

RECORD OF SOCIETY OF ACTUARIES 1984 VOL. 10 NO. 3

MONITORING INVESTMENT PERFORMANCE OF A LIFE INSURANCE COMPANY

Moderator: R. STEPHEN RADCLIFFE. Panelists: KENT L. MEYERS, ROBERT H. STAPLEFORD,
STANLEY B. TULIN. Recorder: CATHERINE B. HUSMAN*

Definition of investment performance objectives

- with respect to pricing objectives
- with respect to C-1 and C-3 risks
- with respect to diversification of the investment portfolio

Develop systems to make appropriate analysis of assets and investments

- projecting cash flows
- models for predicting optimum asset mix

Measuring actual investment performance vs. performance objectives

Confirmation of appropriate matching of assets and liabilities

Analyze the after tax efficiency of investment income

MR. R. STEPHEN RADCLIFFE: I do not believe that you would have seen this kind of session or anything like it in the Society's programs three or four years ago. Why has this topic suddenly become so important that we not only have this session but an entire Society meeting centered on investment performance? The answer is that in 1980 and 1981 high interest rates, spiking in excess of 20%, threatened the existence of nearly all of our major companies. For a short period of time the events were quite scary.

Why was that time period so scary? We had products that guaranteed to pay our customers book value on surrender, but the assets backing up that promise were worth a much reduced market value. In my opinion, this is a position that we as an industry got into accidentally or inadvertently. In retrospect, and I must admit hindsight provides great wisdom, we would not have consciously put ourselves in this predicament. We have put the policyholder in a win/win situation. If interest rates go up, he can surrender the policy and move on to another investment product that will pay higher rates. If interest rates go down, he can stay with the policy and lock in the interest rate. Obviously, if the policyholder is in a win/win position, the company is in a lose/lose position.

Whether we got to this position accidentally or not, we are stuck with the problem of monitoring our investments quite

*Mr. Meyers, not a member of the Society, is Assistant Vice President, Aetna Life & Casualty Company.

closely to avoid catastrophe. After the scare of the early 1980's, we watch our investment performance like the heartbeat of a critical patient. By the way, monitoring investment performance for our session today means not only monitoring the earnings from the investments but monitoring the structure of the assets.

Today, we will hear from our three speakers about how they attacked this very difficult problem of monitoring investment performance. I might mention that it was difficult to recruit this panel because I found that there are very few who have actually had hands-on experience with this problem. You might notice that our program will not exactly follow the outline. I have asked each of our panelists to structure their presentations around their personal experiences in their work on monitoring investment performance. I hope that you will see that we will cover the points on the outline in substance and forgive us for not covering them in detail. We will begin our presentation with Kent Meyers.

MR. KENT L. MEYERS: I spent about ten years at Aetna in the investment area and for the past two years I have been involved in pensions, managing the guaranteed investment contract (GIC) product line. I have only a passing familiarity with the individual life business, but I think I am able to raise some questions and draw some parallels that should be of help in all aspects of investment performance for life insurance companies.

Because the focus of my experience has been in the GIC business, I will spend most of my presentation on describing some of the approaches that we use in monitoring investment performance for GIC's. We can then use that as a springboard for looking at investment performance for other life company products. As an industry, I think we have learned a great deal through the GIC product about the need for coordination between the investment area and the product area. But, if your companies are like ours, we have only begun to ask the right questions as regards the other products in our business. I do not come with all the answers, but I think we can present some good tools and approaches and describe areas that deserve some more detailed exploration.

Let us start with a very simple concept. The United States' financial markets are generally quite efficient. In other words, you cannot expect over a long period of time for large volumes of investments to obtain differentially higher returns than your competition without incurring higher risk and volatility. In spite of what some investment people might claim, there are no magic formulas nor secret investments. The market does, however, reward those who pay attention to the signals and punish those who do not. Your long term performance is a measure of, first, how much risk you are willing to take and, second, how expert you become at reading and reacting to market signals. The second part you will

generally be wise in leaving to your investment departments. But the first, that of risk assessment, is one in which you should play a significant role. From our standpoint then, what we must seek is a proper balance between the return expectations and the risks incurred.

The risk for fixed income securities can be broken down into two basic categories: (1) the quality of the investments, and (2) the maturity or duration of the investments. At various points in this presentation I will talk about duration of both assets and liabilities. In doing that, I am speaking of McCauley duration which is a measure of the present value weighted timing of cash flows.

I would like now to quickly go through the major investment risks to lay the foundation for a discussion on how to monitor investment performance. Keep in mind that our focus during this part of the discussion will be essentially on GIC's. However, for those of you who have not had experience with the GIC market, there are direct parallels with single premium deferred annuities, annuities certain and, with the exception of mortality assumptions, with group single premium and individual supplementary contracts. All of these have specified initial deposits and a fairly well known payout stream. That payout is either specified by contract or well established through mortality experience. For simplicity of presentation, I am going to use what we refer to as a compound bullet contract with a single deposit and a single maturity, with interest compounded until maturity. The concepts, however, are easily extended to other patterns of cash flows.

The first and most obvious risk is that the initial yield on the investments purchased are insufficient to cover your guarantee, expenses and profit. The easiest way to miss that target is through poor communication and coordination with the investment departments. Since October of 1979, fixed income markets have been as much or even more volatile than the stock market. I would no more quote a rate or premium on a guaranteed income contract today without daily frequent communication with the investment department than I would guarantee to deliver a number of shares of IBM stock at some future date and price without checking to see what I could buy it for today.

The second risk involves commitment timing when we are dealing with privately placed bonds and mortgages. These instruments are individually negotiated between lender and borrower and are not traded on any exchange. Negotiations generally take weeks or months. When we use these private markets, we run the risk that interest rates will change and a different rate will be negotiated at the time the commitment is finally signed and becomes binding. In order to operate knowledgeably on the product side, we have to develop a good understanding of the functioning of the investment markets in which our companies operate.

The third area, which becomes of particular significance in times of rapidly falling interest rates, is commitment cancellations. In the privately placed investment markets, there is a lag between the time a commitment is signed and the time funds are actually dispersed. During that period of time, negotiations continue on legal matters and on certain covenants and constraints in the debt instrument. When interest rates drop precipitously, there is a great incentive for the borrower to find various loopholes or to become immovable in negotiating some of these other important aspects of the debt. The result is a much higher incidence of cancellation of previously signed commitments than is normally the case. Our only option at that point is to replace them with other lower yielding securities.

With the exception of treasuries, almost all assets provide the borrower with an option to call or repay the loan at some point prior to maturity under certain conditions. Usually this includes the payment of a premium and is subject to restrictions regarding the source of funds used to repay the loan. For example, most public bonds are open to call after five years, even if they are 30 year securities. Privately placed securities generally provide much better call protection, although not complete.

The call amounts to an option. The borrower is not obligated to prepay the loan unless it is in his economic best interest to do so. If he is paying 15% on his debt and interest rates are currently 10%, it does not take a financial genius to know that it makes sense to pay off the loan with money borrowed at 10%. The lender has no option but to accept the prepayment and reinvest the funds at then current interest rates. This is only likely to occur when interest rates are down substantially so the reinvestment of those funds will provide lower actual total returns over the life of the contract than was initially expected.

Asset defaults have exactly the same effect, except worse. We not only have to reinvest funds at then current interest rates but lose principal as well when defaulted securities are paid off at less than par.

Most investments available today provide for interest payments to be made during the life of the loan along with certain scheduled principal payments (for bonds these are called sinking funds). At maturity there is a final balloon payment of the outstanding principal balance. Our liabilities seldom, if ever, match that cash flow pattern. To the extent that we write compound bullets, or other contracts that have different kinds of cash flows, we will be receiving cash from investment income and principal which we must reinvest to maturity of the contract. To the extent intervening interest rates between deposit and payout vary from the assumed interest rate at the time we wrote the contract, our total returns will vary. The risk of coming up short is obviously greater for contracts written when interest rates are high. This is one of those

situations that actuaries are quite familiar with -- on the average the cash flow looks ok, but the incidence can kill you.

Investment timing is particularly crucial in times of steeply positive yield curves such as we have had over the past couple of years. If you sell a contract with the deposit expected immediately and make an investment commitment which will fund three months from now, your only choice is to invest the cash for three months in short term instruments. In today's market, you would take a yield hit of about 300 basis points during that three month period.

Even if you time deposits and commitment fundings to occur concurrently, the private investment market provides another monkey wrench in the form we call "slippage." Because of the negotiations and legal reviews that have to occur prior to the disbursement of funds on these loans, it is common for as many as 20% to 30% of the investments expected to close in a particular month to be delayed for another month or more. Since the long term rate is already locked in on those deals, the only thing you can do with your cash is invest it short and take the yield hit. You can also be guaranteed that, when short term rates are much lower than long term rates, the borrower has a great incentive, once he has locked in the rate on his long term debt, to delay the funding of that debt and continue borrowing from the banks at short term rates.

For those of you who have studied duration, you will recognize the maturity risk as simply the flip side of reinvestment risk. When the duration of your assets is shorter than the liabilities, even though the maturities may be the same, you incur reinvestment risk. You incur maturity risk when the duration of the assets is longer than the duration of the liabilities. Whereas the reinvestment risk hurts us when interest rates are down, maturity risk hurts us when interest rates are up. If at the time of payout, interest rates are significantly higher than when we obtained the contract and the asset, we are forced into either actual or constructive liquidation of the asset at a value less than par. For example, if the asset were yielding 12%, interest rates were 15%, and the asset had three years left before maturity, the market value of your asset would be approximately 7% below par. If, on the other hand, you choose to use constructive liquidation by selling a new contract at 15%, you lock in a 300 basis point yield deficit for three years. The economic effect would be the same as selling the asset. Of course, if you are lucky and interest rates fall, you achieve a commensurate gain on the sale of the asset. The point is not that we should not take the risks, but that we should understand the risks and make sure that our pricing and capitalization reflect accordingly.

With that background, let us look at some of the ways to monitor investment performance. I want to stress, however, that no amount of monitoring can compensate for poor communication and coordination up front. It is kind of like Houston

notifying the astronauts returning from the moon, "Gentlemen, your course trajectory will take you past the Earth into outer space. It is too late to make a course correction, but we can give you the exact measurements on your future trajectory. Good luck."

The key to investing is to know your objectives up front. Knowing your objectives, you have something against which to measure investment performance and to warn of needed course corrections early on. Let us spend a few minutes describing the various investment needs for GIC's.

	<u>AMOUNT</u>	<u>DURATION</u>	<u>DUR. WTD.</u> <u>YIELD %</u>
INVESTMENT NEEDS:			
NET EXISTING PORTFOLIO CASH FLOW (CURRENT YIELDS)*	\$ 10	3.5	12.97
CONTRACT SALES (PRICING YIELD)	69	3.8	13.25
INVESTMENT SALES (MARKET YIELD)	21	4.7	13.65
COMMITMENT CANCELLATIONS (BOOK YIELD)	15	4.3	14.04
CONTRACT DEPOSIT/WITHDRAWAL VARIANCES (CURRENT YIELDS)*	<u>(7)</u>	<u>3.3</u>	<u>12.90</u>
TOTAL	\$108	4.0	13.45

* USE: - CURRENT YIELD TO MEASURE INVESTMENT PERFORMANCE
- BOOK/PORTFOLIO YIELDS TO MEASURE IMPACT ON
PROFITABILITY

As we go through this chart, I want you to keep in mind that we are measuring investment performance here and not profitability. In a minute I will talk about the changes that you need to make to look at the effects on profitability. Let us look first at the cash flow from the existing portfolio on the first line.

Any portfolio which is not totally cash flow matched will have some positive or negative cash flow, which will vary from time to time. Implicit here is that you have in place the systems to forecast and monitor existing portfolio cash flow, as distinct from contract sales and investment sales. Once establishing that forecast, we sit down with the portfolio manager and develop a strategy for how that cash flow is to be invested. That strategy is dependent upon (1) our objectives to either lengthen or to shorten the existing portfolio of assets relative to the liabilities, and (2) whether we desire to dollar average over the year as opposed to making a bet on interest rate trends during the year. The strategy includes a

recognition that the investment of the portfolio cash flow has as stringent a yield requirement as we have for new business if we are to maintain profitability.

Once that investment strategy is developed and communicated, it becomes the objective against which to measure performance. I have assumed here that we have a strategy of investing portfolio cash flow as it occurs at a 3.5 year duration using current spot rates for the point on the yield curve for that duration. The yield curve I have assumed in this chart produces a yield requirement for that duration of 12.97% on the \$10 of existing portfolio cash flow for that period.

I might indicate that in talking about existing portfolio cash flow, I am not just dealing with principal and interest from the assets. We net against that all expected contract payments, both those that are scheduled and a forecast of unscheduled employee thrift plan withdrawals. Keep in mind that you are dealing with a total portfolio of assets and liabilities, remembering that a dollar is a dollar no matter what its source.

The second objective, the second line of the chart, is to provide investments at the gross investment yield that you assume in pricing your contracts at an agreed upon duration relative to those contracts. The duration of 3.8 years shown here is the target for the investment managers. Actual contract durations may match this, or be shorter or longer depending upon the strategy which you have chosen to meet all of your risk, pricing and surplus constraints.

The third line reflects portfolio management activity at market yields and the remaining duration of the investments sold. I should stress here that in measuring investment performance the yield to market at which the investment is sold is the critical number, not the original yield on the asset or the yield of other securities with the same durations. The yield to market reflects the quality, the duration and the marketability of the instrument and becomes the bogey in replacing that investment in the portfolio.

We talked earlier about commitment cancellations, the next line, where we failed to fund an investment previously committed because of legal or other considerations. Since they were committed against previous investment sales, contract sales, or portfolio cash flow, they need to be replaced at book yields in order to maintain profitability. Obviously, if interest rates have changed since the time the investment was committed, that may not be possible. However, this places the responsibility for minimizing commitment cancellations upon the investment departments where it properly lies.

The last element deals with variations from expectations. On a regular basis, we update deposit and withdrawal expectations based upon new contracts sold. These numbers are reflected in

the net existing portfolio cash flow and contract sales that we showed in the first line. However, actual activity never exactly equals what we expect. Investment departments cannot be expected to cover those variances at the interest rates applicable to the contracts. So for measuring their investment performance, we determine the duration based upon the contracts which had the variances and set a yield bogey based upon the current yield curve at that duration.

This brings us to the difference between measuring investment performance and measuring the impact on profitability. To know whether you are improving or reducing profitability, you have to compute net existing portfolio cash flow and deposit and withdrawal variances based upon the yields of the underlying investments and contracts. In practice, we believe it is important to monitor both for investment performance and for profitability. This obviously has systems and information implications in managing the product.

You will note in the right hand column that the yields we have been using are duration weighted yields. This allows us to measure yield performance relative to the desired durations. You will also find that using duration weighted yields provides you with a basis for market valuing a portfolio of assets or liabilities and for determining the effects on the market values from a change in the general level of interest rates.

Once having determined the investment needs, it is a simple matter to compute the average duration and the duration weighted yields on all investments purchased over the same time period and compare them with our investment targets.

	<u>AMOUNT</u>	<u>DURATION</u>	<u>DUR. WTD. YIELD %</u>
NEW INVESTMENT PURCHASES	\$115	4.4	13.31
INVESTMENT NEEDS	<u>\$108</u>	<u>4.0</u>	<u>13.45</u>
DIFFERENCE	\$ 7	0.4	(.14)

The difference in amounts reflects how much the investment process is getting ahead or behind investment needs. The duration difference reflects how much shortening or lengthening of the asset portfolio is occurring relative to the liabilities. And the difference in duration weighted yields indicates how close you are to the yield targets that you have established. This can then be used in conjunction with the expected profit margin on new business in order to assess how much your expected profitability should change as a result of this period's activity.

In order to maintain good control over this business, we have found it necessary to monitor this kind of asset/liability

activity on a weekly basis for the last week and for a rolling four-week period. This provides hands-on short term control over the direction of our investment activity. On a monthly basis, we use a longer time frame showing the latest month and rolling three, six and twelve month periods. We also perform an analysis of the total portfolio in terms of its duration, yields, and the present value of expected profits at varying interest rates. These provide not only the longer term perspective on investment performance but also the foundation for establishing future investment strategy.

To summarize the benefits of this approach, it measures new investment performance, monitors portfolio trends, provides an early indicator of changes in profitability, gives you a framework for maintaining close coordination with investment departments, and provides a measure of over and under committing.

The second tool is simply to forecast expected cash flow and monitor actual results. This needs to be done on a daily basis for the next month or so and on a monthly basis for the next year or so in order to manage short term liquidity positions and to provide the information necessary to your short term money managers. Beyond that, annual forecasts are probably sufficient.

Such cash flow forecasting provides liquidity control by allowing portfolio managers to target the timing of investment fundings to coincide with the emergence of cash. It also helps you to monitor investment slippage and the excess liquidity that that creates. The longer term forecasting provides an indication, in conjunction with duration measures, of how well your portfolio is matched. This gives you a guide to steering contract maturities and asset sales toward years when you have excess cash and away from those years where negative cash flows are expected to arise. Good cash flow monitoring and forecasting also is your basic tool for tracking deposit and withdrawal activity relative to expectations and to contract provisions. This becomes particularly crucial in times of rapidly rising or falling interest rates, when good contract control is imperative and early forecasting of trends is crucial in planning investment responses.

Three other areas of investment performance monitoring are important, but generally quite straightforward, and so I will not take much time except to mention them. The first is problem loan monitoring and the second, closely related to it, is portfolio quality reporting. Each of these gives you an indication of how closely the portfolio is matching the quality expectations and default experience that you projected in establishing your initial pricing.

The third area, call risk reporting, is one which has been sadly neglected in assessing GIC portfolio risks. For the past 25 years we have seen a broad secular rise in interest rates with no sustained period of dramatically lower interest

rates. Such a period is needed to provide the economic incentives for borrowers to call high interest rate loans. Consequently, we essentially operate in an experience vacuum as regards call risk. It is, however, a simple mathematical exercise to determine the economic incentives for a borrower to call a loan. Then using the call dates and call premiums on the loans in the existing portfolio, you can determine the effects on your portfolio and its profitability, given various future interest rate scenarios. This provides an input to modeling for both pricing and profitability estimates. Based on that modeling, we can develop guidelines for future strategies for controlling call risk.

I might mention here in passing that GNMA's create a special problem in terms of call risk. These government-backed pools of single family mortgages have the equivalent of call risk no matter which way interest rates go. Generally, the assumption is that a pool of mortgages will follow some relationship to historical prepayment experience as people move out of their homes or refinance their loans. Discounts and yields assumed in purchasing GNMA's include an assumption on how fast those prepayments will occur.

In actuality, however, the speed of prepayment increases as interest rates fall. At lower interest rates there is a greater incentive for people to refinance, and generally higher housing turnover occurs. Conversely, as interest rates rise, prepayments slow down as refinancing and moving become more costly. The result is that you tend to get more cash to reinvest when interest rates are low, and less cash when interest rates are high.

Needless to say, the systems needed to monitor and to forecast such activity are quite complex. The systems' needs, together with the actual risks, have implications for how dependent you want to become upon GNMA's as a major part of your portfolio.

Now, let us look beyond GIC's and into other aspects of our business. As I mentioned at the beginning, we have only begun to ask the right questions, and so I will provide little in the way of answers. I do, however, have some ideas which I would like to share with you.

The first concept that we have to hammer home is that there is no difference between the investment risks for GIC's and those for other products. We perceive them differently because we look primarily through our own eyes. With GIC's and other non-participating or nonexperience rated products, the investment risk flows totally to the company, and so we see it in its totality. With participating products, the investment risks are shared to varying degrees depending upon the products. Participating products do not change the total risk; they only spread it between the company and the policyholder.

The GIC market has opened for us a window on the relationship

between assets and liabilities and the need for improved investment performance. I believe we owe other policyholders the same attention to investment needs as the GIC market demands. As markets have changed, new products such as variable premium, universal life and single premium deferred annuities have forced us to take a closer look at the correlation between investments and insurance. The yield on the investment piece is far more critical and more visible than ever before. We need to understand how to invest to get the best yield without incurring unreasonable risk through bad mismatch or poor quality decisions.

I would suggest that there are yield and duration requirements for essentially every policyholder participating in our general accounts. These may be ill defined and perhaps even subconscious on the part of the policyholder. Some have needs which are very long term, have little need for immediate access to funds, and prefer to participate in the longer term investment markets. Others are more concerned about liquidity or maintaining investment yields which track market movements fairly closely.

It is obvious, then, that considerable judgment is required in establishing those duration requirements. It would require policyholder feedback and an understanding of the competitive environment in which our products operate. A couple of examples might help.

First, consider a customer who may occasionally have need for funds and who may at some point want to completely redeploy his invested assets. If those assets are accounted for at book value, but are only accessible to him at market value, and we entice him to make deposits by providing good yields through 30 year bonds, we set him up for a real surprise when he wants to withdraw funds at market value. That was the experience in 1980 with pension Investment Participation Guarantees.

On the other hand, for some clients we grant withdrawal of funds at book values, no matter what current interest rates are. Examples in the individual life area would be cash value surrenders, loans on individual life policies, and bailouts on single premium deferred annuities. As individuals become more and more sophisticated in financial matters, we will find more frequent negative variances when we grant such options. So the second thing we need to review is the financial options which we grant our policyholders. We must then either price for those options or reflect them in our investment strategy.

The third step is to work with investment areas, to agree on the characteristics of the business, and to define investment strategies. This involves establishing the duration requirements we talked about earlier, establishing an investment pace based upon liquidity targets, and setting target yields based upon spot rates and that investment pace.

It would then be possible to set up a dummy liability portfolio based on the characteristics that we determined in the first three items. The dummy portfolio we establish for the investment departments may be somewhat different from longer term policyholder needs, depending upon risks or market positions we may wish to take. But our pricing and reserving should reflect that accordingly. The key is to give the investment areas a target to shoot for and then to monitor their performance against that target. Some of the tools we have talked about today that are used for measuring investment performance for GIC's could be applied here.

In summary, we have learned much from the GIC business. We have established relationships with the investment departments which should have been there years ago and which will be imperative in a deregulated highly competitive financial services marketplace. As we work to improve those relationships and to understand the investment needs of our various insurance products, I would suggest we focus not on the differences between GIC's and our other products, but on their similarities and use these tools to help us meet the needs of both policyholders and the company.

MR. MATTHEW EASLEY: I was curious to know who sets those target interest rates for the GIC's.

MR. MEYERS: The target rates are set by the investment departments. We push them a little bit.

MR. ROBERT H. STAPLEFORD: In my presentation, I will consider why the monitoring of investment performance is important. Then, I will look at how investment programs and objectives are established at the Mutual Life of Canada, with particular attention paid to the impact upon investment objectives of the pricing assumptions for individual annuity and group pension products. Finally, I will discuss some of the ways that investment performance is monitored at our company. This will involve a brief discussion of some work that we have undertaken with respect to improving our methods of allocating investment income and how this can be applied to the monitoring question.

When I was considering the question of why monitoring of investment performance has become more important today, I thought back to a Society meeting in 1980. I was the recorder at a session devoted to investment policies of life insurance companies. One of the panelists discussed why insurance company portfolios do not receive the same amount of analysis as do pension funds. Reasons given were:

1. Performance measurers are more willing to make a critical analysis of pension fund managers because they are usually outside vendors. It is more difficult to be critical of co-members of a management team.
2. Other members of management know less about investments than other aspects of the business.

3. Insurance company portfolios tend to be nonmarketable and more passively managed, thereby not lending themselves for performance appraisal.

The reasons given were valid in my opinion but, nevertheless, companies must face up to these issues.

I tried to relate the current forces causing the industry to develop better methods to understand investment performance to the points made in the 1980 presentation.

First, it is not easy to be critical of co-members of your management team. However, the earnings performance of life companies is critical particularly in this current period of deregulation when the barriers in the financial services industry are crumbling and when the financial strength of companies in the financial services sector has become a more important competitive feature in today's volatile and uncertain economy. Our industry is moving more and more into competition with banks and trust companies. The financial strength of life companies is an advantage that life companies have. This is particularly true in Canada where size is a significant disadvantage. The assets of the Canadian banking system are concentrated in a few large banks. The assets of each of the three largest banks in Canada exceed the assets of the entire life industry. The great popularity of interest sensitive products and the potential risk/reward of the mismatching of assets and liabilities has caused the investment function to have a major impact upon earnings. Earnings are important, and the performance of the investment operation is crucial to the company's success. Hence, objective assessment of investment performance is necessary for a well run company. To allay fears that we are picking on the investment types, I believe it is true that most companies are responding to the need to examine in a fair yet demanding way the performance of various functions and individuals throughout the organization. One of the keys is to have objective measures of performance and means of assessing results relative to these objectives.

Second, I believe that there is an increasing understanding of the investment function throughout life companies. This has been forced upon us by the sizable sales of interest sensitive products. Understanding the financial results of the individual annuity or group pension line requires understanding whether the investment objectives have been met. Much of the pricing work now performed by actuaries is tied to assessing the yields, terms, availability and liquidity of fixed income assets. The performance of such lines is dependent upon close cooperation between the line and the investment operation. It is also, in some degree, a matter of self interest as each product line tries to ensure that it is receiving its fair share of the higher yielding investments. At our company, we are considering how we can use the model and system of allocating investment income to view the investment division as a separate profit center, thereby pulling the investment impact out of

the individual annuity and group pension lines. We feel that this would go a long way to addressing the understandability issue.

The third point made in 1980 was the more passive approach to the management of insurance company portfolios. In this current period of volatility in the capital markets, a passive investment strategy can reduce the potential gains arising from trading operations. Greater awareness of matching requirements may result in trading activities or changes in investment strategy to ensure that asset terms stay in match with liability terms. At our company, our marketable bond portfolio was approximately \$1 billion at year end. In 1983 the total volume of bonds traded was \$350 million. This level of trading was actually down from previous years. Even though mortgage and private placement bonds do not trade actively, the trend to shorter terms or to adjustable rates causes these assets to turn over much more quickly. Perhaps life company portfolios are not traded as actively as pension funds. However, the claim that they are passively managed is shrinking.

For the reasons given, I think that companies are much more conscious of investment performance, and much greater efforts are being extended to understand and assess investment performance particularly as it affects earnings. We have moved beyond reliance upon the $2I/A+B-I$ measure. New measuring sticks must be developed to understand performance in the current marketplace. This is particularly true for fixed income assets.

To appreciate the monitoring of investment performance, I think that it is useful to consider how investment objectives are established. Objectives at Mutual are set on a calendar year basis with some carryover from previous years of uncompleted asset placement programs, particularly the private placements and mortgages. However, it is recognized that a high degree of flexibility will be required and changes may frequently have to be introduced. The objectives are changed throughout the year as conditions change, as opportunities arise, or as projections become reality, either in an expected or in an unanticipated way. The establishment of investment objectives requires consideration of several factors. These include:

1. Cash flow

- How much money is there to invest?
- What type of products are giving rise to investible funds?

2. What is the expected timing of cash flow? This is important to Canadian companies writing individual annuity business where cash flows are particularly strong in the first quarter as people make deposits to tax effective savings vehicles and claim the deduction on the previous

year's tax return. Actuaries must price products where the money is received in January or February, but the ultimate mortgage or private placements to support these obligations will not be acquired until later in the year.

3. Economic forecast - direction of interest rates
 - relative attractiveness of various asset types
4. Availability of various assets and capability to source desired amounts - placing investments in mortgages and higher yielding private placements can be extremely competitive.
5. Diversification - asset type
 - geographic
6. Tax position - do tax effective assets fit?
7. Required liquidity position - to meet outstanding commitments on liability cash flows or outstanding asset commitments.
8. Strategic investment consideration - social, acquisitions tied to corporate strategy.

Most of these factors have contributed to the formation of Mutual's investment strategy for several years. The one parameter that has received great attention and will continue to receive even greater attention in the coming years is the work to understand the nature of the cash flow. What are the investment requirements for the liabilities that we are acquiring? Mutual Life sells:

- Individual and group annuity and insurance products with the interest rate granted to the policyholders tied to short term rates.
- Individual annuity and group pension products with interest guarantees of 1 to 5 years; some group pension products have 20 year rate guarantees. For these interest sensitive products, we provide a market value surrender option or we do not permit surrender prior to the end of a guaranteed period. The book value surrender problem faced by issuers of SPDA's is not a problem in Canada for these products.
- Life and certain annuity contracts where contracts may be in force for 15 - 40 years.
- Insurance products with no specific guarantee but can be surrendered upon demand.

Each product has its own level of assumed investment support.

The line actuarial staff working together with the investment division have developed pricing packages that reflect yields and assets currently available. I might add that the investment division at Mutual has had actuarial staff working in it for several years, and part of their job is to ensure that pricing formulae and their application reflect current market conditions. I think that the positioning of actuarial staff in the investment division has benefited the company, as well as the actuaries who have worked on investment matters. The pricing work incorporates immunization concepts and high quality assets are selected for the pricing package to minimize the default (C-1) risk.

As part of our cash flow forecasting process, we determine the amount of cash to invest for the major product groupings. For those products with specific interest guarantees, an expected level of investment support can be determined by applying the pricing package to the expected cash to invest. When aggregated for the total company or a particular segment, this will define the anticipated amount of fixed income assets that must be acquired. The senior investment officer is aware of what the liability flows expect the investment operation to produce. If at the outset of the year or at any time during the year, the ability to find the required investments becomes doubtful, the pricing formulae will have to be adjusted to reflect this situation. Since the establishment of investment objectives is directly tied to the pricing assumptions, the investment officers must have a significant input into the establishment of pricing assumptions. At the same time, the marketing officers, who want to have as competitive rates as possible for their products, need to be assured that the investment operation is generating sufficient investments to enable products to be priced competitively. It is a two-way street and one that requires regular and open lines of communication. The impact that the setting of investment objectives has upon the sales success of our interest sensitive products forces senior management to assess carefully whether those objectives are sufficiently challenging to ensure that competitive rates can be offered and yet are sufficiently realistic to ensure that expected profit targets are met. This fact exacerbates the need to develop the appropriate measuring sticks.

How do you measure whether the investment operation has been successful? The answer is not always obvious and requires careful analysis. I will address this question from a general perspective and then deal more specifically on how we are working to address this issue for our interest sensitive products.

The most obvious way to develop a general assessment of the investment performance is the bottom line. Investment operation is an integral part of the overall company results. Good earnings are likely to be indicative of a successful investment operation.

Most companies are likely to perform detailed earning analysis

whereby investment gains, mortality and underwriting gains, expense gains, valuation strain, and termination gains are analyzed by line or by product. The time and effort to develop earnings analysis are most beneficial to explain sources of gain and loss. As the standards of performance become better understood, earnings targets can be established. Such targets can be designed to reflect defined investment objectives. A common way to express an investment target is to generate investment return X% greater than interest required on policyholders' funds in order to meet expenses and profit. This analysis is similar to the spread analysis commonly used in the banks. In fact, banks do not define revenue as the receipt of premiums or deposits. To them, the generation of investment income is revenue, and what they pay to their clients is their cost of goods. The trend in our business, at least in the individual annuity and group pension lines, is to recognize that we are asset managers, and our earnings are based upon our ability to generate the necessary spread.

The sales results of interest sensitive products are a barometer of the performance of an investment operation. Much of the sales success for interest sensitive products is tied to the rates that can be provided by the investment operation. I do not mean to imply that sound product design, a well motivated and well trained sales force, or efficient administration are not essential to the success of these products. However, as consumers are becoming more sophisticated and rate conscious, they are willing to move funds to companies offering better returns. The popularity of no-load products, the decline in usage of termination charges and technological changes have made it easier to move monies to competing organizations. In assessing investment performance, it is not just gross sales that need to be considered. The shorter time horizons of our policyholders have caused funds to be rolled over to new guarantees much more frequently. If your rates are not competitive, not only will new sales be lower, but also termination experience will be greater. The large amount of annuity and pension reserves puts great pressure on the investment operation to generate returns to keep existing business, as well as attract new funds.

Most of my remaining remarks will deal with monitoring fixed performance as it relates to the pricing parameters. We utilize several internal measures to assess equity performance. Most involve a unit value calculation similar to that used in determining separate or segregated fund performance thereby enabling stock returns to be compared to appropriate indices, such as the Dow Jones, Standard & Poors, or the Toronto Stock Exchange. Such measures are beneficial for investment officers to compare their performance to competitive standards. However, as investment strategies relate more and more to liability and matching considerations, external comparisons, at least on the fixed income side, may become less relevant.

I will now consider how we monitor investment performance for

one product and then consider the work that is underway at Mutual to refine our allocation of investment income and how that work may be used to monitor investment performance.

We are working towards segmenting our assets into several pools to support certain products with specific investments. One of the segments that we established four and a half years ago is a short term account paying daily interest. This segment is invested in short term paper of 30 to 180 days and in floating rate bonds, mortgages and preferred stock where the yields are tied to bank prime and change automatically when the prime moves. The liabilities supported by these assets include our individual annuity products tied to short term yields, liabilities awaiting immediate payout to policyholders and some insurance products with floating yields. The annuity liabilities form the greatest proportion of the liability. Such products compete with similar products of other life companies and also with savings accounts and deposits tied to short term paper rates offered by banks and trust companies. This segment grew rapidly in the volatile economic times of 1981-82. Although growth has slowed, this segment still represents 9% of total company assets excluding segregated funds.

A pricing formula reflecting a combination of short terms and assets tied to prime was developed for the annuity products. Hence, at any moment, the required investment yield to support these products is known. At the end of each month, a calculation of the instantaneous yield on the entire segment is made. This is compared to the expected return in the pricing formula and results of the comparison are regularly presented to our investment committee. The results indicate whether investment operations are exceeding or falling below expectations, thereby enabling an assessment of the appropriateness of the pricing formulae. Although the yield offered to policyholders is tied to short term rates, the investment manager has some flexibility to buy assets with longer terms. By longer term for this segment, I mean assets up to 6 months or perhaps a year in length. For example, in the second half of 1982 when interest rates dropped, longer term assets were acquired thereby causing the yield on this particular segment to decline much more slowly than the rates offered to the policyholder. The comparison of the investment target to the actual return indicated the impact upon profit margins by this particular investment decision. The floating rate segment is a relatively easy example of monitoring investment performances in relation to pricing assumptions because asset and liability yields are so short in nature.

The second area of monitoring that I will discuss has not been completed at our company so I will describe our intentions. I hope that the actual results and intentions prove to be compatible.

We are working to improve our method of allocating investment income to the various lines of business. We currently utilize

an investment generation model that allocates all investment income of the company's general assets, except investment income arising from policy loans and from assets in the short term segment and the health branch, which in Canada must be operated as a separate account. The model incorporates broad cash flow data for each line and broad investment assumptions. It develops a modeled amount of investment income for each line of business. Ratios of the proportion of modeled investment income for each line to the total are determined. The ratios are applied to the actual amount of investment income to determine the amount of investment income to be allocated to each line. Hence, any deviations of actual investment results from those expected in pricing are buried in the allocation procedure and are therefore hidden in the bottom line.

This method of allocating investment income has several shortfalls. In my opinion, the key is that the pricing assumptions for individual annuity and group pension products are not directly reflected. Hence, those lines with specific interest guarantees on the products that they offer do not necessarily receive investment income on the basis of the assets assumed in the pricing assumptions. Although we have roughly quantified any discrepancies, this has caused confidence by senior management in our allocation method to fall. We are working towards refining our methods to ensure a more equitable and accurate allocation, thereby recapturing senior management's confidence in the allocation method and ultimately our internal financial statements by line of business.

Part of the work to update the allocation method is the further segmentation of the company's assets. We have developed or are developing separate segments for:

1. products with specific, fixed rate guarantees; these are primarily the individual annuity and group pension products
2. short term products
3. insurance products with guaranteed cash surrender values
4. a health branch, regulations in Canada require separation
5. corporate surplus account
6. separate (segregated) funds.

Our goal is to allocate investment income separately within each segment. On the basis of cash flows and the characteristic of the cash flow to each segment, we are earmarking assets to a particular segment. This will enable the investment income for each segment to be determined separately. Development of the administrative support to identify cash, track assets, especially those that are actively traded, and to identify investment income by segment has consumed substantial time and effort and continues to do so. Our ability to

administer the various segments needs to be enhanced before we will add further segments. An allocation model will be applied to each segment to allocate the investment income back to the operating lines since the segments may include products from several lines.

In discussing how investment performance will be monitored, I will concentrate on the segment encompassing the interest sensitive products. This is the more complicated situation, and I hope that other segments will be easier to develop. We are working on a separate allocation model to apply to this segment. It will allocate investment income by product, thereby permitting the allocation to each participating line. To do this, a more refined model is required. This model will be supplied with the cash flows by product on a monthly basis. The cash flow can be split into cash flow arising from new products and that arising from existing assets. Since the pricing formulae are known, the model can determine an expected asset distribution. The model must simulate the pattern of cash flow arising from the various assets used in the pricing, which include marketable bonds, private placement bonds and mortgages of varying terms. Initially this will involve six or seven different asset types.

The model will then develop an expected amount of investment income for each product. If we adopted our current approach, ratios of expected investment income by product to the total expected investment income for the segment would be developed and would be applied to the actual investment income for the segment. This is what would be allocated to the lines.

However, one of our goals in this work is to try to isolate the investment performance. If we can develop sufficient management confidence in the allocation model and develop the necessary administration support for the segmentation, the amount of investment income to be allocated to the lines will be the expected amount of investment income and not ratios applied to the actual amount of investment income. The model will define an investment target for these products. Any excess or shortfall will be the contribution to profit of the investment operation. Hence, the profit/loss for the line would not be affected by whether the investment operation did better or worse than expected. The individual annuity and group pension vice presidents could look at their bottom lines and see the results of the efforts of only the people within their divisions.

The model will also define an expected investment portfolio for these products. We believe that such a portfolio can serve as a guide to our investment operation. We can perform mean term calculations and compare them to the actual portfolio. Analysis of the composition of the portfolio by type of asset can assist in identifying sources of better than expected or deficient investment performance.

In essence, this would enable us to establish the investment operation as a separate profit center or line of business. It would take the funds generated by the other divisions for which a specific return was promised and invest them to meet the target and hopefully exceed it. The interest required to be paid to the policyholder and for expenses and planned profit would be the cost of funds. We also compare the mean terms of assets and liabilities to ensure that any deviations between mean terms of assets and liabilities are within acceptable risk tolerance limits. This limitation controls the investment division's flexibility to mismatch and accept risk.

The primary goals in our efforts on segmentation and allocation of investment income are: (1) to develop a reliable and equitable allocation method ensuring the integrity of our financial statements, and (2) to enhance the efforts for greater consistency of asset and liability matching and to ensure that any mismatching is undertaken with full awareness of the risks involved. The additional step to actually allocate modeled investment income will help us better understand our business and our performance. Addressing this issue through the work on segmentation and allocation brings these related objectives together and helps address the monitoring question with little additional cost.

As I indicated, this work is not complete. Acceptance of it will require the complete confidence and understanding by our management team and by the Department of Insurance. This is no small task, given the substantial amount of detailed administrative work involved and the complexities of the allocation model. Our task is to develop credible procedures and systems. If we are successful, I think that this will go a long way to help us understand our business and make better business decisions.

The changing nature of our business has forced us to look for new and more meaningful ways to assess performance. The approach that we are following to better understand investment performance is not unique. Many companies are going this route and the concepts are well documented in the actuarial literature. The necessity to understand your performance has become crucial in this period of rapid change in products and business thrusts.

MR. RADCLIFFE: When you are deciding on your investment income targets that the investment department is going to have to live with and be measured by, it would seem as if some friction would develop between the people who have the models that develop the pricing targets and the investment people. How has that worked out and how are the differences arbitrated?

MR. STAPLEFORD: I do not think that that problem is unique just because of the work that we are undertaking. I think it has been alluded to several times in this meeting that market-

ing people want high rates and the investment area wants to establish targets that they can in fact achieve and actuaries want to generate profit. I think this work brings that into much clearer focus and enables the whole issue to be better addressed. Ultimately, at our company, it will involve the president and the chief executive officer. But I would also say that, by having actuaries in the investment division, many of those deliberations take place at more junior levels. For example, the actuary involved in the individual annuity line is working with the actuary in the investment division, and he knows full well what the problems are and what the challenges are. The demands and expectations by the lines bear those considerations in mind.

MR. JOHN FAHRENBACH: Could you tell us what level actuarial people are in the investment department, FSA's or students or senior management?

MR. STAPLEFORD: Both I and another FSA report directly to the investment vice president. As well, though, the investment vice president's boss at our company, our senior vice president, is an actuary as well. The establishment of investment goals and objectives has had a fair amount of actuarial input at our company.

MR. JACK HANNAFORD: I was interested in your investment area being a profit center. We have always wished we could get our data processing area to actually be a true profit center, but really if there are gains or losses in either the data processing or investment area, where do they go? Do you just adjust your surplus? After all, the lines of business basically end up with all gains and losses.

MR. STAPLEFORD: We separate our surplus into the surplus generated by the traditional lines of business. Our major concern is not how surplus would ultimately be separated into the various lines of business. We have not yet addressed the issue of whether we will actually continue to segment surplus and have a portion attributable to the investment operation, although the system would allow us to do that if we so choose.

MR. ALLAN IRELAND: I assume that the new approaches you are taking to investment income allocation will apply to the statutory allocation for the government statement. Could you elaborate on how the par/non-par allocation will fit into the process you described?

MR. STAPLEFORD: First of all, we have not had this method approved by the Department of Insurance. They have approved our existing investment generation method, and so that is a step to be contemplated down the road in terms of presenting this to the Department of Insurance. If they do not accept it for government statement purposes, I would have to suspect that, for the sake of understanding our own business, we would apply it to our internal financial statements. Now as far as

the separation into the par/non-par split, that really comes down to when you put the assets on the books and knowing the pricing assumptions. What are you leaving over in terms of the investment programs to support the insurance, the par liability? The biggest challenge for us is on the non-par annuity products. And that resides with the investment area because they know the pricing assumptions and they know, as the assets are coming in, which ones are necessary to support the annuity operation. However, at the start of the year when the investment programs are being developed, if the annuity programs are anticipating \$200 million of required high yielding mortgages and private placements and the ability of the investment division to generate those products is expected to be \$200 million, the management committee would see that and say "Well, then there's not much left over for the par policyholders and their particular segment." And so that question would have to be addressed by adjusting the pricing formulae to make sure that a fair share of the higher yielding assets are left over for that block of business.

MR. DALE HAGSTROM: I see the advantage of what you are trying to do both as a spur to the investment people and also so that they can explain to everyone else why they are an important part of the team. It strikes me that what you are creating is a separation that, at least in the United States, people are trying to overcome. It is created by accounting. In the United States, insurance companies hold bonds at book value. Assume your company has SPDA's, and the two sides have not been working too well together. The SPDA is a package of calls and puts, and the investment may not particularly match that combination of calls and puts. When you actually go out and start hedging better, you mark the market pretty often on the calls and puts and the futures; however, on the SPDA you are still following book value and so your accounting is going to get all fouled up in the United States. And that, I think, is one of the things that are preventing people from doing as good a job in that as they might. It seems to me your management structure is creating potentially the same problem, and I am curious as to how you overcome that.

MR. STAPLEFORD: It is a good point. I was at a LOMA financial officers' meeting a month ago in Boston and several speakers made the comment that we should be developing financial reporting systems that meet the needs of management and not the statutory requirements. Now this, I think, is not to take away from the statutory requirements, but is asking if you need to have financial reporting systems based upon market values so that management really knows what is happening and distortions are not being created by the accounting system. We took that route of having financial reporting systems for internal purposes only, based upon market values. We hope that they will help us to understand what is going on and avoid some of the distortions of the statutory statements. For most published reports we are probably going to be tied to the statutory requirements. But in terms of understanding our business and

the business decisions that management must address, I think this work on getting rid of some of those distortions can be important. Maybe it has to be such that the companies are keeping two sets of books.

MR. STANLEY B. TULIN: Before I begin my presentation I would like to comment on what the other panelists have said.

One of the things that I have learned in the last few years of working in this field, is that what I used to think were separate risks and separate functions within an insurance company, namely pricing, allocation of investment income, analysis of results, and finally investment strategy development and implementation, are in fact becoming one and the same. As time passes and as the business changes, I think that we will see structures within the insurance industry change to adapt. However, you cannot price without being able to see your results emerging quickly enough to know whether or not you are performing up to expected. You cannot invest without knowing what you are supposed to invest in, and finally you cannot really run a company unless you have one person responsible for all of those things. That is a very different structure from the one I grew up in and from the structure that we all exist in. We have line managers developing products and marketing them. We have actuaries either within those lines or sometimes even in a separate actuarial department that reports back to those line managers pricing products and finally we have the investment department handling the investments. That structure used to work when we priced by assuming that interest rates were a level 10%. Now we are talking about things like C-3 risks and C-1 risks, which we are all starting to understand. The important thing that I see happening is that one person will make all the decisions about how to invest the money, what product he is going to market and how he is going to price it. In large companies, at least you need good communication between all of the parties involved.

One of the biggest problems with the investment management function and, for that matter, the line management function, is the structure. It is a structure that used to work but in my opinion does not work any more. Just as an example, what I can see us moving to several years down the road is, for instance in Kent's GIC line, actually having an investment manager who is responsible for investment performance for the GIC line who is in turn a part of the GIC product line. Kent's company may have a lot of reasons for having a centralized investment department, both for size and diversification of assets. My point is that the investment manager who is a part of the line and reports to the line goes to the investment department as an investment supermarket and says, "This is the investment I want. Can you sell it to me?" If the investment department cannot deliver, then we can get into Bob's analysis where we start in effect charging the difference between what the line of business with its investment manager wants versus what is available. There is no more reason why you should

have investment department and investment performance monitored separately.

Before I get to my prepared remarks, I would like to talk about the allocation question and just raise some of the issues that we found. Actuaries typically learned only about the investment year method (IYM). I remember there was an exam on investments of life insurance companies. All you had to remember was how much of the industry's assets were in bonds and remember that because of the long term nature of life insurance liability we all invested in long term assets. That gave rise to the problems of 1981 and 1982 because life companies did invest in long term assets and in 1981 and 1982 we found out why we should not.

Going back to the allocation question, we found that allocation of investment income leads you to some fairly sticky questions that relate to the following things. First, there are tax problems. Under the 1959 Act, there were serious problems both in the investment strategies of the line of business, which hopefully you could deal with as a corporate entity. More importantly in the investment allocation and tax allocation that you used, different lines of business were in different tax phases. Different lines of business could make use of deductions in different ways, and different lines of business had different liability structures. You invariably were faced with the question of how to allocate tax gains or losses. There is not just one answer. You have to make a management decision about how to allocate the tax. The second problem that we found was how to handle interline borrowing. It is easy to allocate money and new investments to a line of business if all the lines of business have positive cash flow in a given generation. Invariably one of the lines of business within a given generation can have a negative cash flow. The traditional IYM in effect automatically borrowed at the rate that some other positive line was investing in. In fact, management has a lot of options about how it treats negative cash flows. It can assume that a line is borrowing at some corporate rate from some corporate generation. It can assume that a line is borrowing short term and, in fact, use a short term rate. It can assume just what the IYM automatically assumes. All these methods produce very different answers. If you are monitoring investment results, I will submit that you cannot really have meaningful monitoring unless you first address these policy level issues: "How do I think about negative cash flow? How do I fund it? What is my corporate return? Do I borrow short or do I borrow long?"

I think Bob Stapleford and his company might want to have two levels of difference in measuring investment performance against the expected performance. One level would be the difference between the expected assumption and what the investment manager can get which reflects the environmental impacts that only the investment manager will be responsible for. The second level of difference would reflect what the

investment manager could have done versus what in fact was done. This would isolate corporate objectives from the line objectives. For example, a corporate objective of a large company might reflect an obligation, moral or otherwise, to be in the United States' common stock market. To the extent that that is not an objective of any of the line managers, I think it should be isolated from the performance of the investment manager.

Now for my prepared remarks, I would like to describe a system that we have developed for some of our clients to measure interest rate risk. We use the measurement of risk from this model to set strategies consistent with management's objectives. This all relates to my belief that a company needs an ongoing investment management process that is going to require hands on treatment by line managers as they look at the interplay of the liability and asset sides of the balance sheet. I think the real problem with asset management today is that it would be very easy for anybody to come up with an investment strategy that they felt was risk averse (and let us assume that most of the people in this room are risk averse) if they knew what the liability pattern really was. The source of most of the asset matching questions is the GIC line or SPDA's. In fact, if you take SPDA's as an example, the liability structures are unknown. They vary with the external environment such as interest rates, what the "Wall Street Journal" is writing about, what the mood of the country is, whether or not there is a war going on and many other issues. Maybe those issues are not all equal, but they all affect our liability cash flows.

The problem is that you cannot predict the future. That is the environment in which we have all been working and has caused an unsettled feeling. You know you have a problem because you do not really know what the liability flow is going to be so you do not know whether to invest long or short. You do not know what that McCauley duration is because you have to make a guess about the future in order to get it. The real problem is knowing how to quantify the duration. I think it is really critical for our profession to explain to management what these risks are because it is so important to the future of this industry.

Because you do not know what the future is going to bring, the first thing you have to do is define your universe of possible interest rate scenarios. What you see on Slide I is one universe of possible interest rate scenarios. It is a grid that is a series of yield curves, which we have labeled going down the left hand side 1-17. One is an 8% short term rate with a 9% 11 year bond rate. In between it has an 8.8% five year bond rate. Number seven is the most recent (5/31/84) yield curve. It is 11.96% as the one year rate up to 13.21% for a five year rate and 13.68% as an 11 year rate. Yield curve 16 was a 20% short term rate with a marked inversion in the yield curve of 16% for the long term with rates trending down.

You have to make a few decisions as you try to set an investment strategy. At the same time you must price your products and finally, monitor your results as they emerge. You are going to have to repeat this process as what you guessed about today becomes reality tomorrow. But, conceptionally, what is here is one definition of the universe that we are currently trying to protect ourselves against. We must try to make a profit while at the same time contain our risks.

The next question we ask is, "How much money are you willing to risk?" I was talking to Don Cody earlier today and I asked him that question. He said he had never heard anybody ask the question quite that way. It has usually been, "How much money can I lose?" or, "What is my total exposure?" We are trying to identify, given a universe, what the total capital exposure is so that you can avoid putting your corporation in the position where you are betting it on one roll of the Dow Jones interest forecasts or the Dow Jones market performance.

The next question that somebody has to ask -- and they can answer it either before they do this or after they do this, "How much money do you have to risk? How much money can this product line afford to lose and still allow you to exist as a company or meet your objectives, and leave enough surplus so that you can continue to expand, keep your Best rating and stay out of rehabilitation?"

If you think back to that first slide, it was a series of interest curves which we were trying to protect against and we are right in the middle of them today. Most managements that have an investment strategy have a point of view as to which way interest rates are going, what the general trends are, or what the long term trends are. On the other hand, I have found very few who were willing to bet their companies on that decision being right. So, what we do next is describe systematically the probabilities ascribed to rates changing off of that interest rate curve on Slide I. If you believe that at any point rates can either go up or go down and that they have equal probability of going up and going down and that they are probably normally based around the current rate, then you develop a very easy kind of probability distribution around the potential interest rate curves. If on the other hand management has a position that it wants to influence its strategy, it has to bias its probability distribution at random walks through time based on that strategy. Then, conceptionally, the idea is to set a strategy which does two things. First it satisfies management's objective with respect to the amount of capital it has at risk. Then it has to figure out what the worst possible interest rate scenario is, given management's definition of the future. In other words, what is the worst case future? You can get that if you have gone through this question of what is your universe. You can then create a structure whereby you never risk more than you have or never risk more than you have dedicated to a product line.

The next thing the model does is optimize the investment strategy that the model will use based on an overall constraint that it can never spend more than you tell it to. In fact, the present value that is the optimal may not truly be optimal because you might have a present value that is optimal but still exposes you to ruin at some level that you are not willing to accept.

What I am showing in Slide II is ten random walks that we have taken in projecting the results of a given investment strategy. The investment strategy includes for a particular product both an initial strategy and then also an annual update to the strategy. It is based on reviewing strategies each year, where your view of the future may change at that point. In other words, if you are at a point where interest rates are 16%, you reflect that but you also reflect the probability distribution about those new rates.

I think the pricing process now has to reflect input from the investment people and real risk and ruin analysis in order to be intelligible. Pricing based on expected values particularly with respect to this risk at this point I think is absurd. On Slide II, all interest rate scenarios start with the short term rate at 11.95%. This is just the short term rate. There is a yield curve that goes with each short term rate so this is really a grid. The first one says a year from now rates will be up to 13%, two years from now they will be at 15 1/2%, three years from now they will be at 20%, and so on. Going across you see that there are some, the third notably, which is at least a jelly bean scenario where you start with 11.95%, drop to 11.25%, then two years at 8%, and gradually picking up and then going down a little bit. What this has done is expose both reinvestment risk problems and also disintermediation problems but in a real way that quantifies the results.

The problem that I have always had dealing with this has been that I feel a lot like somebody who thinks that he might have stepped on something but he is not sure until he looks at his shoe. The only way that I have been able to tell what I have stepped in is to lift up my foot and take a look. The only way that I have been able to find to deal with these words that we have been hearing like "disintermediation risk" and "reinvestment risk" and "seethrough risks" and all these other things is to go about the process of trying to simulate with models to try to find out what the risk is.

Slide III shows at least some of the results. This slide shows the present value of profits by trial. What we showed on the prior slide were the random walk trials. In fact, you look at many of these before you conclude that you have a strategy that you are happy with. You certainly look at many before you think you know what the expected value is. What this shows is the model determining two different strategies based on two different constraints or available levels of surplus. The aggressive strategy is the one that the model

goes through when it has more surplus to lose, or more money to invest. It is also the one that you would expect to have a higher mean in terms of the distribution of future profits. On the other hand, it is the one that you would expect to be much more volatile. The results on Slide III under the aggressive strategy show that going through those random walks produce rather violent distribution in terms of expected earnings. This happened to be for a block of business that many companies have. What it shows is that notwithstanding the fact that you have an investment strategy that is tailored to meet given risks on your part and to be risk averse, you still get rather dramatic variation in income. That, I think, is true for almost every product line that we are in today as an industry except for GIC's. It may even be true for GIC's, but to a smaller degree. For all of the lines that involve book value guarantees with market value assets, you have just this kind of problem and maybe worse.

The second strategy is based on a modest amount of surplus available and it gave rise to a modest strategy. You can see that where we lost 22.7 in the seventh scenario on the aggressive strategy, using exactly the same scenario but with an investment strategy that was tailored to meet a modest available surplus, we get a higher gain or a higher present value of profits. Interestingly, the mean of those two things is exactly what you would expect. The aggressive strategy has a mean that produces a higher present value expectation commensurate with more risk. Ultimately management has to make the decision about whether or not the higher expectation of profit is worth the variations. Management has to make the decisions about how much surplus is available and whether or not it can take the risks that are necessary to compete in today's life insurance business. Finally, management has to create structures that allow the actuaries and the investment people and the marketing people to work hand in glove at solving some of these problems that face us today.

MR. BRUCE NICKERSON: Starting with the thought that you put to management of how much can they afford to lose, have you considered giving a range of possible outcomes such as you showed, and assigning utility values to them? Management has a further question, I would guess, which is, "If you can make 100 with reasonable assurance, how valuable is it to make 200?"

MR. TULIN: What we have found is that managements are interested in just that distribution. One of the things that most managements are most interested in today is whether there is a "feasible solution". Is there a solution in terms of strategy, distribution in this portfolio, that meets management's objectives of available surplus given their pricing requirements? Next management is interested in what I will call the utility curve, which shows for given varying capital commitments what your expectation is. You do get to a point where there are diminishing returns.

MR. DON CODY: Stan, you left out at least one step here. It is a very interesting step because you had to have an outflow or an inflow function having to do with disintermediation of withdrawals or having to do with additional money coming in. It takes a lot of wisdom to develop something there that you can be sure of because we just do not have the experience. Could you say something about your termination and new business function?

MR. TULIN: The block of business that we were looking at here was a combination of SPDA's and single premium whole life. I agree with you, Don, that we do not have that much experience, but we have more there than we do, for instance, on universal life. We have maybe 10 years of decent experience whereby we can relate the termination rate to two other things. One is the credited rate on the contract and the other is the external environment. We have done some plotting of past results, and the results are scary to me in terms of the implications for the industry. We have plotted on SPDA blocks lapse rates with new money interest rates and corresponding credited rates on their contracts. The correlation is about 90%, and we fit a formula to that to have the lapse rate move while at the same time we have also done some things with the assumed strategy for managing the portfolio. Since you have a dynamic liability, you always have an option of increasing the credited rate to reduce the lapse rate. You almost get into a subgame within a game. If this is an overall game that you are playing for big stakes, there is another game within it that you are playing for big stakes, which is how to manage the liability side. That gets into how far you move the credited rate to keep interest sensitive business with you.

MR. WOODY RICHEN: Since you do have some basis for predicting how the cash flows are going to behave in your various scenarios, how sensitive is the outcome of your models? You are going to miss the mark some of the time, particularly in universal life, where you do not have very good data. Do you have any feeling for how sensitive your models are to that? Do they still give you a better sense of confidence from having them?

MR. TULIN: My view is that I really meant what I said about feeling the need personally to quantify this and look at some of the strategies that you need. I think that there is a lot that we know about those liability movements. It is sensitive to the answer, but one of the things we have tried is just to run it, for instance, with a different formula for the lapse rates. The lapse rates really are the key thing that affects your cash flows. And if you just run it with a different series of sensitivities for interest rate movements, you can get a very different liability pattern. What we have found is that at least we are bracketing what our clients think is reality. Bracketing what they think to be real, you can get results that really have significant meaning as to how you ought to invest your money and give a lot of comfort then about

what you really have exposed. The key question here is understanding what you are dedicating to different product lines.

MR. RODNEY WILTON: Stan, yesterday we heard somebody say that you should not worry about 30% interest rates because we would all be dead anyway. Back in 1975 I remember people saying that if we had 20% rates we would all be dead, and then it turned out in 1980-81 we did have 20% rates and most of us survived. I just wonder what you foresee if, three years from now, we have 30% short term rates. Do you really think that the whole industry will have collapsed?

MR. TULIN: The modeling we have done and the analysis that we have made suggest two things. The first is that the industry just barely survived the problem of 1980-81 and maybe if interest rates had stayed at that level, some of the short term solutions, like exhausting lines of credit and borrowing at 20% to lend at 5%, would have shown the industry to be in more trouble than in fact everybody realized. I think the industry knew how much trouble it was in, but a sustained spike in interest rates would have created a problem. The second thing is that I think we can sustain short spikes, but a short term spike to 30% suggests a drop back to a level that I do not think we can survive. If you get a short term spike to 30% and a drop back to long term rates at 22%, I think that the life insurance industry as we know it is going to change substantially, both ownershipwise and capitalwise, because it will not have the same owners and there will not be any capital.

MR. HAGSTROM: Stan, I am just curious if you have drawn out your clients on their strategy for investing or managing the business. When you have got your clients to agree ahead of time how much they are willing to lose, and you go through a scenario where three years into it they have lost their stake, do you run from that point forward with a different strategy, or do you keep to the original one?

MR. TULIN: No, if they lose their stake, we tell them that they cannot use that strategy, and they have got to go back and give us more money to play or have a different strategy at the start.

MR. HAGSTROM: What if they lose 75% of the stake, and they feel that, according to Don Cody's work with them, they still need "x" amount?

MR. TULIN: They need a new strategy at that point and probably more capital.

SAMPLE YIELD CURVES

Yield Curve	-----BOND TYPE-----							
	1	2	3	4	5	7	10	11
1	8.00	8.50	8.65	8.75	8.80	8.90	8.95	9.00
2	8.75	9.25	9.55	9.75	10.00	10.20	10.40	10.60
3	9.25	10.00	10.50	10.85	11.20	11.50	11.75	12.00
4	9.50	10.00	10.25	10.50	10.70	11.00	11.25	11.50
5	10.50	11.00	11.20	11.40	11.60	11.80	12.00	12.25
6	11.25	11.85	12.25	12.45	12.65	12.90	13.05	13.05
7	11.96	12.46	12.71	12.96	13.21	13.36	13.46	13.68
8	12.20	12.80	13.10	13.30	13.45	13.60	13.70	13.80
9	13.00	13.65	13.95	14.15	14.40	14.55	14.70	14.80
10	14.00	14.75	15.00	15.25	15.40	15.40	15.10	14.85
11	14.50	15.20	15.40	15.70	15.80	15.70	15.40	15.10
12	15.50	15.80	16.00	16.20	16.00	15.85	15.60	15.35
13	16.00	16.25	16.50	16.10	15.90	15.75	15.60	15.45
14	17.00	17.50	17.25	16.75	16.40	16.00	15.85	15.65
15	17.50	17.75	17.50	17.00	16.50	16.25	16.00	15.75
16	20.00	19.50	19.00	18.25	17.25	16.35	16.35	16.00
17	23.00	22.50	22.00	21.25	20.25	19.35	19.35	19.00

SCENARIOS* TESTED

<u>Year</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
0	11.95	11.95	11.95	11.95	11.95	11.95	11.95	11.95	11.95	11.95
1	13.00	14.00	11.25	10.50	12.20	14.00	15.50	12.20	13.00	14.50
2	15.50	13.00	8.00	8.75	11.25	14.50	17.50	11.95	14.00	14.00
3	20.00	12.20	8.00	11.95	12.20	11.25	14.50	14.00	14.50	14.00
4	20.00	14.00	9.50	11.95	11.95	9.50	14.00	14.50	14.00	14.00
5	17.00	13.00	11.25	9.50	9.25	11.95	14.50	20.00	13.00	12.20
6	20.00	13.00	12.20	8.75	8.75	11.95	15.50	15.50	15.50	10.50
7	15.50	14.00	9.50	9.25	8.75	11.25	20.00	15.50	16.00	11.25
8	13.00	12.20	9.50	9.25	11.25	14.00	15.50	17.00	14.50	11.25
9	13.00	11.95	12.20	11.25	11.25	15.50	16.00	13.00	16.00	10.50
10	12.20	11.25	11.95	12.20	13.00	17.00	13.00	12.20	16.00	10.50

*These are short-term rates -- each short-term rate carried a yield curve.

PRESENT VALUE OF PROFITS BY TRIAL

<u>Trial</u>	<u>Aggressive Assumption</u>	<u>Modest Assumption</u>
1	\$ 20.0	\$136.9
2	128.2	163.1
3	1,068.1	742.9
4	820.0	625.9
5	459.5	409.4
6	288.8	256.1
7	(22.7)	88.5
8	37.6	87.2
9	30.5	89.5
10	159.2	272.4