

**1997 VALUATION ACTUARY
SYMPOSIUM PROCEEDINGS**

SESSION 4

Investment Strategies in an Asset/Liability Management (ALM) Context

Frederick W. Jackson, Moderator

Douglas A. George

Michael J. Hambro

Ray E. Helfer

INVESTMENT STRATEGIES IN AN ASSET/LIABILITY MANAGEMENT (ALM) CONTEXT

MR. FREDERICK W. JACKSON: This session is a natural extension of the asset adequacy work that most of us are all painfully familiar with. The same modeling processes are central here. A lot of you are already doing asset/liability management work, as opposed to asset adequacy work. I guess the difference on the asset adequacy work is the audience. To the regulators the issue is solvency with asset adequacy.

Here, we're going to be talking asset/liability management, where our audience is mainly senior management and, lately, rating agencies. Especially, A.M. Best is making a big issue of ALM work these days. The issues there are risk management and profitability optimization.

I'm Rick Jackson and I work for an investment firm, Scudder, Stevens and Clark, in Boston. I work largely on ALM for life and annuity companies. I'm on an ALM Principles Task Force with the Society. We have an exposure draft coming out soon. One thing that's emphasized in the SOA ALM exposure draft is that there's no one right way to do ALM work. I hope the exposure draft will address some of the principles, and then later on some of the practices will get more explicitly defined. It's a developing area of practice.

I'll introduce the people who are going to be speaking to you. Ray Helfer is a managing director and portfolio manager at my firm, Scudder. He's a CFA (Chartered Financial Analyst) not an FSA (Fellow of the Society of Actuaries). He spent about eight years or so with Northwestern Mutual and two or three years at ICH in Kentucky before coming to Scudder five or six years ago. He now acts as the chief investment officer in about six different investment management relationships. He's no stranger to insurance liabilities. He'll give you an investment perspective to start off the session. It will be a decidedly nonactuarial focus.

1997 VALUATION ACTUARY SYMPOSIUM

Then Mike Hambro from National Life of Vermont will speak. He's vice president there in charge of ALM work, surplus management, and a few other areas. Mike is going to discuss derivative instruments from the perspective of the ALM practitioner. He'll be focusing on risk control and risk management uses of these instruments, and not really any speculative applications.

Doug George is a partner at Avon Consulting. He's a frequent speaker at these conferences. He'll discuss the tools and practices that he uses in his ALM consulting work, and then he'll turn it back to me briefly at the end for a quick look at a case study.

MR. RAY E. HELFER: I guess I'm here representing the asset management side of the balance sheet as opposed to being an FSA. As Rick pointed out I am a CFA, which is sort of the junior, junior derivative of the FSA approach.

When I came in, I noticed that the fertilizer conference is going on. It was suggested from one of your colleagues that as a portfolio manager speaking to your group, I might want to address their group instead, given some of the comments that you will hear coming from different asset managers at your own firm.

Let me just state that I'm going to give you somewhat of a portfolio manager's perspective. Again as Risk mentioned I'm not an actuary and don't play one on TV. My thoughts are really based off of generally working with a lot of insurance companies, both life insurance, reinsurance companies, and some companies on the property/casualty side. I try to work with their actuarial groups and their senior management to try to come up with solutions and different ways to approach problems.

The approach I'm going to take is really just to talk about what I consider to be my perceptions looking at investment strategy from the portfolio manager's standpoint. Then you can all take that going forward. We have the marketing group, the actuarial group, and the investment group.

INVESTMENT STRATEGIES IN AN ALM CONTEXT

As I see the situation, these groups are really working closer together now than they ever have in the past, and I'm sure they'll work closer together going forward. But as I see it, the marketing group generally sort of represents an offense approach to the market. They want to pay high credited rates and new money resets on existing business. They would like as many contract options as either they or their competitors can dream up. They want to offer very high up-front commissions, for obvious reasons. They want to offer multiple products, which make the actuarial business quite difficult. And if they want multiple products, they want them all, now. And if a competitor comes out with a product, they want to sell something similar, ten basis points higher.

Now the investment group throwing stones really represents almost a mirror opposite of that. And speaking as one of the investment people, in essence, we want to pay the lowest credit rate possible. We want portfolio reset rates so that we can buy long bonds and park them away and forget about them, because we're going to reset at some sort of portfolio rate anyway.

We want as few contract options as possible. We want the lowest minimum rate guarantees. We want the lowest barest contractual features, too. In essence, make it easier for us to get any kind of earned spread or growth spread that's required in a product structure.

We want low commissions as opposed to high commissions because we have to earn it back over the first several years. And we want very limited product offerings. We want to segment our portfolio as little as possible. And we want to have things that are the least confusing possible.

In essence, the actuarial group most of you represent really acts as the referee. Your job is to pull these two rather diverse groups together, and try to come up with particular products and manage the profitability of the company.

For example, taking the marketing approach, what you find is you have lots of new business production, and you make no money. If you take the investment group's approach, you have some

1997 VALUATION ACTUARY SYMPOSIUM

very solid, theoretically designed products, although you sell none of them, so you don't have any business to actually generate those high gross spreads and high earned margins off of.

In essence your role is to try to pull these two groups together. And the closer these groups can work together the better off everyone is. The way I see it, a successful product management team approach is really what's required. Because more and more of the liabilities are becoming very interest-sensitive, you need all these groups working together. I really view it as your role in your firms to try to get senior management support and pull these groups together to work together. The major point that I wanted to make is that the compensation methods should be tied to product profitability. As an asset manager, we will go to as many meetings as anyone in senior management makes you go to, to talk about product design, portfolio management, investment strategy, the reinvestment risk, and things of that sort. But when push comes to shove, we will manage the portfolio to try to beat whatever our compensation is tied to, i.e., third party benchmarks, book yield. I mean it can be done in a number of different ways. But when we leave the general thinking session, if you will, we go back and say, what is it that senior management has laid out for us, so that we can get a bonus at the end of the year?

So the big question is, how do you tie the compensation structure of the investment managers into your product design? Otherwise, you'll find that we're trying to beat something that doesn't have a particular correlation to what it is you're trying to do.

The product mix flexibility is based on a balance of marketing and investment environments. Again, these groups have to pull together. Because the marketing department or the investment department carries a significant amount of weight relative to the other, you'll find that you either have to have very competitive products that don't make money, or you'll find that you have very noncompetitive products that look very profitable, but you can't sell any of them. So that's really the role of the group. Here you can try to pull those factions together.

INVESTMENT STRATEGIES IN AN ALM CONTEXT

The following list could be titled, “Yield Enhancement Tools for Asset Managers” or an alternate title could be, “Product Risk to Be Blamed on the Asset Managers.” This view comes from having been through numerous sessions where senior management actuarial groups try to sum up the investment process. To put this in perspective, in the first CFA exam, there’s a book called the *Handbook of Fixed Income Securities*. It’s about 1,300 pages long. I took the luxury of simplifying that down to six bullet points:

- Duration
- Credit
- Embedded options
- Liquidity risk and private placement issues
- Foreign currencies
- Equities

You’ll find that the investment people are somewhat simpletons in terms of our approach to things. I would challenge you, as I’ve challenged some of my investment colleagues at Scudder, to try to find a chapter in that 1,300-page book that I could not easily fit into one of these six bullet points. I’ve yet to find one, so if anyone wants to let me know I’ll do that.

First off, the question is, what do we do to actually try to generate excess yield for individual portfolios? It’s quite simple what we do. The first thing you all notice is we take the duration route. You sell a liability with a market value adjusted duration of, let’s say for example, three years, some sort of annuity with a reset function to it. And we go out and buy a portfolio that’s five or more years in duration, but we hope not a whole lot more than five. Because the yield curve is positively sloped, we pick up a certain amount of income for taking this duration risk. The second thing we do is take credit risk. Most of you represent companies that are triple A or double A rated in terms of claims paying ability. There are a lot of people at triple A surplus levels.

1997 VALUATION ACTUARY SYMPOSIUM

We take the money that comes in on the marketing side and we go out and buy single A or triple B, if not lower rated securities, and we take credit risks. So in essence we're leveraging the balance sheets from the credit risk perspective. With duration risk and credit risk now we're sort of moving up the yield curve, if you will, in terms of book yield on the individual product. Then we go out and we say, hey, what are better options?

We say that we can pick up more yield by buying mortgage backed securities because they have prepayment optionality to them. And so we go out and buy some of those. And then we turn around and say, well, if a ten-year security is trading at X type of a yield, we can pick up another twenty or thirty basis points so we buy securities. And we have a call feature to it.

Your writing options are better than that. We then get securities with put features and things of that sort. So a lot of this is embedded in the portfolio. We try to take these various things and layer them together and come up with kind of a book value deal that people are looking for, at the same time trying to generate the total returns that we're being measured against.

We have liquidity risks and product placement issues. We add another layer of risk. Should we have a problem in the portfolio, you may need to generate cash flows in a certain percentage of the portfolio that either is not saleable or saleable due to the complexity or unique nature of some of the securities.

All of this we get paid for so to speak in terms of yield. Whether we're getting an attractive rate or not is open to debate at different times in the market. But these are the things that we do when we go back to our huddle, if you will, in terms of managing the portfolios. The last two points are for foreign risk. The four currency risks are included. If you think back a couple of years there was a big debacle in Mexico.

There's a huge currency problem in southeast Asia. There are a lot of large life insurance companies more so than property and casualty companies that have significant exposure in their portfolios to

INVESTMENT STRATEGIES IN AN ALM CONTEXT

these areas. The major reason for this is, as long as they went the foreign exchange route, they picked up more income. And so we layer that in a little bit. You see a lot of portfolios with some foreign exchange exposure in it.

The last point is equities. We work with senior management to have a percentage of the portfolio put in equity securities. In most cases this would be a percentage of surplus. But it does introduce a modeling variable, if you will, to the actuarial side. It is very challenging to try to actually model equities into any sort of ALM framework because if anyone knew where the equity market was going to be a couple years from now, they wouldn't be sitting here, or better yet they wouldn't be standing up in front of you.

The last thing I want to mention because I think it is important is active management. What we do as asset managers is we say, you're modeling the various portfolios against the liabilities. You're putting in the default rates. For example, we have clients who ask us, "Gee, what types of default structure should we put into our model or our task model in terms of credit risk?" My answer always is zero because we're going to sell it before it goes bankrupt. That's the course the asset manager takes.

I'm being a little facetious about it, but really there's a certain feeling on the asset management side just to be honest about it, that we believe that we can layer in these various levels of risk. However, we mix this list up here and true active management will try to get you out of the way, if you will, when any individual aspect of this risk is going to go south and cause major portfolio problems.

What that does is introduce a level of modeling complexity to your work. In essence, you can't take me at my word on that. You have to model out these risks and lay them out and try to put some parameters around them. After thousands of interviews in commissioning those super computer experts at MIT in studying this, I can assure you that the portfolio managers are right exactly half of the time, in terms of our active management decisions.

1997 VALUATION ACTUARY SYMPOSIUM

And it's 50.00 to be exact. So that when you go to modeling ALM work, you have to overlay on top of all of these risks, sort of, what I would refer to as active management noise. That's very difficult to do given the quantitative models available now -- to try to layer in sort of the human nature approach to what the portfolio managers will do if and when there are problems in the portfolio.

I have a couple of overly broad generalizations from an asset management perspective. This is really just getting at some of the things I have seen over the last eight or ten years concerning some of the more interest-sensitive products and what some of the challenges are. First off, the historically flat yield curve has significantly reduced yield enhancement of duration mismatch. That's very important, because my perception is a lot of product structures actually take into account what I'll refer to as the yield pick up for duration mismatch, which I mentioned earlier.

If we consider the Treasury yield curve as of July 1997 and the Treasury yield curve as of year-end 1993, when you look at 30-year Treasuries in both periods, they're basically on top of each other. It's coincidence, in terms of how it works out. But what you do see are some rather dramatic differences. Quite frankly, if we run all the way from the two-year Treasury up to the 30-year Treasury, the spread at year-end 1993 was 211 basis points.

Looking at it in July that same spread was 58 basis points. What this says is that my job used to be a whole lot easier, in that you would sell a three-year duration liability. I'd buy a five-year duration asset and pick up 30 or 40 basis points without even trying. And to tell the truth, two years worth of duration mismatch isn't that big of a deal.

Now if I take two years of duration mismatch I'm only going to pick up a handful of basis points. So that requires the portfolio structure and the ALM process behind it to be much more rigorous because the easy money has already been made, if you will, in terms of duration. And I would argue that in interest-sensitive life products, specifically, the more positively sloped the yield curve the

more profitable a business can be, especially when you're looking at new product versus a flat yield curve.

A flat yield curve is a significant challenge to profitability. My observation has been that a lot of companies have not quite grasped this particular issue that the yield curve is flat now, but, hey, maybe it will be positive a couple of years from now. You are selling a product now, so it is important to take that into account when you're looking at what types of spreads are available and things of that sort.

We're now getting at the credit risk issue. I just talked about duration risk and how the challenges are significantly greater, and the importance of you being apologetic to the asset managers. So when you go back to your office, you know to extend that apology.

Chart 1 is a five-year single A financials versus five-year U.S. Treasury rates. And what you can see here is the straight horizontal line is just the yield spread. The other line is supposed to be the yield ratio. The yield spread here if we go back in time is this yield spread in 1990, but it runs off to the current time period.

At first, I said that taking duration risk does not pick up nearly the amount of basis points that it used to. Quite frankly, we don't think it will for some time to come. Now looking at spreads we just picked the five year as an example (Chart 2). Obviously, this is sort of the golden years, if you will, 1990 through 1993. You could buy securities at very significant spreads: 100 to 150 basis points, single A rated. That goes in your book yield, which helps your profitability. It allows you to have fewer embedded options and other things in your portfolio.

You now have spreads in the five-year area just inside 50 basis points on single A finance issues. If I were to pick some other types of securities, there would be a very similar chart. So from a credit risk standpoint, you find that the amount of basis points picked up on money being put to work with

1997 VALUATION ACTUARY SYMPOSIUM

new production is dramatically lower than it was in years past. We anticipate this to continue. Again, this is a significant challenge to the ALM practitioner in going forward.

CHART 1
SPDA Asset Yield/Duration Objectives

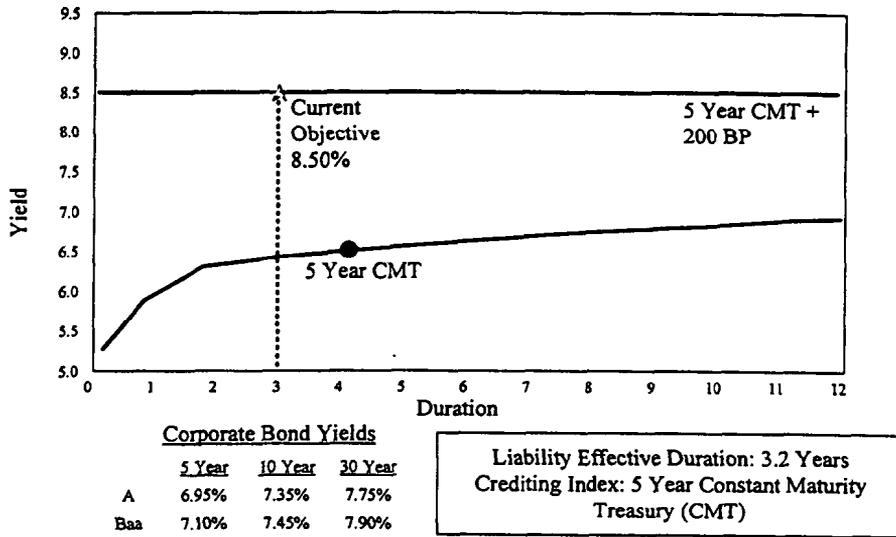
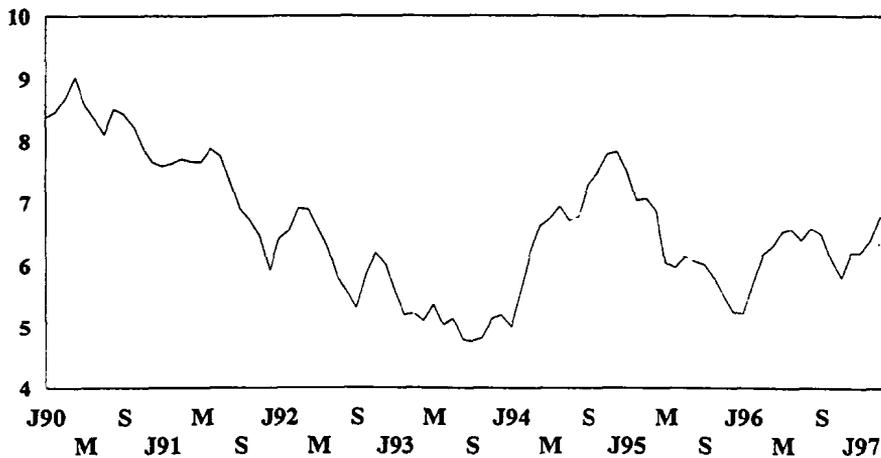


CHART 2
Five-Year U.S. Treasury Yield



INVESTMENT STRATEGIES IN AN ALM CONTEXT

I feel quite strongly that high portfolio book yields relative to new money rates are being used to support new business. Alright, that's a perfectly fine business strategy, although I find it's used more often and its knowledge is being used in that interest rates have gone down significantly over the last ten years. When I started in this business, 30-year Treasuries were 14% and Continental Illinois had just gone under. I think rates went to about 14.25% or 14.50%. They've done nothing but come down with a bit of volatility shaking in there a little bit.

A steep yield curve and falling interest rates is a money machine for interest-sensitive life insurance products. And that is what we've had over the last ten years. Consider 30-year Treasuries trading at roughly 6.5%. Ten-year Treasuries are at about 6.25% give or take ten basis points. And there's a whole lot less room between here and zero.

I can assure you that interest rates are not going to drop 600 basis points over the next five years. I can say that with complete certainty. So that being said, you as a group are significantly more challenged, if you will, going forward in generating profitability from a modeling standpoint and a product design standpoint than you were in the past.

The minimum rate guarantees are becoming increasingly expensive and should be priced accordingly. If I had a soap box here I'd get up on it. I think this is perhaps one of the most important factors to the ALM business going forward over the next five to ten years. We anticipate interest rates over a number of years will continue to decline.

I recall a meeting Rick Jackson and I had about a year ago with an actuary who had just been appointed as the first and only ALM practitioner for one of the three largest Japanese life insurance companies. His problem was this. Interest rates in Japan were 2.5%, and he had a 5% minimum rate guarantee on all of their annuity business. He wanted to know if there was anything we could offer to help him in terms of product design and structure.

1997 VALUATION ACTUARY SYMPOSIUM

Quite frankly the answer to that is no. I hate to have my boss listen to this tape, but once the cow is out of the barn as far as minimum rate guarantees, the cost of trying to buy them back is exorbitant. And we find that with older products, specifically, we believe that the life insurance industry will actually have to come to terms over the next several years with this whole minimum rate guarantee issue, and it could become very expensive for those companies that don't begin to address it at this time.

Let's consider a case study of a flexible premium deferred annuity (FPDA) asset yield duration. We've looked at the duration of five-year constant maturity Treasuries (CMTs). We look at the duration of the particular liabilities that we are modeling at this time. And roughly 3-3.2 years, I believe, is what we have.

And in speaking to senior management of this particular client, we asked them, what is your gross spread objective in the design of this product? And they tell us 200 basis points.

Well, since we're a fee-for-service business, we don't scoff at 200 basis points. We say, gee, that's interesting. And start working on it. We have 200 basis points over a five-year CMT. This particular product credits five-year CMT plus or minus 25 basis points. This is a relatively generic product in terms of the annuity business. I'm sure if we had a show of hands, there are people here in the room whose companies write this and a lot of them probably write a lot of it.

And, in essence, at start up there is nothing more than five-year CMT plus 200 basis points at the liability duration. In a perfect world, we as asset managers would be asked to buy three-year duration securities yielding 8.5%.

We would park that away without all the embedded options and other nonsense that I talked about earlier. From an asset/liability practitioner standpoint, you and I could tell senior management that we now have a portfolio that is going to have 200 basis points, and it has spreads to pay commissions, is profitable, and keeps the lights on at the company.

INVESTMENT STRATEGIES IN AN ALM CONTEXT

Triple B corporate bonds were yielding at the time we put this together in the 10-year area of 7.45%. So I'm already out to a duration of about a 7. The highest yielding security is a 30-year triple B bond yielding a 7.90. So for example, this would be 30 years at a duration of a little over 12. So we're up at a 7.90. I'm still not earning anything close to the book yield that is expected; it is a gross yield, if you will, for this particular type of product. So as an asset manager I look at this and say, this is an issue of product design. And again since my boss isn't listening to the tape, we may say, gee, how are we going to do this? Quite candidly, I have to tell them this is not going to happen. We will not put together a portfolio on new money business that's yielding 8.5% or anything close to 200 basis points, because the yield curve has flattened dramatically, and because the credit risk or basis point per unit of credit risk has come down quite dramatically.

So this is an unrealistic paradigm, if you will. Having said that, that's referring to new production. If you look at existing portfolios most annuity writers would be earning at least this off of their current portfolio. The 200 basis points is often a slam dunk in the current environment. The reason being your asset managers took duration risk at the time you wrote that business. And interest rates have come down dramatically.

When interest rates are lower, you still have the higher book yielding securities, and so now you lower your credited rates and you're earning big spreads. That's being helped to support new business. The annuity you sell tomorrow I can assure you will not have a 200 basis point earned spread once you get the sales tickets booked to your general ledger, or the purchase tickets, I should say on the investment side.

And so the challenge of the business is trying to decide what's temporary in terms of market forces. You need to know what's much more long term that needs to be factored into the ALM context. And you know how we go forward from there.

Now, I had people look at this. As a matter of fact I believe Rick said, why don't we reduce the 200 basis points to 100 basis points, just so that you have something somewhat in the realm of possibility

up on the page. Well, I want to leave it at 200 basis points because this is the most recent annuity product that I worked with for a client on modeling. And those are the answers they gave us. So I wanted to lay out what the perception versus the reality is out there with certain types of product structures, and why I think this will be a challenge to U.S. ALM practitioners going forward.

The next example is relatively simplistic. I want to make the point that this starts in 1990. This is a yield on a five-year Treasury rate. In the annuity business or the interest-sensitive life business of any sort, anyone can make money during this period. And pretty much everybody has. I would say that a steep yield curve in falling interest rates over the first two years of the 1990s was the life insurance interest-sensitive product savior bill, if you will, for those types of product lines. But when you get into this period, we have a much more choppy market in terms of interest rates.

Consider this portfolio. Again I told you this was a real portfolio that we looked at. All we did was say, let's go back to my list of six possible things that the asset management group can do for you in a portfolio. We took an existing portfolio from this particular prospect, and we just laid out what the dynamics were. The portfolio is a little bit long in duration relative to a benchmark.

And we make some changes to it. We looked at maturity structure; we looked at duration; we looked at credit risk. We looked at embedded options. We pulled out that whole 1,300-page book and decided, what is it we can do here? Again, we made some moderate changes in various areas. We bought mortgage-backed securities. We love that prepayment risk because we get more yield. We had long finance issues. We got rid of some callable stuff. Some taxable management we didn't like.

We really tried to take that whole list of six things and say, what can we prudently do as asset managers to increase the book yield on this particular portfolio? Reduce the yield erosion in the falling interest rate environment. We talked about security selection and have recommended individual types of securities and things of that sort. We pretty much used all the arrows in our

INVESTMENT STRATEGIES IN AN ALM CONTEXT

quiver, if you will, from a portfolio manager's standpoint to try to do what we could to improve the dynamics of this portfolio.

Well, where did it get us? This again is a real portfolio of about \$250 million. Rick has pointed out to me that as actuaries you use a minimum of 100 stochastically generated interest rate curves to do various types of analysis. Since people in my business take the CFA instead of the FSA, I'd use three.

If I show the down environment, I have to show the up environment. So, we squeezed them all on the page. This is taking that \$250 million portfolio of existing business and projecting it over five years. We have interest rates going down 200 basis points over the first couple of years in one. In another, we are level, and finally, we're going up 200 basis points, with the first couple of years being level.

So really when you consider this, the book yield on this portfolio due to reinvestment and all the callable bonds and the mortgage securities and everything else, you have a lot of reinvestment cash flow. For the book yield projected without putting in place all of our high priced recommendations, we picked up 20, 25 basis points given all the recommendations on the last couple of pages, so that we look at this and say gee, we get a little more yield here.

Consider the annuity portfolio without the cap. We picked up about 20, 25 basis points putting in place all of the various changes of the portfolio. But nevertheless the yield in the portfolio drops off the table.

If we were going to have a show of hands, what is the best scenario for this particular company? Well, we have a five-year CMT dropping from 6.5 to 4.5%. The portfolio yield comes crashing down; however, the portfolio yield is still over 200 basis points higher than the five-year CMT. And if you were actually following a new money crediting strategy, you'd be able to pull that off.

1997 VALUATION ACTUARY SYMPOSIUM

Looking at a level yield or a level interest rate scenario, this is quite significant to this particular company in that what we're showing to them is that, even if you didn't do anything, you continue to reinvest your portfolio with cash flow. Since most of the securities in the portfolio were purchased in high interest rate environments, you're now in a situation that, pretty much no matter what you do, your book yield is going to drop quite dramatically over the next few years. I would venture to guess that the vast majority of your annuity portfolios for the people in this room would generate something similar to this profile in a stable interest rate environment. Maybe because interest rates have come down and the portfolio has a degree of catch up if you will.

In terms of deriving the interest rate environment, my third example is a horror show, given all the modeling you all do. I'm sure you're not surprised that we have five-year CMTs going up 200 basis points, from 6.5 to 8.5% over two years of being stable. We have this portfolio book yield not even getting its head above water at the end of five years. The question is, how can that happen? And the reason is that the reinvestment of portfolio cash flow in the first two or three years is getting rid of, if you will, very high book yielding securities that were purchased several years ago, even though we're reinvesting those cash flows in a rising interest rate environment.

When you run out the model, you find that, if you actually push and pay a new money rate, you're generating net gross spread losses in this particular product over a few years.

Now obviously, I'm not saying that if you got into this situation that senior management would continue to pay that kind of number. That would require a product change, if you will, in terms of your strategy. You may go to a portfolio rate and some other things that Rich and my colleagues are talking about. But just laying out the particular parameters of the product, you've got a big problem there.

So, people say well let's hedge it. I should say it's kind of like the Nike commercial. Just do it. What I hear all the time is just hedge it. Hedging is viewed by many, and Mike's going to talk more about it, as sort of a catch-all situation that, gee, you identify the risks. Once they've all been

INVESTMENT STRATEGIES IN AN ALM CONTEXT

identified from an ALM standpoint, you lay out what the risk tails are of the continuum. And you say, just hedge it. We're going to hedge out the tails on either side, be it rising or falling interest rates. Then we're all going to be fine and I can learn how to play golf.

Consider a five-year CMT cap. And it's very straightforward. There's a lot of experimentation on this day. I'm sure there are people who could talk at greater lengths than I. But for simplicity purposes we have a \$250 million portfolio. And if you went out to one of the esteemed Wall Street firms and competitively priced this out at the time I put it together, this together costs you 200 basis points for five years for this type of a cap protection. It would be 100 basis points out of the money. The cap kicks in at 7.5% CMT, and the current situation is a 6.5% environment.

You can amortize the cost of the cap over the life of the cap. Over five years, 200 divided by five was 40 basis points. Looking at the cost of 40 basis points annually is what I mean when I say hedging costs money. You have risk in the portfolio, and reducing that risk is going to cost you something. From a modeling standpoint, you have to be able to capture that in your modeling work.

Moving forward, how does the cap pay off? Relatively simplistically, when interest rates go to 7.5%, your cap starts generating money, and you can tell your boss why in the world you wanted to buy this thing. It starts generating income over the course of the thing. You put it all together. You now say, if interest rates go up 200 basis points, what happens here is my cap kicks in and I can still generate positive green spread. It's not a lot of green, but it's not red anymore. And so in the up 200 basis points scenario I can tell you as an asset manager you identified a risk tail. I gave you something that could be used to provide disaster insurance, if you will, against this risk tail. And whether you should do that or not I don't know. I mean I have some opinions on it, but in terms of the risk profile, that's a decision that has to be made with the whole group and with senior management involved.

So are you willing to give up a little bit of green to provide disaster insurance? I guess that's a question to be answered. I don't know the answer to that. My point really is that risk reduction costs

money whether you sell on bonds or buy shorter bonds. You can buy caps. You can do interest swaps; you can do swaption and various things. But all of them cost money. The reason you have yield is because you have risk in the portfolio, and reducing it will cost you something.

The very high book yield may be a very useful option to lay on an existing portfolio. For a new portfolio like the one I designed looking for 200 basis points, when I'm only going to get 100 in today's environment, 40 basis points is a lot of money.

So for new production you have to put on a little different hat in terms of whether you want to hedge things. Because if we were to hedge the risk out of new interest-rate-sensitive products now with today's yield curve and today's spread environment, you would find that you would be booking negative margins, if you will, once you lay on all the costs and commissions on top of that.

So risk has to be taken in the ALM context; the question is, how is it defined? And what type of portfolio insurance is laid over the top of all that?

MR. MICHAEL J. HAMBRO: I want to talk about derivatives from the perspective of a medium-sized company that does use derivatives or has looked at derivatives to hedge certain products. We're not doing anything speculative.

What is a derivative? It's simply a contract whose value depends on the value of an underlying asset reference or index.

In the insurance industry, at least for companies beyond a certain size, we're seeing expanding uses of derivatives. One use is risk control or earnings stabilization. A second use that derivatives can play is an integral role in the product investment strategy. Also some companies may be using derivatives to accomplish yield enhancement, or at least are trying to do that.

INVESTMENT STRATEGIES IN AN ALM CONTEXT

I have a series of examples on some of the uses of derivatives that are currently in play. The first example I have is a fixed annuity. You're worried about rising interest rates. In fact, sharply rising interest rates may cause fixed annuity profitability to be seriously eroded, especially if policyholders efficiently exercise the put option that we build into fixed annuities.

Also, the cash-flow-testing results for this type of product may be unsatisfactory under several scenarios. Well, one thing you can do is to purchase an out of the money interest rate cap that can effectively mitigate the severity and the frequency of relatively poor results. What interest rate caps are is a series of put options that can effectively hedge the put option that we grant to policyholders.

This is how a cap would work. I'm not going to go through how it would apply to the product because Ray has already done that. Consider a five-year contract based on five-year CMTs with an inception date of 1/1/98, a notional amount of \$100 million, a strike rate of 9%, and a quarterly reset with a reference date two days before the end of the quarter. If the five-year CMT exceeds 9% on the reference date prior to the end of the quarter, the reference rate minus 9% divided by four, times \$100 million, is paid at the end of the next quarter. On the other hand, if the five-year CMT is less than or equal to 9% under the reference date, then no payment is made at the end of the next quarter.

If on March 29, 1999, the five-year CMT is 10%, then the payment at the end of the next quarter at June 30, 1999 would be 10% minus 9%, divided by four, times \$100 million, or \$250,000.

Purchasing caps would generally lower the mean profitability of a product. One reason for this is you're generally dealing with a counterparty that is looking to take its cut of the action, and you're going to pay somewhat of a spread to enter into this type of arrangement. However, the volatility of product profitability will be decreased, and the number of poor scenarios under cash-flow testing may also be decreased.

Caps, on the other hand, are not a substitute for the appropriate investment and interest crediting strategy. If a product design is flawed and the investment strategy doesn't make sense, then

1997 VALUATION ACTUARY SYMPOSIUM

profitability and the number of bad scenarios are still going to be unsatisfactory from a management perspective. Also, management must understand that things like caps require an up-front premium. That has to be clearly communicated to avoid surprises.

My next example applies to mutual companies selling a lot of participating traditional life insurance. There has been a lot of pressure recently to lower traditional life premiums. That squeezes the margins between guaranteed and nonguaranteed values by decreasing the ability of the dividend to absorb adverse experience, such as falling portfolio rates combined with guaranteed cash values.

Interest rate floors can protect against falling interest rates. An example of an interest rate floor would be a five-year contract based on the ten-year CMT. The inception date is January 1, 1998. The notional amount is \$100 million. The strike rate is 5%. The quarterly reset is just like before. Then if the ten-year CMT is less than 5% on the reference date, prior to the end of the quarter, the contract pays 5% minus the reference rate, divided by four, times \$100 million at the end of the next quarter. If the reference rate is greater than or equal to 5%, then no payment is made.

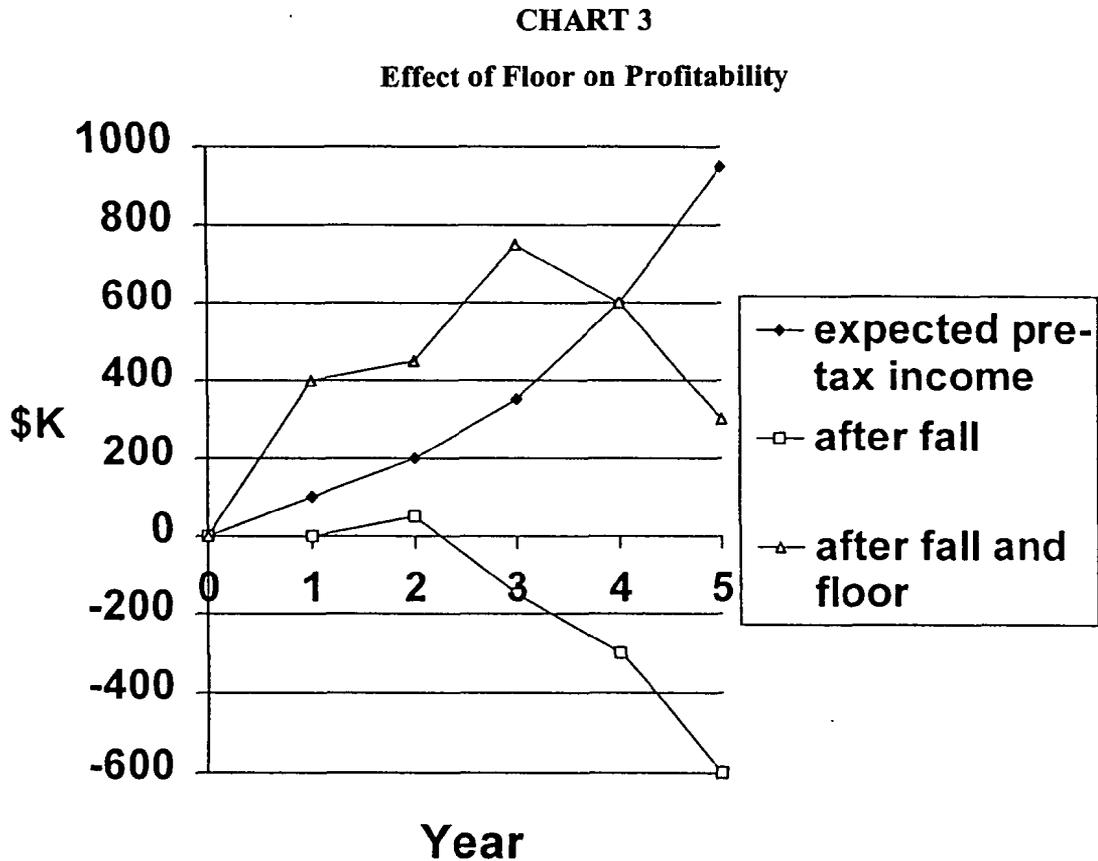
If you have a situation in which the reference rate is 4.5% on 6/28/98, then 5% minus 4.5%, divided by four, times \$100 million, or \$125,000, is paid at the end of the third quarter.

Let's assume we've got a product, and our yield curve starts at 6%. It's a flat yield curve, not a realistic example but illustrative. The notional amount for the floor is \$100 million. Let's say the five-year floor is based on the ten-year CMT with a strike at 5%, and the cost of the floor is \$500,000 or about \$100,000 per year. I think that's pretty realistic based on some data I obtained a couple of months ago.

And let's also assume that the yield curve drops immediately to 4.5% for two years. It then falls to 4% for the remaining three years of the projection (Chart 3). Before any changes in interest rates, the product had a pretax income pattern that was expected to start at \$100,000 the first year and gradually increase to \$900,000 at the end of year five.

INVESTMENT STRATEGIES IN AN ALM CONTEXT

We still see the materially improved situation that you didn't have before the floor. The reason that in the early years you can actually have some profitability pick up, is that you're probably going to have your bonds have a lot of inertia. And if there's a lot of call protection in the bonds, you actually may not see profitability get eroded with a floor in place.



So providing guaranteed values especially for products with significant renewal premiums grants the policyholder the equivalent of a call option. Interest rate floors are really a series of call options that, structured properly and combined with the appropriate investment strategy, can hedge the guaranteed interest rate risk for traditional life and other products.

Another use of derivatives is for equity-indexed products. For general account equity-indexed products, derivatives are a key part of the investment strategy. You might be familiar with those

1997 VALUATION ACTUARY SYMPOSIUM

products. Generally they offer principal protection, some minimal interest rate guarantees, and upside potential via participation in an equity index, such as the Standard & Poor's (S&P) 500.

The principal and interest rate guarantees are usually funded via fixed income assets like bonds, mortgages, etc. The policyholder equity participation is generally provided using one of the following: trading, call, and perhaps put options and futures, reinsuring the equity participation with the Wall Street counterparty via customized transactions. Or reinsuring the equity participation, or the whole product for that matter, with some of the commercial reinsurers that we are used to dealing with.

For companies investing directly doing their own investing for these products, some of the key capabilities that we see needed are the ability to choose appropriate strikes and expiration dates. You need a robust option pricing model that shows you what the prices should be, to at least keep Wall Street honest. You need a hedge monitoring system. You want to be investing in options, futures, maybe other derivatives, and you need to know on an ongoing basis how effective your hedge really is. You need to evaluate your investment strategy on an ongoing basis and you also need a good cash-flow-testing system. By the way, some of these capabilities are not fully implemented yet.

There are some additional considerations in dealing with derivatives. Equity-indexed products require the appropriate selection of counterparties. There are implications to Wall Street pricing. You have volatility: there's implied volatility, and there's historical volatility. There is the volatility skew factor. Both of these affect to a large measure the price of the options or other derivatives that you're going to be buying -- the relationship between futures prices and many cash prices is important to understand because Wall Street hedges its risks with futures.

Also you want to consider liquidity if you're buying over-the-counter options. Your investment strategy may require trading and not a buy and hold strategy. Often prices offered may not be attractive. You also may pick up the phone and call your favorite broker on Wall Street and find out that nobody is home; they don't even want to buy it back from you. You hear about such things

INVESTMENT STRATEGIES IN AN ALM CONTEXT

being hypothetical, and this isn't hypothetical. There's a real series of difficult issues in derivatives for this product.

There are additional considerations: tax treatment, statutory and GAAP valuation, qualifications or nonqualification for hedge accounting, and consistent valuation of assets and liabilities. It's important to have consistent valuation of assets and liabilities or your income statement can show some strange results.

Another place in which derivatives come into play or have come into play is inflation-indexed annuities. Early this year, the Treasury began offering inflation-indexed bonds. Some insurance companies initially thought that those bonds could be the central investment strategy for an emerging product: inflation-indexed immediate annuities.

However, these new bonds have been available only at ten-year maturities. Also, investing in Treasuries directly generally provides insufficient risk adjusted product spread. You can't offer a profitable and marketable product just investing in Treasuries. But a properly structured derivative can fill the maturity and spread gaps. How that would work in one solution is to enter into a swap arrangement with a counterparty. The life company would pay to the counterparty the yield on a specified maturity Treasury.

In turn, the life company would receive consumer price index (CPI) plus Y basis points, where Y would depend on the specified Treasury maturity. The duration of the arrangement is specified at the beginning of the contract. The net result is that the life company is then able to invest in a suitable combination of corporate and government bonds, commercial mortgages, etc. (i.e., its normal investment strategy). The company earns the CPI plus Y basis points, plus its risk adjusted spread that depends on the investment strategy.

Consider an example of a CPI swap (see Table 1). The company pays to the counterparty based on the CMT yield at the start of the contract. If the contract is a ten-year duration based on the ten-year

CMT, the company would pay the ten-year Treasury that was in effect at the start of the contract, and it would receive, let's say, every quarter on an annualized basis, the CPI plus 349 basis points. So if the company bought a ten-year bond that had a risk adjusted spread of 50 basis points over Treasuries, it would receive the CPI plus 349 from the counterparty plus another 50 from the investment strategy on a risk adjusted basis.

TABLE 1
CPI Swap Example

Derivative Contract Maturity	Company Pays Counterparty Based on Yield in Effect at Start of Contract	Company Receives
Three Years	Three-Year Treasury	CPI + 320 basis points
Five Years	Five-Year Treasury	CPI + 344 basis points
Ten Years	Ten-Year Treasury	CPI + 349 basis points

Managing derivative activities is something new for actuaries. Derivatives should be part of a comprehensive risk management process, not a stand-alone activity. We're not doing it for speculation, we're doing it to manage risk.

For many small- and medium-sized companies, over-the-counter transactions will encompass most derivative activity. And the reason for that is we're just not going to be able to invest in the size of transactions, or we're not going to get the right strike prices and maturity dates, etc., to do exchange traded activity.

If we are looking at over-the-counter, liquidity considerations must be well understood, especially if active trading is anticipated.

INVESTMENT STRATEGIES IN AN ALM CONTEXT

Evaluating and planning for counterparty risk is absolutely essential. Exposure to counterparties must be quantified. This exposure depends on the transaction type. It's insufficient to just consider notional amounts, you also must consider value at risk and current exposure versus potential exposure. You should run different stress scenarios to see how the derivatives can behave in conjunction with your hedge and the item you're trying to hedge. Make sure that you have your risk contained if something happens to the counterparty.

Another consideration is that the company may own other investments issued by the counterparty, for example, bonds or stocks. And if you do other investments, that's going to restrict the amount that's available to engage in further activities, namely derivatives with that party.

A risk management policy is extremely important in order to engage in derivative activity. And this should be a policy that's really well understood by management.

Some of the issues in dealing with counterparties should be the rating of the counterparty. You might want to do more with a double A than a triple B firm. The risk control techniques employed by the counterparty vary all over the place. Some counterparties have very good risk control, and others may not. The quality of the service and research that they provide and competitive pricing vary. Pricing for the same type of transaction can differ greatly. What is the priority of your claims in the case of counterparty failure? One consideration here is, are you dealing with the operating company or the holding company?

Modeling derivatives is, I don't have to say, pretty important. You need to have the capability to independently price. You need to model behavior under both the deterministic and stochastic scenarios. And you have to understand and appropriately incorporate differences between internal model assumptions and Wall Street pricing.

One example of that is on the issue of volatility. Right now, if you're looking at buying at the money call option, the implied volatility embedded in the price of that call option is about 22%.

1997 VALUATION ACTUARY SYMPOSIUM

Actually, over the summer the volatility exhibited in S&P movement was about 16.6%. So, there's a huge gap between observed volatility and implied volatility. And that's factored right into the price. You're going to pay for that especially if you're going long on a call option. If you're going short on a call option, they're not going to price it at 22%. They might price it at 21 or 21.5%.

Communication is something that also has to be handled well in dealing with derivatives. Management must understand the purpose of derivative use, its associated up-front and ongoing costs along with the resources required to properly employ derivatives. In many cases, derivatives provide risk management from an economic perspective. But management must understand also the effect on your statutory and GAAP statements. Even if you're hedged or doing a good job minimizing volatility from an economic perspective, you still may have some explanations from a statutory or GAAP perspective.

Derivatives should only be handled by persons who have had adequate training and have sufficient time available. Recordkeeping, risk-based surplus, accounting valuation and, very importantly, netting offsetting positions must be considered. If you have a long and a short position with a counterparty, you want to make sure you can get netted treatment for that. If not, you're going to find yourself very restricted in your activities.

Finally, I have some recommended reading for derivatives. There's the Group of 30 Reports covering derivatives, practices, and principals. It's not hard reading but it's good common sense. The association of Investment Management and Research report on risk management is good. Some of the Society syllabus on options, futures and other derivative securities is good. John Hull's book is the best book I've read on derivatives since I've been looking at this. Finally, the FASB just came out with a new exposure draft on derivatives.

MR. DOUGLAS A. GEORGE: I'm going to talk to you about performing what I call real ALM analysis, and using our cash-flow testing models to do that. And when I say real, what I mean is using the analysis and using our models to make decisions to really change the way we manage our

INVESTMENT STRATEGIES IN AN ALM CONTEXT

business or to do things like assess and evaluate alternative investment strategies or in-force management strategies. Right or wrong I think a lot of us look at our cash-flow testing models, and the exercise that we go through as more of a regulatory exercise. It's something that we do to jump through the regulatory hoops and meet the requirements. But then we put our models aside at the end of the quarter or the end of February and rarely use them to help us really manage our business.

I think that needs to change and I think it should change. There are a couple of reasons why that's still true. They can be summarized really under two general headings. One is practicality. How difficult is it to perform real asset/liability management analysis and how much leg work is required, given our software systems and our models.

The other reason is credibility. I'm not sure we can fully trust what comes out of our cash-flow testing models. Let me address this first. There are a number of reasons why we might not feel that our cash-flow testing models are completely valid. First is just the asset and the liability models themselves. For some of our assets and some of our liabilities we might not feel like we have a really good model in place. Something that we can trust. Some of the features in our liability products are not modeled in our systems. On the asset side our model for commercial mortgages might be rather simple. We don't really have in place good models for foreclosures or workouts. This applies to real estate models, stock models as well. Many of us are trying to invest more in the stock market these days. I'm not sure we have real good comprehensive stock models in our software systems.

On the liability side some of our product features are not modeled well, like bonuses or the new equity-indexed products. I'm not sure there's much in place to really perform good pricing, good reserving, and good cash-flow testing for equity-indexed products. Yet many of us have quite a bit on our books already.

The strategies in our models can be somewhat limited. There is the strategy for ongoing management or for ongoing reinvestment or for selling. A lot of times we tend to run our cash-flow-

1997 VALUATION ACTUARY SYMPOSIUM

testing models by locking in a certain strategy that we use throughout all different types of economic conditions. This can be something that we feel comfortable enough with for cash-flow testing. When it comes down to modeling how we really behave and how we will manage our business it might not capture the real dynamics.

Liability behavior modeling can be rather simple. I'm not sure we really capture the true behavior. Many of our policyholders do not follow the bond market. They don't really see interest Treasury rates increasing and decreasing, and use it to determine how they should behave. I think a lot of them see whether their credit rate went up or down from last year as being one of the real drivers for behavior.

I'm not sure we account properly for policies being inside or outside the surrender charge period. The fact of the matter is our policyholders do not want to pay a surrender penalty. I'm not sure our current behavior algorithms really capture that. Even a 2 or 1% surrender charge is enough to keep a policyholder from lapsing, and I don't think our current algorithms really take account of that properly.

Consistency can be an issue. If we're modeling our assets and our actuarial software, they will have certain prepayment patterns. They will have certain cash-flow patterns. And they might be different from what our investment people feel those cash flows ought to be. If that's the case, it can be difficult to convince the investment people to buy into our results. It can be difficult to say they should change the way they invest and change the way they allocate their assets if they're not buying into the results that our system is producing.

Finally the analysis needs to be expanded. Many of us perform seven scenarios for cash-flow testing and maybe add a few supplemental scenarios. But you really need to do something more comprehensive if you're going to use your models to do real asset/liability analysis.

INVESTMENT STRATEGIES IN AN ALM CONTEXT

Now one way to address some of these issues is through systems integration. I've talked quite a bit about this topic over the last few years. But the real goal here is to try to take the best parts of your actuarial modeling software and your asset analytical software and put them together and try to get a more credible model. In practice I've seen this really expand. You can have commercial actuarial software, commercial asset software. Homegrown systems are built in as well, to pick up specific products that are not modeled well in the actuarial software and to pick up specific assets that are not handled well in the fixed income analytical software. In the end, you are really getting more credible analytics for both sides of the balance sheet. You're also getting, I think, some buy-in from the investment people as to the results because you're using their system to generate the asset side of the balance sheet analysis.

Another way is really just to knuckle down and enhance your software. Sometimes we have to view our commercial modeling systems as being generic. And they're not going to contain everything we need to model the business for each and every one of us. We all do things differently. Our products are different. We manage our business differently. So the commercial systems can't always take into account everything that we want to in terms of our modeling and analysis needs. So what it really comes down to is enhancing in the system in the areas that we feel are not credible to perform what I call real asset/liability analysis.

In the work that I've done I've found that this is almost always required in some form. And having worked with different companies, I know it's not always the same area of the system or the same things that you want to improve. But one way or another there are almost always a couple things that you think need to be enhanced in order to perform the analysis.

Now if we do want to perform this analysis, the first thing we need is an interest rate generator. The interest rate generator or the interest model is extremely critical to the results that come out. A lot of us spend quite a bit of time working on our asset/liability models, and developing very accurate models. But we don't spend much time looking at our interest rate generator. And I think that's a

1997 VALUATION ACTUARY SYMPOSIUM

mistake, because the interest rate generator really drives the results as much as the accuracy of your asset/liability modeling.

I have worked with quite a few generators that are out there and sold commercially. I've generally found that they are developed for really one of two purposes. The first purpose is for pricing generators, and these are for option adjusted analysis for doing duration and convexity calculations, and for calculating the fair value of liabilities. These are mainly characterized by being arbitrage free.

The second purpose is for stress testing. And here you want realistic scenarios. These scenarios should be based on historical movement that bears some relationship to historical yield curves. And these can be very different in terms of the scenarios or the paths that you get, as compared to the ones that are produced by the option pricing models.

As I said I worked with quite a few models, but I've never found one that does a good job of doing both of these types of analysis.

I worked with a couple generators about a year ago. I did some quick analysis to compare them to each other. And I set up a single premium deferred annuity (SPDA) portfolio and a sample asset portfolio that supports them. One is from Global Advanced Technology. It was a Black Derman Toy algorithm as an option pricing model. The other one is from Capital Management Sciences which uses a Heath/Jarrow/Morton application.

I found I got the different duration numbers for the exact same portfolios when I ran them through the two different generators. There are a couple of reasons for that. Well, certainly number one is that any generator is going to have bias. Another is I don't think I calibrated the models exactly the same. Although I think that it would be impossible to get them exact, there may have been some additional errors in the calibration; i.e., there is a little bit of change in the volatility of one model versus the other.

INVESTMENT STRATEGIES IN AN ALM CONTEXT

But nevertheless the point is that we do get different numbers and the Capital Management Sciences numbers came out higher in terms of the duration of the SPDA. But it also came out higher in terms of the duration for the asset portfolio. So when you get down to the bottom line, the mismatch is not that different between the two.

Now my point here is that any of our generators have biases. What you want to do is have consistency. If at all possible, you want to use the same model to calculate numbers on your assets and your liabilities, so you can compare them and get an apples to apples comparison. If we use a generator on one side of the balance sheet and another on the other side, we will end up with a different feel for what we think our duration mismatch is under this condition.

Duration only gets you so far. Duration numbers give you quite a bit, but there's a lot that's missing. One way to expand the information that you get is to perform a whole price behavior curve rather than just look at durations. And here what you get is duration and convexity, and you get it across a range of interest rates, rather than just a duration for the current yield curve and the just level rates. So this doesn't give you all your interest rate risks or a picture of all your risk. It gives you much more than just a duration will give you.

The durations are represented by the slope of the curve. And the convexity is represented by the general curvature. So if you look above the zero interest rates you have our current yield curve. The slope of the asset line is quite a bit bigger or higher than the slope of the liability line. And in this case I think the duration of assets is about four compared to the duration of liabilities of about one.

Curvature is also an issue, and I said that's convexity. The convexity of the assets here is negative, and they put an upward curvature or the downward curvature on the asset line. The convexity of the liabilities is positive. And that gives you the upward curvature.

So the curve really gives you a good picture of why your duration and convexity risks are an issue for you. I found that they're a good way to present results to senior management. When you're

1997 VALUATION ACTUARY SYMPOSIUM

trying to communicate asset/liability risk. You can quickly see how the duration mismatch and how the convexity mismatch becomes a problem, as your economic surplus is the difference between the two lines. So your economic surplus erodes as interest rates go either up and down, due to the duration mismatch and the convexity mismatch.

The way I use curves is to really assess different asset/liability profiles, to try to line up and create different types of risk profiles and asset/liability risk pictures. There are a number of ways to do that. The curves themselves are additive, so if we rebalance our asset portfolio, we can add the new assets that we're putting in to the asset curve and change the shape.

You can do the same with the liabilities. If we change the crediting strategy on our liabilities, that will change the shape of the liability curve. So it's become a good way to really give a pure picture, if you will, of duration and convexity risks.

Besides rebalancing and changing crediting strategies in the liabilities, as Mike and Ray have discussed, another thing you can do is use derivatives. Consider a basic fixed for floating rates swap and an interest rate cap and their price curves. If you add those to the asset portfolio, the swap, having a negative slope, will bring down the duration of your assets. The cap, having the positive curvature, will help correct or improve the convexity of your assets.

If you add these to your portfolio, you might get a picture that looks more like what I call a partial hedge. We've added a little bit of the swap and the cap to try to line the curves up better. If you add more, you might be able to achieve something that could be considered a full hedge or at least a full hedge at this point in time, just considering your duration and convexity risk.

Now the problem with this is I'm not sure which is the right balance to have. I'm not sure what's the right position to have. I don't know what it costs me to put these into or add these derivatives to my portfolio. As Ray mentioned in his example, it was 40 basis points a year, and that's pretty significant.

INVESTMENT STRATEGIES IN AN ALM CONTEXT

I'm not sure on these curves how far apart they are. I'm not sure where that liability line really should be. We have nothing to compare them to since liabilities are not traded actively. We don't have anything to reconcile it to. We're not sure what the discount rate is to use for liabilities to produce this curve. These two curves might be right on top of each other, for all I know, which would mean a sort of zero economic surplus. I'm perfectly hedged but I'm not going to make any money.

So the technique that I tend to use is to use these type approaches for outlining and designing different strategies. But I go back to financial projections and stochastic analysis to try to really see what the effect is of those strategies to my financial performance.

Now to do that, I do need to have a stochastic generator as opposed to the option pricing generator. And for what I've seen for generators available in the market over the last few years, I never really found one that I've been quite happy with to be honest with you. So I developed my own.

It incorporates a term premium into the interest rate structure so that you do have upward sloping yield curves quite often. And that's something that is very desirable. On some of the option pricing models you tend to get quite a few inverted curves, 50% inversion. This is obviously not very realistic. For the stress testing and for the scenario testing, you want realistic scenarios.

Plus they've got a banding effect so that you can mimic the effect of interest rates staying within a band for periods of time and then moving towards a different band and sort of hovering there. Currently, there is a lot of theory and a lot of thought on how interest rates behave.

An efficient frontier is something that could be theoretically produced if you ran many different combinations of asset/liability strategies through your many, many different stochastic scenarios. Each point would represent one specific asset/liability strategy and an investment strategy combined with a crediting strategy or a new product strategy.

1997 VALUATION ACTUARY SYMPOSIUM

The least amount of risk is sought for the given level of expected returns. The problem is, this is very difficult to perform. The run time alone is pretty prohibitive to have all these scenarios or all these strategies run through all these scenarios. To get a comprehensive graph can take just tons and tons of leg work. So I've never produced a graph quite like it before. And even if I could, I think I'd be a little bit skeptical. I wonder if my models are really that refined where I can get this level of accuracy to measure the difference between these different points. You know our models are based on a number of assumptions.

I mentioned the behavior of policyholders, for example. This is something that we certainly aren't sure of. And this will drive this type of analysis quite a bit. So I think I'm kind of looking for a level of refinement here that may not exist. And that's generally why I tend not to trust the black box approaches to ALM as much.

You really need to roll up your sleeves when doing this analysis and get underneath the numbers and see what's driving them. You need to see why they're coming out the way they are. In our models there are going to be many biases. The nature of a model itself is approximation, its grouping methods. You really have to get underneath them because oftentimes you can get answers here that are driven more by a model bias than something that's realistic. That could be some advantage that you found in the asset market or in a product feature. So you really do need to be careful.

Sometimes you run this type of analysis and you get, instead of an efficient frontier, what's called the efficient box. This is where one strategy sort of stands out as our best one and you might as well follow the strategy.

This may be correct or it may not. Again before I mentioned it was the model biases. There could be a significant bias in the model that produces this strategy that makes it seem like it's far superior where really maybe it isn't. So you do need to be careful. You want to roll up your sleeves, and you want to see what's underneath it. You want to look at the scenarios, you want to look at the results. Look under specific scenarios and see why they're coming out the way they are.

INVESTMENT STRATEGIES IN AN ALM CONTEXT

On the other hand, you may have found something in it. You may have found a better strategy. You may have found something that is getting close to optimal. You find that the next move I'd take is to look at variations of it.

Let's look at tweaking it a little bit. And then see if we can come up with something better or try to produce more of an efficient frontier, if you will, by adding more risks, or taking away risks and seeing how the results come out.

That would imply I think a normal distribution of returns, and the returns are not normal. When you run these analyses, I don't think you could argue that they are normal. So the measurement of risk here isn't quite accurate. You know which ones tend to be more variable and which ones don't, and which ones produce an expected return under all your stochastic scenarios. Then you must find a lower level of risk and which ones have many negative returns as well as more positive returns.

To measure that a little bit more, you can create a chart where we have three different points that are on our efficient frontier. You can have the median return or the average return. In this case the median increases. But also the risk increases, because we have much more of a chance that returns will be low positive or even negative. We have our zero line, our tenth percentile, and our strategy number 15. We get returns that are way negative. So we can interpret this as to say that there's at least a 10% chance the returns will be negative on this block of business with these given strategies.

When we do this analysis, you'll find it's mutually exclusive. You need to achieve a high level of return. Naturally you're not aware or don't want to be aware and maybe senior management is not quite aware yet of what the real risk is and the fact that, if interest rates do move against you, you will be in situations where you make quite a bit less than the desired return, and quite a bit less than your hurdle rate.

As opposed to really rolling up the sleeves and looking at some of these areas, I would look at what the scenarios are at the 25th percentile. Let me take a look at some of those and let me think of how

1997 VALUATION ACTUARY SYMPOSIUM

realistic they are. Let me communicate to senior management that, under this type of interest rate movement, we will get a return that's suboptimal and lower than a hurdle rate. And under this type of interest rate movement, we can obviously get a very high return. But I think you need to communicate the risks that are there. So that if and when they do happen, people won't be surprised.

If you really do implement a full hedge, you've really gotten rid of your risks, but you've also gotten rid of your return. You've hedged in a profit level that is not acceptable.

Maybe the partial hedge is acceptable. But maybe that isn't an acceptable level of average return. Most of it ends up back with the no hedge or very little hedge. And that's why a lot of us don't buy the derivatives, because the cost is so high for hedging our portfolios.

My final point is on sensitivity analysis. When you do this type of analysis, you want to do sensitivity of results. You want to look at the policy behavior function because that does tend to drive a lot of this.

You want to see how that's going to change your efficient frontier line. You want to see how that might change your price curves. Where you thought you had a hedge position under a different policy behavior assumption, you might find you didn't have a hedge position. So you really do need to consider this when you're doing this type of analysis.

MR. JACKSON: I guess the ALM practitioner is kind of a loose metaphor. It's like the owner of profitability restaurant, and it's his or her job to present a current risk profile to senior management, kind of like a meal. And it's also his or her job to present alternatives. In doing this, you have a menu that you present to senior management that consists of choices from the asset side of the balance sheet, with choices of management action on the liability side of the balance sheet as well.

INVESTMENT STRATEGIES IN AN ALM CONTEXT

You really can work both sides. It's the ALM practitioner's responsibility to recommend some choices and explain those choices to senior management, but ultimately senior management decides. So I'm going to describe to you quickly a few examples.

One company kind of challenged us to show them the payoff on this kind of analysis. What's all this work? What are we going to get for it? Our senior management has seen some work done before, and we really don't see a payoff. So where does it come from?

When we lay it out, there are four different strategies that are tested. This is really an annuity optimization case study. It will tease you I guess a little bit, because we're dealing with one product and we're dealing with four or five different alternative scenarios. You really should be looking at the whole company. All your product lines and 50, 100 or more alternative scenarios should be tested to try to optimize your profitability. Ultimately, the way you optimize profitability depends on how you keep score.

You have about \$14.5 million of surplus after five years under this particular case. In this base case strategy, the annuity portfolio being used employs a portfolio interest crediting strategy. They're getting a spread of about 185 basis points. Now under 50 different economic scenarios, you get an average return of around \$14.5 million of surplus increase after five years. The higher and lower ranges are \$16.1 and \$5.2 million. It's not a real wide variation. The portfolio manager can in some cases improve the asset side of the balance sheet. Ray was showing us an example in which a portfolio restructuring increased the yield 20, 25 basis points. You could do that, but he couldn't do anything about the liability risk the annuity portfolio showed in a rising interest rate environment.

He could institute a hedge, which could provide some partial mitigation, but never did you really get the payoff that really let the ALM person say, we more or less solved this kind of problem or we've optimized profitability. He was working with the asset side of the balance sheet.

1997 VALUATION ACTUARY SYMPOSIUM

The second example is, what if we substituted for the collateralized mortgage obligation (CMO) portfolio? What if we substituted a noncallable bond portfolio for the CMO portfolio? The what-if tool that's used by the asset/liability manager practitioner can test that particular scenario. There is a little different result, but you're going to have a slightly lower mean of an \$11 million increase in surplus. That's a little bit tighter range of profitability. You've dampened variability some. It's not a result that makes somebody want to jump up and down. Management is not going to say, yeah, let's jump over to that particular strategy.

A third strategy is, if you went straight to a market interest crediting strategy, the way this portfolio is running off, it's got a high credited rate as Ray was talking about. Your mean would be significantly higher under these 50 economic scenarios. You've got about a \$30 million increase in surplus over five years, but a much wider range of variability. But the result begins to get interesting. It has a much higher return, but with a lot more volatility. It still is not completely satisfactory.

This particular company that we're dealing with was looking closely at the fourth alternative here with what I call a hybrid interest crediting strategy, to put it simply. When interest rates fall, they would move very quickly to market crediting market rates, but when its rates rise, they would lag that rise.

It was this particular scenario that showed a mean return of around a \$40 million increase in surplus with a little tighter range of profitability. There was variability, still, but since this was the scenario management was most interested in testing, they were pushing a more aggressive interest crediting strategy. They knew they would be taking on additional risk of upsetting their field force.

The new risk was that the policyholders would surrender more product. So of all these that were actually tested, they actually implemented this particular plan. What we didn't test was the likely impact of an interest rate cap. If we used an interest rate cap, we would have given up an average

INVESTMENT STRATEGIES IN AN ALM CONTEXT

mean return of around \$3 million. However, we would have narrowed the range of profitability: given up a little bit on the mean, but definitely gotten rid of some of the worse performing scenarios.

So this work had some kind of a payoff that management was interested in. The same four or five scenarios actually tested were translated to a return on equity (ROE) basis because management was getting paid based on ROE. In the first scenario for the base strategy, the mean return would be a 5.6% ROE.

In the CMO substitution scenario (for no CMOs), the mean would drop, and ROE would be around 3.6%. Obviously, this was not satisfactory, as management was getting paid based on ROE.

The market interest crediting set of scenarios showed 9% ROE. This is the best scenario so far, until we look at this last strategy. The company has a target for the annuity line of around 10% that they're not reaching. This is the only scenario that gets them up into the 12% mean range.

This work provided a kind of justification of the strategy they wanted to implement. This was the payoff that they were looking for, for an ALM process to give them. We didn't really test the interest rate cap alternative because we were looking to do it for the entire company. In putting on the cap, a likely result would have been to lower that mean return to around 11% ROE, but with a tighter range of profitability. This is the kind of analysis that can be done that will really provide a payoff.

MR. JAMES G. BRIDGEMAN: You have two different sets of interest rate generators. One is used for pricing and one for scenarios, and they give different answers. Which one is right?

PANELIST: In the sense that which one adheres to the real world, and of course what I'm leading up to is, there is something cockeyed about the pricing, it's probably biased towards the people who are selling.

1997 VALUATION ACTUARY SYMPOSIUM

PANELIST: That's a good point. I think the stress testing scenario generator is the real world. That's the one that mimics interest rate movement. That's the one that I think produces realistic yield curves.

The nature of the analysis, I think, is somewhat different for each generator you use. And while I agree with you there is a conflict, I don't think the conflict is quite as black and white as you might think it is. I think the realistic scenario generator is used for decision making. It's used for strategic analysis. It's used to decide, for instance, allocation of assets. Whereas the pricing generator is more used to decide one asset versus another.

And that's why we want it to be arbitrage free. And that's so you can compare assets with different cash-flow patterns. I don't think it's correct, to be very honest with you. But it's really the only way to compare one security to another so a portfolio manager can decide which one is the best one.

So I think you know the best answer I can give you is the nature of the application is different for the two different generators. I don't think there's quite the conflict. That one gives you one answer, and the other one gives you another.

PANELIST: I'd like to just add. I was at a seminar a few years ago on the market value liabilities, and it was pointed out in order to price the market values, you had to use an arbitrage free scenario generator. I can't get square with that. If you're in an environment where the yield curve is shaped one way or the other, let's say it's upwardly shaped, then the future rates are going to have an upward bias. And what's going to happen is policyholder behavior is going to be exacerbated, at least according to that model. And if that's realistic pricing, I really don't see it. Take a model that is more of an equilibrium model that at least reproduces historical movements or perceived future movements and interest rates more appropriately.

FROM THE FLOOR: On that same subject, is there also an issue of the arbitrage free scenarios that are generally out there like the GAAP factors, or whatever? Are they really getting a good price

INVESTMENT STRATEGIES IN AN ALM CONTEXT

for a cap and a flow or a swap? And if you're not getting a good price for a cap or a swap out of that, do those price curves tell you anything?

PANELIST: The price curves do but mainly because they're calibrated to do so. I think arbitrage free models are designed to change the parameters to produce the accurate price. They're calibrated to match prices. So sort of by definition they do.

PANELIST: I think it can be difficult to use one set of parameters consistently in an arbitrage free model, and get an accurate pricing for say different caps or floors that are at different points being in and out of the money.

You tend to need to have one volatility if you will. Whereas depending on how far you are in and out of the money there are different implied volatilities in those prices.

