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INVESTMENT STRATEGIES

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o Buy/sell
o Hold
o Exchange
o Long-term
o Optimization
o Hedging of the business and investment risks
o Immunizing strategies

MR. IRWIN T. VANDERHOOF:
EXPENSE STRATEGY IN PRICING INDIVIDUAL INSURANCE POLICIES
The first speaker will be Ken Stewart. Ken has an interesting and varied
background which is going to change within the next week. Actually, what you
are seeing here is practically a Wall Street panel. Ken Stewart is a Fellow of
the SOA and the Canadian Institute; Director of Investment Planning at London
Life and is responsible for asset liability, programming strategy and tactical
planning and investment operations; directing management of segments, port-
folios, backing interest-sensitive liabilities, liaison between individual and group
product design pricing and surplus management, consultation and mergers acquisi-
tions, mortgage financing, private placements and corporate development. As of
next week, I think on Halloween, I'm not sure if there is a significance in that
date, he will become a Vice President of Salomon Brothers in New York, an
industry specialist representing Salomon Brothers to the insurance industry
throughout North America, ensuring focus of their research and publications to
meet the needs of the industry and acting as a consultant in corporate finance,
mergers and acquisitions. In connection with his general background, he told
me that it was optional about mentioning the poor blind dog, named Benjy, or
the sled with Rosebud written on it. So, you can consider those mentioned or
not mentioned as you prefer. Ken is going to speak on the general topic and
act as the generalist in this forum on the variety of strategies stated in the
program.

MR. KENNETH W. STEWART: There is a saying that, "A Rose is a Rose is a
Rose," and another one that "Irwin is always Irwin."

The job of an investment strategist is to create and manage strategies that
realistically reflect his or her environment, satisfy a number of public and
corporate policy goals and balance the return objectives and the risk exposure of
the company fund or product in question in a way that adds real value on the

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*   Mr. Stricker, not a member of the Society, is Vice President of Goldman
Sachs in New York, New York.

bottom line. In my remarks I'll speak to two broad areas: First of all, three high order or entity level strategies within which common operational strategies fall, and second, I'll talk about five common functional strategies that apply either singly or in combination in actual portfolio management.

From my perspective, there are really three generic strategies that apply at the entity that is the fund or segment level: These are spread management, total return management and tax management. Let's look at them in turn.

Spread management is probably the one we talk about most. It refers to manag-ing the spread of investment return over a very well-defined liability cost. It applies when liability cost is well understood in both time frame and as in the case of life annuities, structured settlements, GICs or the initial crediting rate period and single premium deferred annuities, SPDAs, that is, or universal life, UL for convenience. On the other hand, the rate to beat may be defined in relative terms as a target spread over a future one, three- or five-year Treasury yield or by some function of the average crediting rate of key competitors for SPDA or UL contracts.

In spread management success or failure is fairly straightforward. We succeed if we usually beat a hurdle rate and during the positive spread over liability cost that falls in our target pricing range. We fail if our spread is consistently below this level.

Total return management, on the other hand, applies to liability whose cost is broadly defined over long time periods and typically expressed only in relative terms. Common examples are pension funding and asset management for tradi-tional whole life contracts. Investment objectives are more difficult to define here. The target return may be broadly expressed in terms such as earning a long-term superior rate of return, whatever that means, or earning an average real return of 4% or 5% over perhaps a 10- or 20-year planning horizon. In total return management, success or failure is clearly more subjective and more diffi-cult to assess even though actual return measurement may be quite straightforward.

Tax management refers to a collection of strategies in which you make investment decisions to achieve specific tax effects. An example in the U.S. would be purchase of tax-free municipal bonds, and in Canada, until recent tax changes took much of the joy out of the game, an example would be purchase of pre-ferred shares for tax-free dividend income. I would categorize tax management strategies as usually risky because the rules can change for new games or while the ball for the current game is still in play.

Within this overall framework, let's turn to the common functional strategies to see how they fit. I'll talk about five: buy/sell, buy and hold, optimization, long-term strategies, and portfolio restructuring or exchange.

First of all, buy/sell. This is the active trading strategy that attempts to improve returns by constantly examining and adjusting the portfolio. Buy/sell is very appropriate for open accounts that follow total return management but remember that your asset managers think and act in market value terms. They'll measure their performance and evaluate their trades in the absence of applied constraints in purely market value terms. Now, except for separate accounts, market value accounting does not usually carry through into statutory or gap or tax accounting and all of them may report the same transaction on a different

basis. So, you clearly need to limit your investment managers by some sort of sensible constraints on their freedom to act in ways such as ensuring a clear understanding of your preference for ordinary income or dividends, which is capital gains, cash versus accruals and short-term versus longer-term perfor- mance. By ensuring that you have a clearly agreed framework for the level of aggregate risk that they may expose the fund or company to and still, at the same time, leave them enough latitude to pay for their not inconsequential keep, you'll need to take particular care to ensure that buy/sell does not trigger adverse tax effects, so clear communication is very important. With these cau- tions, buy/sell is the norm for pension funds and for portfolio liabilities such as participating insurance, traditional non-par products and health insurance. Buy/sell can also be used to generate made-to-order tax effects.

Now, buy and hold is a passive strategy. You buy a portfolio that meets your return objectives and except for changes as a result of actual or perceived credit impairment, you plan to hold it to maturity. Buy and hold is used in the case of fixed income for some predefined holding period and in the case of equity real estate and perhaps even indefinitely in the case of stock holdings. Buy and hold is very well suited to both spread management and tax management if you select your initial portfolio with care to lock up those portfolio features that you really want and both assets and liabilities are change resistant. Buy and hold works very well with some interest-sensitive products, such as insured annuities and structured settlements. It works rather poorly on its own with GICs, SPDAs and UL, because both the assets normally used and the liabilities themselves have deeply embedded optional features, especially in the U.S. Buy and hold works somewhat better for spread products in Canada because the embedded options are less severe. Buy and hold does work well in combination with other active strategies. For spread products it can be used to build a core portfolio which matches the lion's share of interest cost and cash flow needs while an active buy/sell strategy with the remaining assets generates incremental return and offsets changes in both the asset and the liability character.

What about optimization? Well, it's the name normally given to a family of closed forum methods of selecting a portfolio to meet specific return and cash flow objectives. By closed forum, I mean that the methods focus on a defined liabil- ity structure, as in the case of spread management, rather than the open forum typical of total return accounts. Optimization may be passive and most common forms or mathematical models are based on linear programming. It's typically applied to GICs, structured settlements, and insured annuities, including pen- sion buyouts. The approach developed by Jim Tilley in his paper and *TSA* XXXII is a very elegant and classic example. The most exacting optimiza- tion model is the dedicated portfolio that selects a least-cost portfolio from a defined universe of available securities. Another approach creates what we might term a near dedicated portfolio by allowing some degree of cash flow mismatching with a conservative reinvestment divestment strategy. This method lowers the cost of the overall matching portfolio by widening the universe from which securities can be selected. Depending on the degree of tolerated mis- matching, optimization of this type may range on the one hand from a rigid buy and hold to requiring a very significant ongoing portfolio restructuring. Optimi- zation also takes an active form. I'm thinking here of an approach such as contingent optimization that combines active management above a certain flow of return with a switch into an immunized portfolio whenever the flow of return is likely to be breached. Except for these active forms, optimization tends to work well where buy and hold works well and to carry many of the limitations of buy and hold otherwise. Active forms, such as contingent optimization, are really

variance of the buy/sell strategy. As a general rule, optimization is technology intensive and it does require a solid understanding of both the underlying model and the assumptions to avoid being trapped in the familiar black box syndrome.

Long-term strategies are a family of methods both analytic and intuitive to select optimal strategies in an open forum environment where rigorously defined liability structures are lacking. These strategies clearly fall within the total return umbrella and they're applicable to portfolio accounts and pension funds. One approach is to use concepts for modern portfolio theory and perhaps an efficient frontier model to select a normative asset mix for a total return account. Asset mix changes can then be made from time to time based on fundamental changes and perceived relative value. Within that framework, each of the asset accounts, by itself, is management by either a buy/sell or a buy and hold strategy. I've used this approach for the participating insurance segment of a large Canadian stock company and using it I was able to justify a very significant increase in its stock and real estate components to improve long-term returns at a very acceptable level of risk. Other approaches to long-term strategizing employ scenario testing. As always, the quality of results is very much a function of the realism of the assumptions used. With this caution, scenario testing is a very useful approach and it will become much better developed as a result of the need to comply with New York Regulation 126 and the much more comprehensive Canadian requirements.

Now, portfolio restructuring and exchange. This refers to attempts to improve results with a lower risk by some fundamental transformation of the portfolio. It takes many forms. The simplest or trivial form is just a change in asset mix. Even this has to be done quite carefully without losing sight of the tax effects of trading and perhaps spreading the asset sales over time to achieve better pricing.

Credit restructuring can be used to raise or lower the credit risk and the potential reward in the portfolio. Credit rewards can be enhanced by such things as a diversified portfolio of high-yield bonds, through private placements, direct mortgage placements or by more inventive schemes such as securitizing your existing asset portfolio. The widest application of restructuring is in the area of term structure where direct sales of assets or synthetic securities are used extensively. Mortgage-backed securities, including the newer and more novel forms, found ready application in life insurance companies to change maturities, to free up cash for a change in asset mix or to enhance the running yield in the portfolio. More recent asset-backed securities have included policy loans, which are given the quaint term, "death backed bonds," and they've reached ahead in time to package the revenue stream of deferred acquisition cost receivables. Further applications to back receivables and policy premiums are expected. Other exchange strategies use futures, options, interest rate term and currency swaps. For example, you can swap the seven-year bond that you were able to get down to the five-year term that you need for matching your liabilities or you can swap principal and interest payments on a kiwi-denominator five-year bond that you want to use for match back into Canadian or U.S. dollars on a fully hitched basis. Asset restructuring can also work internally. You can take an intermediate term fixed income asset or a pool of them, strip that into a shorter-term asset for backing your SPDA or your UL liabilities and a longer asset for life annuities and avoid trading and brokerage costs.

Portfolio restructuring on the whole has very important applications to both spread management and total return accounts. By reducing exposures, by

getting a better price for your assets, you can materially improve your performance.

I've alluded already to some high-bid strategies such as combining buy/sell with a buy and hold. One variation for spread products is to use buy and hold for the first three to five years of SPDA or UL cash flows and then an active buy/sell strategy for the remainder. This effectively limits your risk of portfolio rebalancing in the volatile shorter end of the yield curve. One large Canadian mutual company combines buy and hold with a long-term strategy for its non-par life annuities. What they do is use a fixed income portfolio to match liability cost for the first 20-25 years and then they invest the remainder of the portfolio in equity real estate to cover liability costs beyond the price and select period. The large U.S. mutual company combines elements of buy and hold, buy/sell and long-term strategies for its SPDA and UL business. They put 50% of assets in high-grade, relatively short, fixed income portfolio and the other half in enhanced return assets, high-yield convertible bonds, equity real estate and participating mortgages. Now, I term this, if you will, a double barbell strategy because of the contrast in both quality and term structure. The high-grade shorter-term portfolio covers liquidity needs under any plausible scenario and provides a time buffer so that the company can afford to wait for the other 50% of assets in patient, higher-risk vehicles to deliver that expected long-term superior return.

The large Canadian stock company combines buy and hold with restructuring for its spread products. Now, the Canadian form of SPDA is typically one- to five-year GICs, as you would call them, with either market value cash out or a very limited book value withdrawal. In this company, matching assets are 80% residential mortgages and 20% private placements. Now, I have to tell you that in Canada, residential mortgages are primarily one- three- and five-year fixed rate contracts with much more limited prepayment than you are accustomed to. And the private placements, in this case, are very extensive call protection. Short annuities, on the other hand, are backed by long commercial mortgages and private placements are either non-callable or call protected. In both cases, this company follows buy and hold with the majority of its matching assets tempered by what it terms creative mismatching. By this, I mean that the duration gap between assets and liabilities is adjusted to manage the effective duration of the net equity assets minus liabilities within a target range. Now, since the assets are liquid, because the secondary market for mortgages in Canada is still in its infancy, the company uses synthetic securities for two purposes; first, to adjust maturities in the portfolio, to reduce the absolute size of cash mismatches and to manage duration and, on the other hand, it strips medium-term assets into both short securities for its version of SPDAs and longer securities for the insured annuities. Now, these are just a few of the examples of hybrid strategies that are in common use today.

I hope that my remarks have illuminated some of the essential differences and the generic links between investment strategies commonly in use. My colleagues on the panel will talk about immunizing strategies and hedging of business investment risks.

MR. VANDERHOOF: Since I'm the moderator and also speaker, I'm going to introduce myself. Hi, my name is Irwin Vanderhoof, I'm a member of the SOA and some other actuarial groups and I'm currently the Vice President for Research, whatever that may be worth. I got my Ph.D in finance last year which was a big thrill because I was the oldest kid in my class.

PANEL DISCUSSION

I wanted to bring a couple of insights to you before I start the formal part of this talk. One is an important insight I had at dinner the other night. We were talking a little bit about politics and it occurred to me that Ronald Reagan is not universally acclaimed for his intellectual prowess. That's true. He also has a reputation of sleeping a little bit during the day as well as during the evenings and afternoons. He is not a hard worker. He's not a well man. You know, he was shot in the heart and had cancer and a few things like that. He really seems to have very little going for him and yet even people who dislike his policies will admit he's been a pretty effective president. Now, this country is going to be faced with Dukakis and Bush. The Canadians are faced with Mulrooney, Turner and Broadbent, names which are in some ways are as familiar in Canada as they are here or perhaps as popular. We don't seem to have much star quality among the candidates for these important political positions. And the insight I had is that we should learn from the example of Ronald Reagan. The Democrats made an error, Robert Redford rather than Michael Dukakis. The Republicans made an error, rather than Bush, Clint Eastwood. Now, you would have televised debates that would have the entire country riveted. If we carry this point off and replace all of our politicians with actors and actresses, I don't wish to be sexist, then we could have in Washington reality totally replaced with appearances and that would be great for actuaries because then we could work the other end, you know, replacing appearances with facts and reality and we would have ensured the future of our occupation forever. That's one insight.

The second insight is we have to look internationally these days. So, I read *Fiasco*, the publication of the venerable Staple Inn Actuarial Society. It used to be the Student's Society of the Institute of Actuaries in London and I came up with one jammer, which the English feel is appropriate for their newsletter. "She was only an actuary's daughter but she knew her surrender value."

I do have some remarks that I hope are more serious than what I've said so far. I'm going to talk a little bit about two things: One is risk which Ken has alluded to somewhat in his comments and second is immunization.

The first really has to do with the C-1 risk and the attitude that I have observed among actuaries with respect to C-1 risk. When we started off learning actuarial science and premium calculations in my generation, we worked on a simple deterministic expected value. You had a set of numbers that represented mortality rates. You picked something for an interest rate and you came out with a premium rate. That has been replaced by the modern text in life contingencies with an approach where we consider distributions rather than one specific value. But, even though we are considering distributions of mortality rates, we, in fact, end up by getting the expected value so we come back with one number. Finances are now referred to as a risk neutral process, a risk neutral calculation. We want the highest expected value and we are not concerned about little fluctuations and results in the intermittent period until we get out to a long term. As we enter business practice, we find out that simple concentration on expected value is inadequate. We find out that managements tend to get very tense when the results go up and down. Somehow a $1 million claim seems to evoke more management interest than 10 $100,000 claims. God forbid there should be a $2 million or a $5 million claim on the books. While we have been taught in terms initially of expected values, we find that what management really wants is for the projections, for the expected values to come out exactly. There was little toleration of tolerable variance.

The same applies in investments. And, I think, actuaries in addition had a tendency to like neatness and precision in their calculation. We have a tendency to like predictable investments. A friend of mine told me how he liked bonds because there was certainty in the results. Well, there is certainty in results. I suspect that the certainty in results, for the investment-insured safe assets, is a certainty only in failure. That should not be a surprise. It is reasonable in this world to expect only failure if you demand certainty. There is a question of risk aversion. And if you avoid all possible risk, you must undertake to pay for it in terms of lost opportunity, pay for it in terms of lost possible return. I don't need to inspect any company's internal books or calculations to be pretty sure on interest-sensitive products; there is very little prospect for a profit or even to break even based upon an investment portfolio that contains safe assets. The reason for that is simple. I know what the capital markets can yield and the returns that companies are offering to credit on interest-sensitive products are simply inconsistent with the levels of low (unclear) risk of bonds. Yet, actuaries, in particular, tend to hate the uncertainty involved with common stocks, convertible bonds, equity real estate, and junk bonds. These are all in some sense pejorative terms of a life insurance company portfolio thinking strategy.

I argue that common stocks which generally are going to yield about 300 basis points more than safe bonds have got to be seriously considered. I argue that convertible bonds, where there is little academic information, have to be seriously considered because there is a Lipper study on mutual funds that shows that convertible bond mutual funds do about as well as common stock mutual funds or have over the last 15 or 20 years. That means you are getting an additional return. And since bonds in the United States can generally be held at book value rather than market, you may not have as much risk to your estate as you would in common shares. Equity real estate is normally carried at the lower cost of market, but somehow market is always appraised value and I never seem to see the appraised values coming in very much below cost. This, again, is a kind of an asset where a long-term additional return is probably available, it's probably not going to show up in terms of cash quickly, it's probably not easily determinable as to when the return will be achieved. But, again, it's something that has to be considered.

Junk bonds have gotten a lot of publicity lately. I'm not sure at the moment that junk bonds are an attractive investment, not based upon the default characteristics, the fact that they can default, but based on the fact that they are getting so popular and starting to get so accepted that you may not be getting the additional return you need. The key in accepting each of these investments as a part of a portfolio is how much are you being paid for it. If your expected value of the return is 300 or 400 or 500 basis points above the return on safe investments, safe though failing investments, then it deserves serious consideration. If the additional return is much less than that, it is unlikely that these could be attractive investments in the long term.

Immunization strategies become very complex when we are concerned with other than risk-free bonds or when we are concerned with other than exactly government bonds. Why should we be concerned about immunization strategies at all? The paradigm for the actuarial profession is now cash flow matching. We have the cash flow needs of our liabilities. We match the suckers out for the next 30 years, then we get a set of assets that will exactly match that cash flow so we're all set. Generally, it cannot be accomplished. You cannot exactly cash flow match. Generally, if you could, you would only have a very limited run in

investments with very limited returns. And, generally, it's not a practical method for managing a portfolio.

Immunizing strategies tend to be more myopic. They're concerned only with the next period, the next six months, but they can be used for managing an actual live investment portfolio, as I've said, at other times and other places. If you go in with your cash flow matching to the investment people, and say, "Gee, under the double sore tooth scenario, #6, we're missing a lot of cash in year 1993." You know, the investment people tend to glaze right over it. You cannot manage a portfolio that way. You can manage a portfolio, however, in terms of duration. You can conceivably manage a portfolio in terms of duration and convexity. And, so, it's something we have to consider if we're going to communicate with the investment people and actually implement investment decision.

When immunization originally came up with Redington, we were talking really in terms of something relatively simple. Redington's world is a world of a flat yield curve and parallel changes in interest rates. That's been shown to be theoretically impossible. It does seem to work fairly well, however. Still, you are dealing now with a very simple asset policy or a world of assets. You're dealing really only with default-free assets where everything is very nice and neat. I'm an actuary and I love it. The real world has a yield curve which is sloped.

In recent years, starting about 1980, I think Fong and Vasacheck published a series of articles which described the way that the second derivative of value respect interest rates, sometimes called convexity, can be used to create portfolios that immunize even if the yield curve changes or wiggles, flaps like a wing. Those strategies, in fact, have never been tested or even illustrated to my knowledge. It's something that needs to be done. I'm sort of working on it. If somebody else wants to do it, send me the results. I'm curious as to how it comes out. In theory, however, it's possible to make the model a little more complex and get the answers we wanted from immunization.

However, if you are not dealing with government securities, if there are other kinds of securities, then the idea of immunization where we're going to have assets and liability matching at the end of six months or a year becomes even more complex because of spreads. Even if you are dealing only with BAA bonds, what do you know? The spread between governments, the truly risk-free liquid instrument and BAA bonds or BAA private placements -- this varies. Sometimes it's 90 basis points, sometime it's 120 basis points. Occasionally it can get even higher. What that means is that the immunization strategy, which is a market value strategy, which assumes that you can restructure your assets at the end of a period, now has a sort of a cliche in it. Even if interest rates move exactly the way you want them to or expect them to, the spread on your assets can change so that the relationship between assets of different maturities doesn't necessarily remain the same because you were dealing really only with the yield curve which was government bonds. This means that at the end of a period of say, one year, we're going to immunize over a one-year period at the end of one year, we now have assets whether it's one value determined by the yield curve or a range of values; maybe it's a small range because maybe we're only in this case talking about 30 basis points. If we deal with junk bonds, the situation becomes more complex again. If we are trying to immunize using junk bonds, we are going to find the following situation: some of the junk will default.

I think some numbers in connection with Beta distribution were published in one place or another. Beta distribution goes between zero and one and is a reasonable distribution to use if you believe that the default rates on junk bonds are statistically dependent, one year independent, one year to the next and are some kind of a sarcastic variable. But, if you are going to immunize, then at the end of the year, you are going to have a range of values for the remainder of the portfolio. Some of the bonds will have defaulted. You can't tell how many. So, once again, first we had the spread between government bonds and relatively low risk bonds; now we have a greater spread caused by the possibility of default on a portion of the portfolio, this junk bond portfolio. So, again, we are coming out at the end of the year with a range of values. I have some information, done some work on what that kind of a range looks like and how you can function with it. In addition, besides the fact that there are changes in the value of the portfolio because of explicit defaults, you have, again, a change in spreads. And that can work both ways if we had invested. Oh, Lord, if you had only been bright enough to invest in junk bonds heavily a year ago at this time, you would be so rich because the spreads for a period of a week, in late October of last year, immediately after the stock market crash, it went up to 500, 600, 700 basis points on junk and it's now half that. But those spreads change also. So, in trying to set an immunization strategy, you must consider the fact that the portfolio of assets may depreciate on account of actual defaults and on account of the fact the spreads at which you could sell these in the market can change. If you are dealing with common shares, common stocks in the portfolio, I think everybody gets pretty comfortable with the idea that common stocks have a return of 10%, 11% or 12% or some number like that with a standard deviation of 20% and they follow a live normal curve.

Of course, the parameters change without notice. We saw that last year at this time. But, again, the market value, and immunization is a market value strategy, of a common stock portfolio at the end of the year is a distribution and perhaps a wider distribution than that produced simply by junk bond investments. What I'm saying really is that in a real world there is investment risk in terms of a variation and return on assets and also a risk of loss of capital either through market value depreciation as in common stock or through default as in junk bonds. In either of those cases, the asset value at the end of the year is going to follow a distribution. It's not going to be uni-variance. It's not going to have a single value. It's not going to file this nice neat pattern that Redington has or that Fong and Vasacheck would have.

I think that this is interesting and exciting. I haven't finished work on it. I thought it would be more fun to tell you about something that I was interested in and was working on and might be current than follow the program exactly. I hope it interests you. I think it provides a wonderful opportunity for actuaries because this is an opportunity to work on something that's newly developing, that's necessary because it is necessary, in my judgment, to find a method for handling the concepts of risk in our assets because you can't make any money without taking risks. The question is, can we evaluate the risks? Can we include them in our management process? Can we include them in our thinking and can we decide how much we should be paid for taking the risk and thereby form a methodology for accepting one risk or another risk. I think that it's going to be done in terms of developing an immunization not a single value that we're matching at the end of this immunizing period but rather distribution of values in deciding what distribution we can tolerate, what distribution we can't. And it should be a good field for actuaries to work in. Work with the investment people to develop something new.

I've tried to talk about risky assets. I think that it is crucial that actuaries understand and appreciate the advantages and disadvantages of risky assets. How much you have to be paid to take the risk is important, but the fact that you must take some risk to, as far as I can tell, continue functioning in this business as a life insurance company is always important.

The second thing is I've tried to sketch it out something like the pattern that we'll develop in the future for management of portfolios in an immunization mode; that is, instead of trying to think of a final solution to the problem of matching assets and liabilities, we rather think in terms of a distribution of final results at the end of the year and a determination as to what portion of this range of possible results is acceptable to us and to our managements.

MR. ROBERT STRICKER: Insurance companies can be viewed as financial inter-mediaries -- just like banks and finance companies. They take in money from policyholders, invest it for a time (hopefully at a positive spread over their cost of funds!), and then return it with interest. Clearly, investment performance is a major concern.

Given the options embedded in an insurer's balance sheet, together with current interest rate volatility, asset/liability management is a critical issue. Hedging techniques are the basic tools which, as part of the overall asset/liability man-agement process, can be used to manage interest rate risk. The key is to determine the cost of your funds and determine how to lock in a positive spread over a wide range of interest rate scenarios.

SHORT STRADDLE MODEL
Graph 1 represents the typical insurer's balance sheet. The upper portion is a price/yield curve for the assets and liabilities. Obviously, as interest rates go up, the value of a bond portfolio declines, and as rates decrease, the value of a bond portfolio increases. However, because of call options in most corporate bonds and prepayment options on mortgage securities, their appreciation will tend to flatten out for substantial declines in interest rates. The price/yield curve for liabilities is similarly convex. However, there is no cushioning out in the rise of the liability value as interest rates decline, whereas there tends to be a floor as interest rates increase because of the book value cash-out options embedded in many policies.

The market value of surplus is simply the difference between the market values of assets and liabilities. This difference is plotted in the lower segment of Graph 1. As illustrated, the resulting "short straddle" produces profits in a stable market, but poses risks in a volatile environment.

If interest rates fall, the insurance company's economic net worth declines. This occurs because the market value of its assets does not rise as rapidly as the present value of its liabilities, owing primarily to exposure to callable bonds and mortgage prepayments. And if interest rates rise, economic net worth also declines. The market value of the insurer's assets falls faster than the present value of its liabilities, owing to disintermediation (policy loans, policy cash-outs and surrenders).

The real challenge is how to flatten out the surplus curve at a profitable level. To help accomplish this will require the utilization of innovative securities to better match your interest-sensitive liabilities. Some of these new investment vehicles which you will want to consider include the following products to help

GRAPH 1

Short Straddle Model

Market Value

Assets

Liabilities

Interest Rates

Surplus
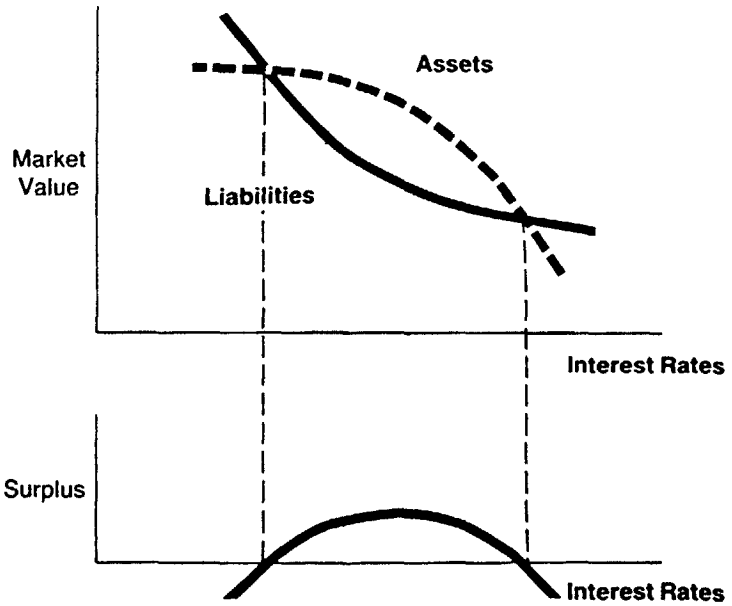
Interest Rates

manage your risk/reward profile: futures; swaps; options; interest rate caps; collateralized mortgage obligations (CMOs); interest only (IO) and principal only (PO) pieces; adjustable rate mortgages (ARMs); and superfloaters (leveraged ARMs). I will review several of these instruments, and I suggest that you consider any of the others as well that you are not already familiar with. In addition, recognizing the embedded options on both sides of an insurer's balance sheet, a more active portfolio management approach will be required to maintain a reasonable match between assets and liabilities as time passes and interest rates move. You will need to monitor market values of assets and liabilities as well as book values, and you will need to use sophisticated asset/liability modeling tools.

MANAGING DURATION RISK

For products with relatively few policyholder options, such as GICs and struc-tured settlements, the basic challenge is to maintain an asset portfolio duration in line with that of the liabilities. A secondary objective is to have the con-vexity of the assets greater than the convexity of the liabilities. At the same time, naturally, a positive spread must be built in. This is the classical immuni-zation problem.
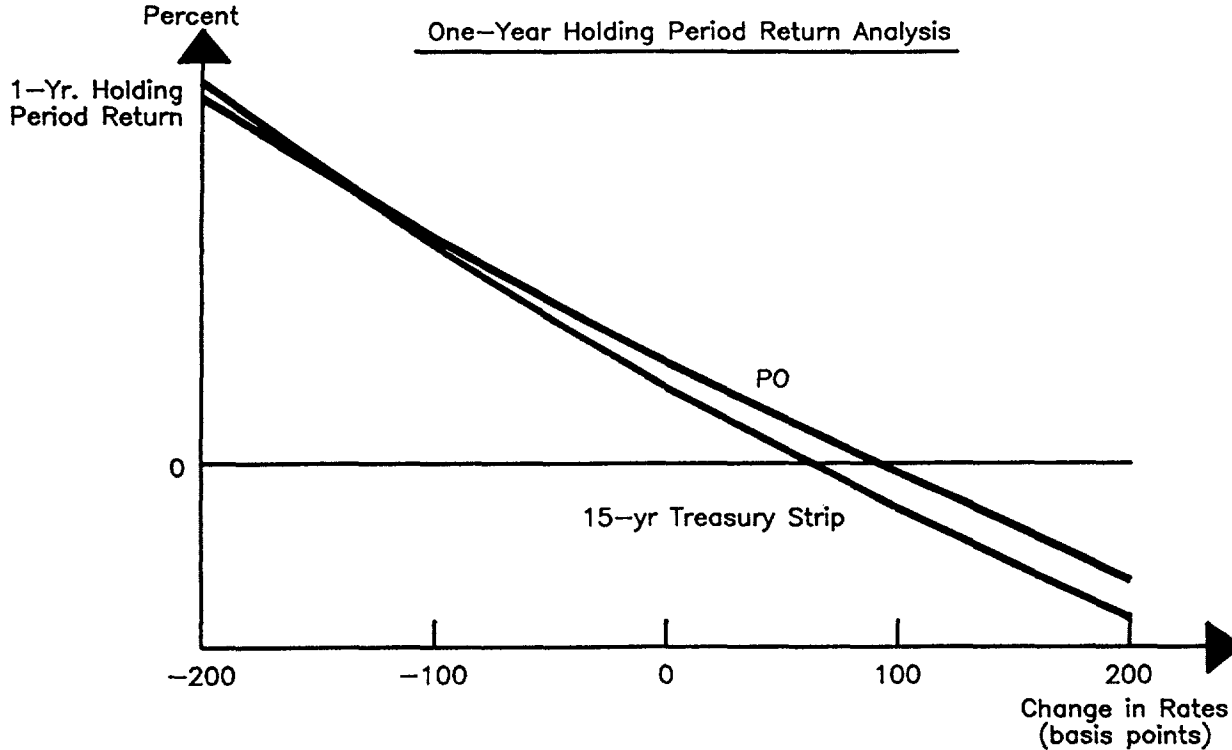
Insurers typically try to match their liabilities by purchasing traditional fixed income securities in the cash markets with the appropriate duration. This is not always easy, however.

Where do you find high yielding instruments to match the long duration of the tail on a structured settlement or payout annuity portfolio? Long Treasury zeros are one alternative, but they do not provide the desired yield. Another alterna-tive you may want to consider is PO pieces. These are securities created by stripping mortgage security pools such as Federal National Mortgage Associations (FNMAs) into IO pieces and PO pieces. Because PO pieces are deep discount securities, often with prices of 50 or below, they have extremely long durations (as high as 18) and are very convex. Their risk/reward profile is very attrac-tive for hedging long liabilities, as can be seen from Graph 2. Furthermore, our mortgage valuation model indicates that they offer attractive spreads, as much as 250 basis points on a static basis and 300 basis points on an option-adjusted basis. Note that unlike typical callable corporate bonds or standard mortgage securities, the option-adjusted spread on a PO is actually higher than its static spread.

Another problem often encountered when trying to run a duration-matched portfolio arises when trying to match a new liability, but attractive investments are not available in the cash markets. One alternative is to temporarily park the funds in a duration-matched Treasury until suitable permanent investments become available. While this will effectively hedge your interest rate risk, it can cause accounting problems if rates have risen by the time the hedge is unwound and a capital loss must be recognized. If futures are used to hedge in this situation rather than the cash market, the need to recognize a loss is eliminated through the use of hedge accounting. An interest rate future is a contract to buy or sell a debt instrument at a future date at a given price, thereby locking in interest rates in the future. An appropriate duration-weighted hedge can be constructed with futures, and the gain or loss realized when the hedge is un-wound and amortized over the life of the permanent investment. Furthermore, at times futures are considered cheap to cash, thereby making it actually more attractive to hedge in the futures market than in the cash market. While deter-mining when futures are relatively rich or cheap requires sophisticated analysis,

PO Analysis

NAME	WAC	DURATION	STATIC SPREAD	OPTION-ADJUSTED SPREAD
T4PO	10.09%	15.3	256 BASIS POINTS	306 BASIS POINTS

Percent

One—Year Holding Period Return Analysis

1—Yr. Holding
Period Return

PO

0

15—yr Treasury Strip

−200   −100   0   100   200

Change in Rates
(basis points)

GRAPH 2

INVESTMENT STRATEGIES

most major brokerage firms run this analysis on a daily basis and will help determine appropriate hedge ratios for their clients.

A word of caution is in order when using futures (or Treasuries) to hedge. You will be subject to basis risk, the biggest component of which is that spreads may decline materially when you are ready to take off the hedge and purchase your permanent investment. One way to reduce this basis risk is to use interest rate swaps to hedge rather than Treasuries or futures. Interest rate swaps are contracts between two parties to exchange a series of cash flows, with one party making fixed rate payments and the other making floating rate payments. The payment is based on a notional amount. Hedge ratios using swaps can be calculated, and because current spreads are locked in, you are protected against a decline in spreads in the future.

MANAGING POLICYHOLDER LAPSE OPTIONS WITH INTEREST RATE CAPS
What about hedging interest-sensitive liabilities, such as SPDA and UL, where policyholders have been granted valuable put options? These are options whereby the policyholder can get his cash value out based on book value as opposed to market value. These options shorten the effective duration of the liabilities from what they would otherwise be. To calculate their effective duration requires sophisticated simulation models. Unfortunately, competitive yield pressures often make it difficult to invest short enough to effectively duration match the liabilities. For these portfolios, insurers should consider hedging strategies to protect against the adverse impact of an upward spike in interest rates.

The risk in this situation is illustrated in Graph 3 for a hypothetical SPDA product. It shows accumulated surplus over 5, 10, 15, and 20 years, based on 40 random interest rate scenarios and also using the seven scenarios suggested by New York Regulation 126 for comparison. The 40 random scenarios were generated by a two-factor equilibrium model of the term structure of interest originally proposed by Michael Brennan and Eduardo Schwartz in "A Continuous Approach to the Pricing of Bonds," *Journal of Banking and Finance*, 1979, pp. 133-55. They are considered more consistent with economic principles than the rather arbitrary New York Seven Scenarios. However, a more precise simulation would include several thousands of scenarios. The scenarios and SPDA analyses were provided by Tillinghast, and are used with its kind permission. Goldman Sachs performed the cap analysis using identical scenarios. While the upside is comparable using both sets of assumptions, the 40-scenario simulation clearly illustrates the downside risk that stems from granting options in a volatile interest rate environment. Important to note is the ability of interest rate caps (described below) to hedge this downside risk. The cap payoff can be managed so as to offset all or part of the negative surplus impact of high interest rate scenarios.

As Graph 3 indicates, interest rate caps appear to offer one solution to help hedge products with policyholder options against a large increase in interest rates. Consequently, we anticipate that purchases of these instruments by insurers will increase.

An interest rate cap is a type of interest rate insurance contract. The buyer of the insurance pays a premium for protection against rising interest rates. The cap provides this protection in two different ways.

GRAPH 3

Comparison of Accumulated Surplus and Cap Payoff
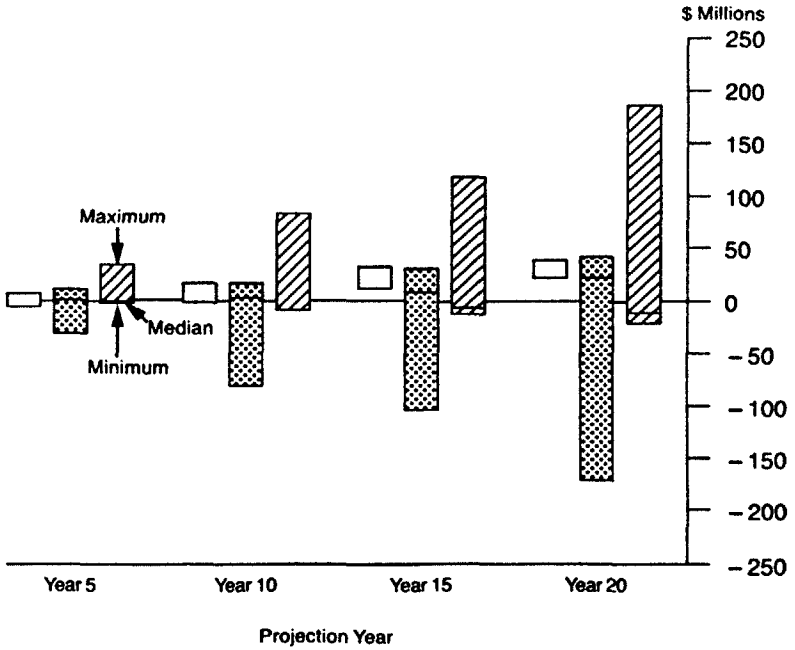
First, the buyer of an interest rate cap will receive payments from the seller, to the extent that the underlying interest rate index rises above a prespecified trigger level. The difference between this trigger level and the initial market level of rates can be thought of as the deductible. The greater the difference, the larger the deductible. This implies less protection and hence lower cost. For example, if interest rates are currently 8% and a 10% cap is purchased, rates would need to rise two percentage points before any payments would be received from the cap. If a 12% cap were purchased, rates would have to increase by four percentage points before any payments were received. Naturally, the 10% cap costs more than the 12% cap because the buyer is receiving more protection. As with any insurance contract, the trade-off between premium, amount of protection, and deductible is a function of your risk profile. The more risk averse you are, the greater the protection that you should purchase, and the lower the deductible should be.

Payment protection is available with a specified frequency, such as quarterly, that corresponds to the buyer's particular liabilities. Cap payments, for example, can be used to credit higher dividends to policyholders when rates rise, thereby making existing policies more attractive and reducing lapses and withdrawals.

The second form of protection -- market value protection -- arises from the fact that caps are marketable instruments. An interest rate cap will increase in value with the level of interest rates. This is particularly useful in situations where liabilities can be "put" back to the insurer in high interest rate environments. The gain from the sale of the cap can offset a portion of the loss on currently held assets, which may need to be liquidated to fund the unplanned payout on the liability. The gain will also help reduce the need to use new cash flows to retire old liabilities.

Both of these features, payment protection and market value protection, are very important to life insurance companies.

Graph 4 shows average monthly levels for three-month London Interbank Offered Rate (LIBOR) from January 1978 through December 1987. The two horizontal lines represent 8% and 10% strike levels for hypothetical 10-year caps purchased in January 1978. Graph 5 shows the hypothetical payouts for $100 million notional amount of such caps. As you can see, substantial payouts at the assumed cap levels would have occurred during 1979-1982. Although the 8% cap pays out more frequently and in greater amounts than the 10% cap (as would be expected), the 8% cap's upfront premium would have been larger because of the lower deductible.

We have developed the following four-step hedging procedure for using interest rate caps to hedge policyholder lapse risk.
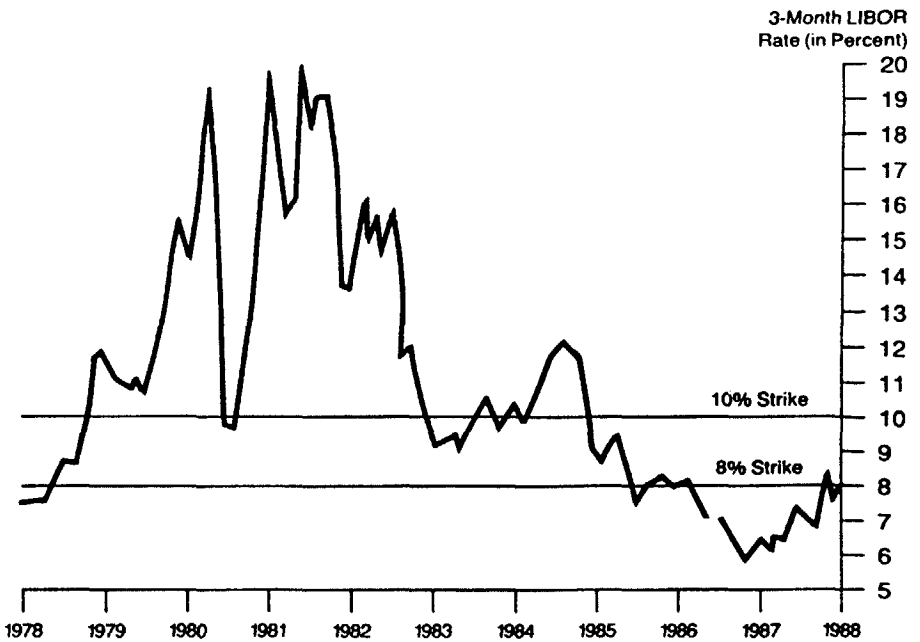
Step 1: Estimate loss exposure for various scenarios (future levels of interest rates).

Step 2: Estimate future interest rate cap values and accumulated payouts for various combinations of strike levels and terms (for the above scenarios).

Step 3: Establish loss exposure constraints (i.e., how much surplus risk you are willing to retain).

GRAPH 4

3-Month LIBOR from 1978 through 1987

8% AND 10% INTEREST RATE CAP LEVELS

3-Month LIBOR
Rate (in Percent)

10% Strike

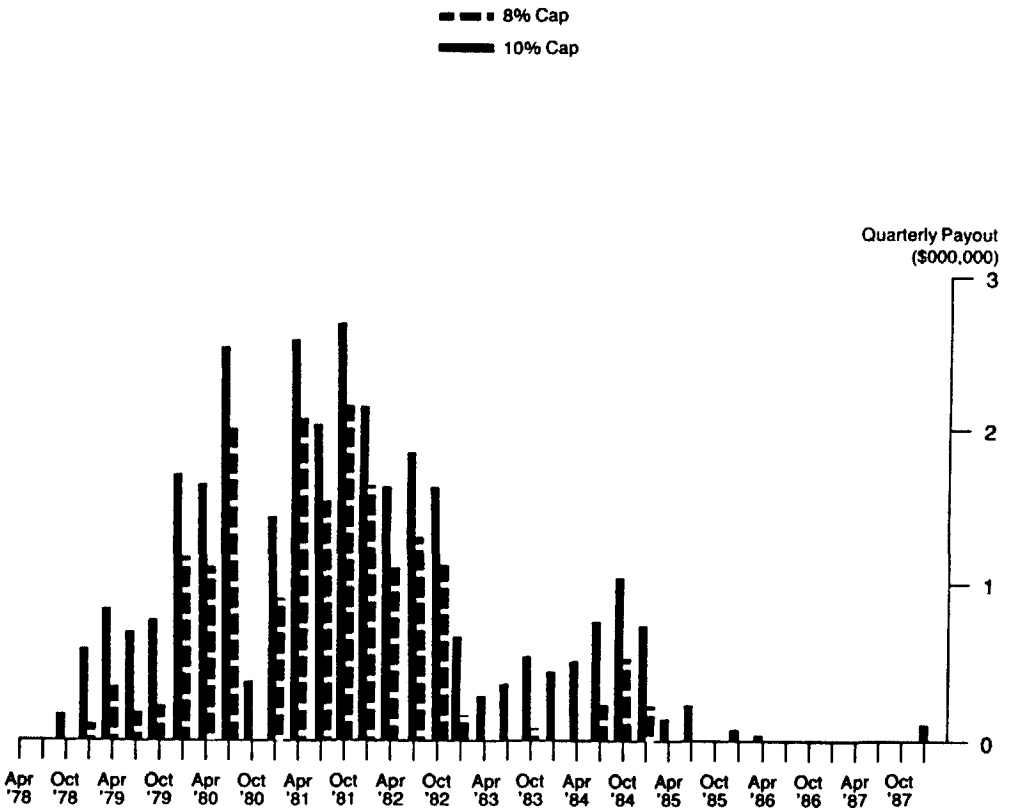8% Strike

1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988

GRAPH 5

Hypothetical Cap Payouts from 1978 to 1988

8% AND 10% INTEREST RATE CAPS (ON 3-MONTH LIBOR) $100,000,000 NOTIONAL AMOUNT

■ ■ ■ 8% Cap
━━━━ 10% Cap

Step 4:   Using an optimization model, select cap position that best fits hedging
           needs: minimum cost or optimal loss exposure across all scenarios.

The results of a typical cap analysis are illustrated in Graph 6. The solid bars
show the surplus exposure of an existing $1.5 billion SPDA portfolio for dif-
ferent interest rate scenarios, up to a 500 basis point spike in rates, over a
three-year horizon. By hedging with a $570 million five-year cap portfolio, the
maximum exposure is reduced from over $40 million to approximately $6 million.
The cost of this hedge is $12.6 million, which would be amortized over five years
at $2.5 million per year. This works out to approximately 17 basis points.

While 17 basis points is a significant cost compared to your expected profit
margin, this cost was actually incurred when you wrote the annuities with the
embedded options. The question is whether you wish to hedge this risk.
Clearly, no one would object to buying caps if they were certain rates were
going up. The real concern, then, is what happens if rates decline and the
caps expire worthless. I would argue that the insurer is actually better off in
this situation because of the embedded option he holds with his crediting strat-
egy. Assuming SPDAs are funded with intermediate bonds, in a declining mar-
ket rate credited rates will decline more rapidly than portfolio yields. This
means that actual profit margins for an unhedged portfolio will actually increase
as shown in Graph 7. The insurer hedged with caps will also experience an
increase in profit margin under falling rates, although less than had he not
hedged due to the amortized cost of the caps. However, this is still the best
case scenario, as illustrated by the line labeled "Hedged with Caps" in Graph 7.
Of course, only the hedged portfolio is protected if rates rise.

SUMMARY
Developing appropriate hedging strategies for asset/liability management will be
critical to the long-run profitability of an insurance company. Investment
managers will need to make greater use of the innovative securities constantly
being developed by Wall Street to better match assets to liabilities. A market
valuation approach must be adopted, and more ongoing portfolio management
(i.e., periodic rebalancing) will be required.

MR. PAUL A. CAMPBELL: I'm also affiliated with the University of Hartford
where we had developed and are putting in place an undergraduate actuarial
science program and that is a program that has both the mathematics side and
the business side in the curriculum. In line with what I'm hearing lately and
Gary Corbett's remarks about the future of the actuary, I would like to ask any
of the panelists or the moderator if they feel there should be an attempt on the
parts of universities to put more of an aspect of this side of investment and
actuarial relationships in the formal education process for actuaries?

MR. STEWART: I would say definitely, yes. There is a need to carry the
elements of the new actuarial symposium through into regular academic practice.
I caution you, though, to make a very careful combination of academic theory
and broadly based practical aspects because, unfortunately, some of the work
that is done in academic circles while interesting and elegant, like what I used
to do many years ago, is not terribly useful in the real world but, it does teach
you to think in a very logical manner.

FROM THE FLOOR: It's interesting that you asked that question. One of my
colleagues, Dave Babble, who is also on the faculty of the Wharton School,
actually did a survey of, I think, the 100 largest insurance companies, their

GRAPH 6

Cumulative Loss Exposure – Rising Rates
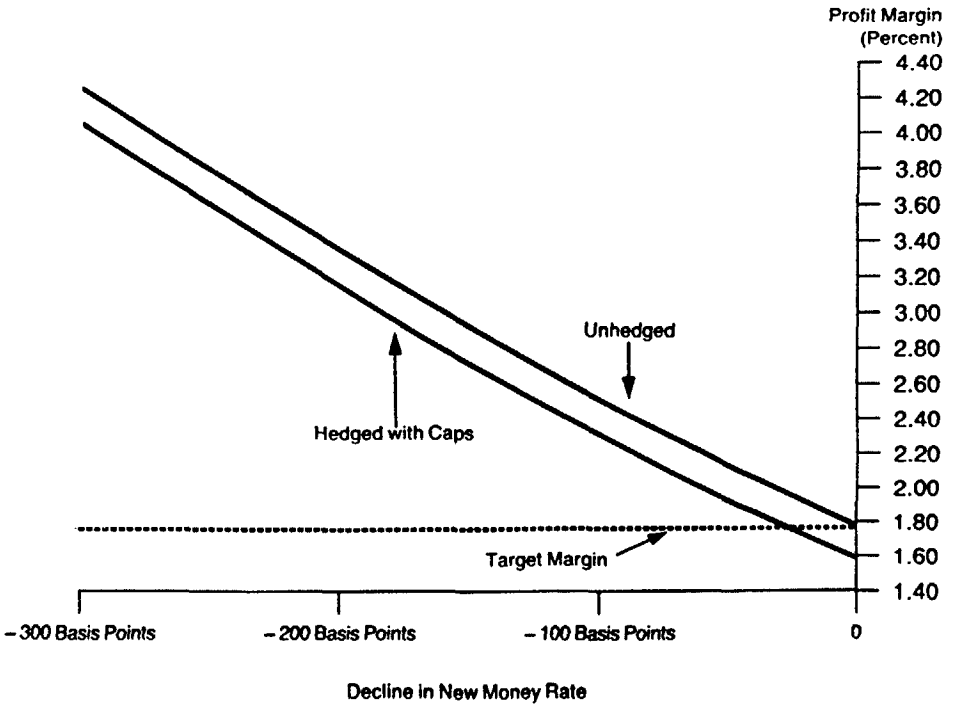
$170 FACE 5 YEAR 11% AND $400 FACE 5 YEAR 13% CAPS

Change in Levels of Interest Rates (Over Time)
Cost = $12.6MM

∎∎∎∎∎∎ Hedged

▬▬▬ Unhedged
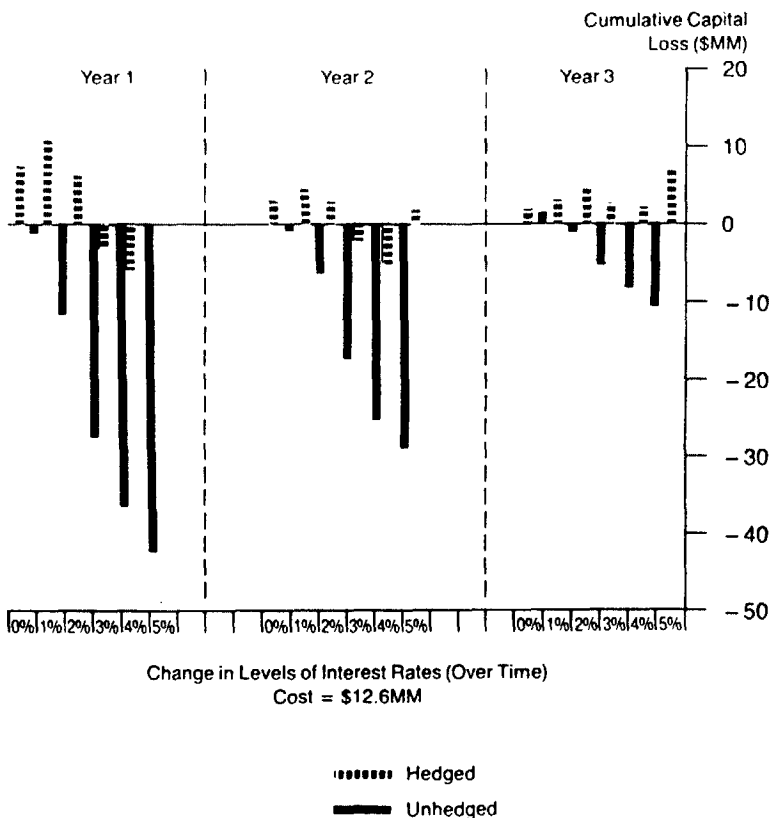
GRAPH 7

Increase in Profit Margin Due to Crediting Strategy

FALLING INTEREST RATES

Profit Margin
(Percent)

— 4.40
— 4.20
— 4.00
— 3.80
— 3.60
— 3.40
— 3.20
— 3.00
— 2.80
— 2.60
— 2.40
— 2.20
— 2.00
— 1.80
— 1.60
— 1.40

Unhedged

Hedged with Caps

Target Margin

−300 Basis Points   −200 Basis Points   −100 Basis Points   0

Decline in New Money Rate

CFO type person or CEO, asking what kinds of curriculum they'd like people that they're about to hire should have and he listed, I can't remember all of the topics that he had but what came away as number one by far was this kind of an application of modern finance theory to this whole question of asset liability management or modeling and that kind of thing. So, I do believe that that would be useful.

I just want to make one short comment: Actuarial theory and the pricing of products do not currently teach us to place any value whatsoever on the embedded options, cash for surrender value options. There's been a series of papers published in England on this subject. That's a clear area. We may be mispricing our products by not including a cost and I've seen some estimates of what the cost can be on some of our products.

MR. HARRY PLOSS: I was looking at Bob Stricker's graphs on caps and I didn't know if the distribution was just reshaped or if the expectations just clearly seem better under those 40 scenarios. I was wondering if there was a bias in the term, short-term interest, and in those 40 scenarios or some comments on these caps.

MR. STRICKER: There is a little line that's called the median return and that median return is slightly below zero. It's basically the premium that you pay. The expected return is positive. Are you talking about the bar graphs?

MR. PLOSS: I was talking about the bar graphs.

MR. STRICKER: Oh, I'm sorry, I didn't make that clear. You have to net the payoff from the caps against the downside from the product. We developed a strategy where the payoff exactly met the cost. If you did that, you would end up on an expected basis at zero which is why I don't think you would do it. I shouldn't say, "expected." You ended up with no risk. Your expected return would be just slightly positive under the assumptions that were there.

MR. PLOSS: I have a second question. In my readings on the efficient market hypothesis, one concludes, that it's very difficult to beat the capital markets and the average trader probably just encourages trading costs on the performance of the indices. Other studies that I've seen in the futures markets indicate that the hedgers are not losers and the large speculators are not gainers and the small speculators who allegedly lose 85% at a time, it's primarily due to the commissions rather than bad judgment. I was wondering what you might say about a hedging strategy versus some kind of a diversified risk strategy where one isn't hedging, one is trying to pick up, I don't know if one can go for the 300 or 500 extra basis points that Irwin talked about but something on that order of some kind of diversification model?

MR. STEWART: In the initial part of my speech I referred to the efficient market hypothesis in the semistrong form which indicates that the way that you make a buck in the market is to interpret publicly available information in unique and innovative ways. Yes, it's very difficult to beat the market if you go about it in a mechanistic way where you add value, literally in the same way that we all add value by using our education, training and experience to interpret the information available. On another note, I believe generally in the faith of the academic institutions and some people on the street; the efficient market hypothesis has been weakening substantially over the last several years and there's now a growing albeit grudging acceptance of the markets in many ways as being

less efficient than we once might have believed them to be. To speak further to your question, I believe strongly in risk diversification, geographic by asset class, by term structure, by spreading your cash flow mismatches over as many time periods as possible, by not trying to hedge out every imaginable risk because the job of the actuary investment officer or any other business manager is not to avoid risk but to manage it. So, my approach almost always is to be in a risky position but to have my bets, if you will, spread over a large number of entities in a large number of time periods and to hedge out only the ones that by design or by accident are much larger in chain circumstances than I wish to have to deal with if I'm wrong in my outlook. I hope that answers your question, in part.

MR. VANDERHOOF: That's a good question. Let me just add one thing, if I could. I don't want to talk about active management but, I think, in the studies that you referred to, we've all seen them but the kinds of things that we're talking about are just another part of that continuum of investment management and clearly the kinds of diversification that you refer to would be your first line of defense or offense depending on how you want to look at it. The kinds of things that I'm calling hedging aren't the same kind of thing that the little guy, that we read about in the futures or option market, who typically loses all his money is going to do. This is something you layer in to hedge that risk which you can't diversify away from. And that's basically what I'm talking about, interest rate risk. If rates spike whether you own mortgages in Connecticut or Massachusetts or California, whether you own junk bonds or government bonds, they're going to tend to react the same way. Most of your policyholders, unfortunately, are going to tend to react the same way if their agents or somebody is pestering them to do away with the old policy and get one of the newer and better policies. So, all we're talking about is, I don't want to call it passive, it's just part of your overall portfolio strategy that says just in case I'm not fast enough on my feet and something happens that I didn't anticipate, let me clip off the tail so I'm not betting the company.

In the efficient market, markets become more efficient. Three or four years ago, swaps were just great. You could do things with swaps and magically hundreds of basis points would appear. You can't do it anymore. Rob talked about POs as being very attractive. As far as I can tell, they are very attractive right now. I don't expect them to be very attractive next year. The juice gets squeezed out of that market very quickly. So, they become efficient. As to whether you can make money on these things depends upon your individual situation. You have two ways of handling something: you can say, gee whiz, there is risk here. One way I can handle it is to have a lot more capital and my capital will take care of that risk. The other way is to say no, it's too expensive to raise or have a lot of capital simply devoted to this risk. I can do it cheaper by clipping off the tails, as Rob said, or I can do it cheaper by diversifying the way Ken has described it. Yes, you can make money for yourself depending on your situation. It doesn't violate anything by capital market theory.