct its affairs so that each block of business is self-supporting over its lifetime without drawing permanently on the funds of other blocks, it must select interest rates as a basis for guaranteed premiums and cash values that are likely to be self-supporting over the lifetime of the block. At the most conservative, this means choosing a level interest rate that the company is likely to meet or exceed for most of the next fifty or so years. This assumption probably must be related to the cost of money for a risk-free investment in an economy with a stable price level. With the cost of money changing only slowly, this type of assumption also can change rather slowly.

Under the current conditions, this leads to excessive conservatism in the interest rates applicable to the early policy years. This is not as serious as it sounds, of course, because the assets accumulated in those years are relatively small. Still, such an interest rate will lead, under current conditions, to overstated reserves in the early years, and to excessive United States income taxes, with no subsequent compensations such as I believe occur under the Canadian tax system.

A modification of the concept of using a low level interest rate, of course, is to use one in the early years (subject to legal limitations) that recognizes in part the favorable interest rates that can currently be obtained on investments and reinvestments during those years. Economic models can suggest appropriate rates; but for life insurance, these have been immaterial since legal limits have been well below the company earnings rates that may be expected in the next decade. The 1980 model valuation and non-forfeiture legislation will narrow this difference. In any event, premiums finally selected should be such that the block of policies is likely to be self-supporting on a no-dividend basis if close to the most adverse combination scenario of interest and other fluctuations were to occur. Many degrees of sophistication can be used in determining such a scenario. As a practical matter, an optimistic view of future interest rate levels requires, for consistency, the assumption that expenses also will increase at a high rate. Conversely, a pessimistic view of interest rate levels suggests a non-inflationary economy and relatively stable expenses. The difference between the premiums developed by these two outlooks is, therefore, somewhat less than might be expected.

Of course, any set of premiums and related values and net costs developed on theoretical grounds must be subject to the acid test: will the result permit the company to get a reasonable share of the competitive cases developing in its target markets? If the answer is "no", soul searching is needed in many parts of the company. The sales executive may need to rethink his marketing plan, but he and the president will also want the actuary to think hard. The main focus for the actuary's thoughts in this situation probably must be on how much above the pure economic cost of money his long term interest assumption can be; that is, how well the investment officers can perform under adverse conditions, how long these conditions will last, and how much surplus from this block of business, and perhaps temporarily others, can be drawn on in adversity.

In the United States, we believe that regulations oblige us to use the interest rates that are applicable to current actual dividend disbursement to develop illustrative dividends to be used in the new sales process. This is not too serious a problem when all companies use their portfolio average rates to determine illustrative dividends. However, the comparability of company results is seriously distorted if some companies are on a year-of-investment method and others are on a portfolio average method. Today's portfolio average illustrations are less favorable than year-of-investment illustrations. Yet, if two companies are equally effective and if current interest rates remain at present levels, by the time the policy of the portfolio average company has accumulated a significant amount of assets, its earned interest rate is going to be substantially similar to that of the policy on the year-of-investment method. The initial action of the Society's Committee on Dividend Philosophy to reconcile these results has been to require the actuary to state the bases used for dividend illus-

trations. While this does not take care of the problems of the marketplace, or adequate explanation to the public, I am sure the Society and the NAIC will come through.

Whenever I consider the problems of policies that require greater asset liquidity because of the high probability of use of the withdrawal and loan privileges, I look at the latest quotation for American Telephone and Telegraph bonds. As one example, in 1971 that company issued a series of bonds paying 7% at essentially par to mature in 2001. When I first noticed the issue in the mid-1970's, a \$1,000 bond was selling at about \$700. Subsequently, it got as high as \$800 and in the collapse of 1981, dropped to about \$515. These fluctuations strongly suggest that a guaranteed lump sum liquidation value is offered at the peril of the company in a product intended primarily for people with a high degree of investment sophistication. This is particularly true if the product lacks substantial insurance features. No tolerable surrender charge can absorb fluctuations like these.

Fortunately for annual premium business, assets are, by definition, accumulated over a period of years, making it rarely necessary to provide for so great a fluctuation. In a mutual company, termination dividends can provide some margins for this purpose. The 1980 amendments to the standard non-forfeiture law permit a differential between reserve and cash value interest rates wide enough for some asset value adjustments for either participating or non-participating business.

It is true, of course, that my AT & T bond is a long term credit. It is also true that fluctuations such as those I reported can be dampened by using securities with shorter terms. But, cynically, I must point out that it is easy for us to say this now when short-term interest rates are higher than long-term. This is not a normal situation. When we return to normal, and long-term rates exceed short-term, I have full confidence that market pressures will force us back to long-term investing with all its perils.

The true separate account is probably the best system developed to allocate specific classes of assets to specific products or product lines. Products funded through a true separate account automatically have liabilities essentially equal to the market value of the related assets. Segregation of assets for the general account, either through a book-record separate account or by compartmentalization, is possible for bookkeeping purposes, subject, of course, to regulatory approval.

The segregations seem to be primarily of value for management control including the recognition of different yields for different branches of business. The company remains liable by the terms of its contract for whatever benefits are being promised by a contract written in a subdivision of the general account. The earmarking of assets in any of these devices will tend to focus attention on the nature of the liabilities assumed, including their fixed payout commitments. This may encourage seeking fixed dollar investments with shorter terms and consequently less chance for value fluctuations than in the longer term situations. But if we return to the conventional relationship between long-term and short-term interest rates, this will increase the cost of insurance because of the tendency of short-term investments to earn less than long-term.

When the actuary moves from periodic premium products to single payment products, the ballgame changes, especially if the product has a specific maturity date. In consultation with investment officers, the rate at which premium income will be invested can be determined. If one is prepared to change rates daily, the principal considerations (other than the initial investment rate) involved in setting rates are the strain on surplus, the margin for profits and for the use of surplus, the risk of loss on investments and the contractual withdrawal provisions affecting investment anti-selection by the policyholder. For longer periods of premium rate guarantees, an allowance for fluctuations in the rates earned by new investments must be added to the list of considerations.

In conclusion, the basic principle of product pricing, the need to charge enough so that each block of business can meet all its obligations, remains unchanged. But with turbulent interest rates, high-powered computers and increasingly ingenious competitors, execution of this basic principle without depriving your company of its share of the good business will require excellent collaboration with the investment areas of the company. This is needed both to develop portfolio investments consistent with the risk being assumed and to avoid product designs that could turn into disasters because of investment developments.

MR. CHAPMAN: We are fortunate to have with us today two guests from the United Kingdom. If I might impose on Mr. Johnston, the Government Actuary, and Mr. Squires, I am sure that we will profit from any insights they can give us.

MR. EDWARD A. JOHNSTON: I would not have thought that the old United Kingdom theory of immunization was particularly applicable to the United States now. It was developed when the companies' business was basically in whole life and long term endowment contracts, and it was developed in an environment where rates of interests did not vary like they do today. Its aim, of course, was to immunize the valuation result. Frank Reddington showed that you can invest your assets in such a way as to enable you to change your valuation basis when interest rates change. In Britain you are free to make such changes, and if you adopted such an immunization strategy you would get the same overall valuation result. The two sides of the balance sheet would have quite different figures on them but the rate of bonus would be the same. But those conditions simply do not apply today, and as a result, I think that the theory must be viewed with a competely fresh eye. Today, in the United Kingdom, we are more concerned about what you have been discussing, matching, or avoiding mismatches, rather than immunization.

MR. RICHARD J. SQUIRES: Immunization is a specialized technique that requires a great many specific assumptions. I have not studied the Reddington article recently, but I believe it assumes a straight line yield curve. When this assumption no longer holds, the method does not necessarily work the way it should and matching becomes a much more useful concept.

One thing occurred to me. I agree with Mike Rosenfelder's statement that it requires a brave actuary to price a product on the strength of his belief that he might get a better yield from an equity investment. But that does not mean to say that equity investments have no part in matching over a longer term. My company started with unit trust products which are based on segregated funds and we decided to develop a conventional product. With our prior experience, we approached the profit fund as though it were a segreg-

gated fund. The first thing you discover is that you cannot buy a portfolio of bonds which is long enough to give you an immunized position. All you can do then is to redefine a property investment or an equity investment as being "hyperirredeemable", if I can use such a term. In the United Kingdom, we do have irredeemable investments, and they are of some help. Even irredeemable investments are sometimes not long term enough, but if you assume that a property investment will generate rising income in the future, you can effectively define it as "hyperirredeemable". From that point of view it is appropriate to have that kind of investment in your portfolio when writing a new line of regular premium business.

MR. RICHARD W. KLING: In light of the subject matter that has been covered in this meeting, I'd like to mention the recent development within the Society of Actuaries. The Society has recently appointed a task force to study the risk of loss due to changes in the interest rate environment. This is the so-called C-3 risk as described in the Report of the Committee on Valuation and Related Problems (Record, Volume 5, Number 1, pages 241-284).

It is anticipated that the task force will deal with some or all of the following items:

- Analysis of the risk and publication of the results.
- The matching of assets and liabilities or, more appropriately, the avoidance of gross mismatches of assets and liabilities.
- The C-3 risk and the Actuarial Opinion.
- Stimulation of discussion, e.g., articles in the Actuary, SOA meetings, seminar topics, calls for papers, etc.

Anyone wanting more information on the task force's work should get in touch with Carl Ohman, the chairman.

MR. JOHN K. BOOTH: As far as the regulatory context is concerned, the work of Dick Kling's group will probably find its way to the NAIC. I thought it might also be of interest to mention that the New York Insurance Department has shown quite a bit of interest in the matching of assets and liabilities. We, at the American Council of Life Insurance, have had a series of discussions with their actuaries on this subject. They appear to be headed toward the development of some sort of a statement to be prepared by the actuary. This statement would be a general outline of the company's intentions with respect to interest-guaranteed products. How does it intend to protect itself against fluctuations in interest yields? An expanded actuarial opinion is also being considered. I assume that as the New York Department's work proceeds, it will probably share its notes with the NAIC and with the other state insurance departments.

MR. JOHN C. SHANK: I would like to endorse what John Booth said. We are working on a plan of operation, and I have the unenviable assignment of writing about the risk assumption. We find that there are three different elements of strategy. The first is the duration of maturity of assets versus the duration of obligations. There are also the questions of how much risk one is willing to take, and, finally, and most important, your outlook with respect to the future of interest.

Of course, you would like to do complete matching, but this is not really possible and, indeed, is not entirely necessary. Nor is it necessary to match contracts with assets. For example, if your assets are longer than your liabilities, you would want to lengthen the differences if you see interest rates going down. If you see interest rates increasing, however, a shortening of the spread between assets and liabilities, i.e., shorter assets, is indicated. The shortening of maturities, therefore, is a strategy that depends on your outlook in interest rates.

MR. CHAPMAN: Has anyone who has tried to match assets and liabilities assumed a relationship between the movement of interest rates and the length of liabilities? The obvious example is rising interest rates cause increased loans and, consequently, increased surrenders. Has anyone tried to quantify the correlation?

MR. MC CARTHY: In my chart, I illustrate a scenario in which the interest rate environment is described as "up sharply" while the lapse sensitivity is "high". In that scenario, the lapse rate increases from a basic 7.5% to 34.4% in the fourth year of that environment. The corresponding increase for low lapse sensitivity is to around 22%. The most probable experience will be somewhere between the two. There is no question that there is a relationship. The more data we review, the more a definite pattern appears to emerge.

MR. E. TOM HUGHES: I have two questions. Could Mike expand a bit on the difference between actual and notional segregation of assets? Secondly, would someone discuss the current regulatory attitude in the United States with regard to the segregation of assets?

MR. ROSENFELDER: If a company has a pool of assets which supports its general fund or guaranteed life and annuity obligations, it might be interested in establishing a separate pool of assets to support particular high interest guarantee products such as the ones I have described. There are many ways to do this. In my view, the most desirable is to go through a physical segregation whereby certain specific assets are separated from the rest for internal management reporting purposes. Whatever investment income these assets provide is credited to that product line. When they mature, the maturity proceeds all go to that product line, and when the money turns over and is reinvested, that again becomes a part of the assets supporting that product line. This is what I referred to as actual segregation, although some might prefer to call it pure segregation.

There are also many sorts of intermediate segregation positions. The best results are obviously produced when one goes through the actual segregation as I just described. In deference to the difficulties of the accounting or administrative systems, however, you can go through a notional segregation in which you simply allocate investment earnings each year by formula. In theory, this gives the same answers as actual segregation. In practice, however, it probably will not.

MR. MC CARTHY: With regard to the U.S. regulatory attitude toward the segregation of assets, New York has typically been the state which has taken the lead on questions of asset and investment income allocation. The Department has approved a number of variations from the classical investment yield method. It has even approved the Equitable's segmentation of its general account into six different so-called business segments. That does not change the fact that all of the assets of the general account support

all the liabilities, but subject to that understanding, it is a total segregation of the general account into six categories. To my knowledge, no other states have been either active or concerned about asset segregation.

MR. CHAPMAN: What happens when one of the lines that you are segmenting develops a negative cash flow while other lines have a positive cash flow? How easy is it to arrange a loan from one line of business to the other? Would a company go outside to seek credit, either from a bank or through selling paper?

MR. WAIN: We expect that when that happens, the line that is short of cash will sell assets to the other lines.

MR. CHARLES C. MC LEOD: I work for ManuLife, a fairly large Canadian mutual company. ManuLife is one of the companies, referred to by Michael Rosenfelder, who have set up an internally segregated fund. I should like to explain why we did this, and to comment on how it is being used. Although I am speaking in a Canadian context, most of my remarks are also applicable to the U.S.

The fund, referred to as the "new money fund", was set up to:

- (a) Aid in the investment of the assets backing the liabilities of ManuLife's new money product (e.g., immediate annuities).
- (b) Assist in the allocation of investment income to product line.

Although particular assets are designated as belonging to the new money fund, this is for internal purposes only. No mention of the new money fund appears in our statutory returns.

A fund, rather than a notional allocation of assets (e.g., an investment generation method), was adopted since it was felt that the results would be more meaningful. ManuLife engages in substantial trading of its bond portfolio and a "real" fund was felt necessary to keep track of what happened to the original investments.

We have paid, and continue to pay, more attention to the matching of assets and liabilities for new money products than for average money products because:

- premium income on new money products is much higher than for average money products;
- the profit margins on new money products are generally very low and the products are usually non-participating;
- there are a number of problems associated with average money products, for example, estimating withdrawals.

Now that the new money fund is in operation, each quarter the cash flow of the assets and liabilities is calculated. The present value of these two cash flow streams is calculated at different interest rates. It is then possible to determine the effect on surplus of a change in interest rates.

I should stress that the new money fund is not intended to dictate investment policy, but rather to assist in setting it. I would also like to stress that good communication between the actuaries and the investment division in developing the fund is essential; otherwise it will not be used.

TABLE I

SINGLE PREMIUM DEFERRED ANNUITIES:

Illustrative Financial Results Under Different Conditions

<u>Lapse Sensitivity</u>	<u>Interest Rate Environment</u>	<u>Investment Maturity Period</u>	<u>Tenth Year Asset Share Surplus, With Assets at Book Value, per \$1,000 of Premium</u>	<u>Contracts in Force After 10 Years (as % of Original Sales)</u>
Low	Level	immaterial	\$ +143	59.9%
Low	Up	20 years	+178	28.1
Low	Up	10 years	+178	28.1
Low	Up	5 years	+457	28.1
High	Up	20 years	- 63	13.9
High	Up	10 years	+ 38	13.9
High	Up	5 years	+313	13.9
High	Up sharply	20 years	Fund goes to zero in 7 years	-
High	Up sharply	10 years	Fund goes to zero in 10 years	-
High	Up sharply	5 years	+215	4.5
Low	Up sharply	20 years	-253	14.2
Low	Down	10 years	- 71	59.9
High	Down	10 years	+ 8	45.9
Low	Up and down	10 years	+176	48.9
High	Up and down	10 years	+104	33.4

Product: Single premium deferred annuity, no front load, declining back load(7,6,5,4,3,2,1). Credited interest rate is set 150 basis points below initial earned rate and is not changed

Interest Rate Environments: "Level" is 14%,all years. "Up" is 14% first year,16% second year, then 18% all years. "Up sharply" is 12% first year increasing 2 points annually to 18% and remaining at that level. Down is 14% first year, 12% second year, then 10%. "Up and down" is 14%,16%,18%,16%, then 14%.

Lapse sensitivity: Lapses are assumed to have an underlying invariant rate, plus an increment expressed in terms of the excess of the current new money rate over the initial new money rate; the increment is also modified for contract duration. For "High" sensitivity, all constants - including the underlying rate - are 150% of those for "low" sensitivity.