RECORD, Volume 22, No. 3*

Orlando Annual Meeting
October 27-30, 1996

Session 89PD
Investment Strategy Formulation and Implementation

Track: Finance Practice Education Committee/Investment
Key words: Investments, Valuation of Assets

Moderator: MICHAEL A. HUGHES
Panelists: DENNIS L. CARR
ANDREW S. CHOW†
FREDERICK W. JACKSON
HARRY R. MILLER
ALBERT V. SEKAC
Recorder: MICHAEL A. HUGHES

Summary: This session explores both conceptual and practical considerations involved with the formulation and implementation of investment strategy. Topics include:

- *decision-making framework and processes*
- *measure of risk and reward*
- *constraints*
- *use of models and solutions to modeling obstacles*
- *evaluation of alternative to modeling obstacles, evaluation of alternative investment vehicles, and hedging opportunities*

Mr. Michael A. Hughes: We are here to discuss investment strategy formulation and implementation. I'm a partner with Ernst & Young in Chicago, and I'll be moderating the session. We have a very distinguished panel. Our panelists are Denny Carr from ARM Financial Group; Andy Chow from CONSECO Capital Management; Harry Miller from Variable Annuity Life Insurance Company (VALIC); Al Sekac from American General; and Rick Jackson from Scudder.

By way of introduction I think that there's an emerging practice within the profession, which is that of the investment actuary role. We're seeing more and more

†Mr. Chow, not a member of the Society, is Vice President at CONSECO Capital Management in Carmel, IN.

actuaries function in some type of investment actuary role as the industry's products become more and more interest sensitive. That role has evolved over the years.

I happen to be chairman of the Committee on Finance Practice Education within the Society. The finance area would like to promote and support actuaries in their new and emerging practices. I'm not sure whether there's a real consensus yet as to just what the investment actuary's role might be. If there is a consensus, it would be that the actuary seems to be well qualified and has the skill set needed to serve as an intermediary between both sides of the balance sheet; a total company risk manager from an asset/liability management (ALM) standpoint. The Society is hoping to support actuaries who are functioning in this role.

What we'll be looking at and talking about are ways of quantifying, presenting, and analyzing risk—both conceptual issues with respect to risk analysis and practical modeling considerations in that regard. With that, I will turn the session over to our first panelist, Denny Carr.

Mr. Dennis L. Carr: I serve as executive vice president and chief actuary of ARM Financial Group, which was formed in late 1993 with the purchase of Integrity Life Insurance Company and National Integrity Life Insurance Company. We focus on the retirement savings marketplace using insurance-type products. This would include fixed annuities, variable annuities, guaranteed investment contract (GICs), and asset management-type operations. Because of our focus on investment-related products, we pay particular attention to things like investment strategy—our topic.

I've had significant involvement in the ALM area over the last 15 years. A large share of that experience has been with life insurance companies, but I also spent five years in consulting with Tillinghast. I thought it would be appropriate to share some of the things that have worked and that haven't worked over the years, as well as giving you the perspective of where we are today at ARM.

As I worked on this topic, three major themes emerged. The first theme is that you need to understand the playing field and your role. I think actuaries need to step back and understand the big picture. It means we need to get involved in the world of corporate politics and organizational structure. The second theme is you need to create a process that has feedback and control. Feedback is important because we make a lot of assumptions as actuaries, and feedback gives us a real world check on those assumptions. In investment-type products, you do get feedback fairly immediately, if you have the right systems in place on the financial side. The third theme is you need to keep it simple.

With those three major themes defined, let me share with you the way I view investment strategy. I see investment strategy as a subset of ALM. I see ALM as a subset of the overall vision and strategy of the business. At ARM, asset/liability management is a big part of our overall business vision and strategy. In fact, integrated ALM is one of our five key vision principles. It is important for you to understand how ALM and investment strategy fit into your company's overall business vision and strategy.

Our initial theme is to understand the playing field. Let me share a few playing-field pointers with you. First, you need to understand the political environment. Who really controls investment strategy in your company? Who is positioned to have an effect on investment strategy in various ways? Do you have a coherent investment policy with a clear chain of command, with feedback mechanisms and control? As an actuary doing analysis, you need to understand how you fit into the investment process. Second, create an alliance with the investment area. This will require a great deal of time and energy; however, if you're going to have an impact on investment strategy, you need to be working with the investment area to establish that alliance. Third, you need to communicate clearly. Analysis of investment strategy is a very technical area. It can involve complex models and lots of assumptions. Most of the time management doesn't have the patience to go through all of that. You need to develop clear recommendations that are backed by your analysis, if you hope to have an impact in your company.

I think of investment strategy as part of the overall investment process. The investment process starts with development of the initial investment strategy. At ARM we develop distinct investment strategies for each liability type. Asset/liability models and various other inputs are used to derive the initial investment strategy. Given an investment strategy, the investment department then initiates the actual buying and selling of assets, or asset trades. Once asset trades are made, our asset/liability area is responsible for reviewing each trade. This is part of our overall control process. The asset/liability area makes sure that asset trades do not change our asset/liability position significantly.

Periodically we run asset/liability models or simulations for our various in-force liability types. Model results may suggest adjustments to the investment strategy. These in-force models provide the feedback needed to keep our investment strategies up-to-date and appropriate.

What is an investment strategy? I believe it is the set of basic guidelines under which the investment function operates. At ARM, the asset/liability area plays a key role in developing the overall guidelines or investment strategy. Generally an investment strategy contains several items such as: duration and convexity targets

(generally a range); credit quality requirements (NAIC 1, NAIC 2, etc.); issuer limits; diversification requirements; liquidity constraints (short-term cash requirements); asset mix parameters (for example, maximum of 30% in collateralized mortgage obligation (CMOs); cash-flow characteristics (barbell versus ladder); and performance criteria (total return, maximize yield).

The asset manager is asked to outperform under the performance criteria while staying within the other constraints defined in the investment strategy.

How do you go about calibrating the various items that define your investment strategy? Asset/liability models are a key tool actuaries can use to calibrate the parameters associated with interest rate risk. These include duration and convexity, liquidity, and cash-flow characteristics. Rating agencies also provide guidance in areas such as asset mix. Finally, regulations guide you in terms of diversification standards, credit quality, and asset mix.

Asset/liability models are a commonly used tool in developing investment strategy. The following are some helpful hints for the proper use of those models. Number one, understand the strengths and weaknesses of any model you develop. Most asset/liability models do a decent job of projecting cash flows, if they are properly calibrated. This gives us a general understanding of cash-flow characteristics and interest rate risk. However, these models generally don't give us a very good idea about credit risk. The bottom line is you need to understand the models' strengths and weaknesses and make sure you're not drawing conclusions based on a weak model.

To have a credible asset/liability model, you need to get buy-in from the investment area on the investment-related assumptions. Failure to get this buy-in can alienate the investment area and make it virtually impossible to move from model results to management action.

Finally, avoid complication in your asset/liability models. In order to understand what's really driving your results, you need to keep it simple. An overcomplicated model can muddle your results.

Asset/liability models produce results over a set of interest rate scenarios. We generally measure the present value of statutory earnings over each scenario. From there, we examine the mean and standard deviation. One measure of risk might be the ratio of the mean to the standard deviation. We might also examine percentile results, for example, 90% of our results are better than X. Many times it is helpful to look at several of the worst case scenarios. Typically you can see a pattern in the worst cases that indicates the most risky environment for that particular liability.

In summary, to effectively develop investment strategy, you need to understand the playing field and your role. That will allow you to create information that assists management in making decisions. You need to create an investment process with feedback and controls. And, through it all, you need to keep it simple.

Mr. Andrew S. Chow: I work for CONSECO Capital Management; we are managers of single-client assets. We manage altogether about $30 billion dollars worth of assets. Currently, I am a portfolio manager and an investment professional. I'd like to talk about two specific areas more in depth: strategy formulation and implementation.

The first thing about strategy formulation is to decide what our strategy should be and what our objectives are. You can't have a strategy unless you know what you want to accomplish. Step two is how implementation can get mixed up because of measures used to accomplish our goals.

The first objective of the insurance company is to make money, but it's not that simple. The ultimate goal is very difficult to achieve in any quantitative sense.

With regards to implementation, we're going to talk about duration. As for model consistency, you use models on the investment side and on the actuarial side, we all use models.

What are our objectives? There is a lot of talk these days about maximizing surplus and risk compensating. I want to back up and talk about an economic entity that doesn't have too many constraints and about privately-held insurance companies. This privately-held insurance company doesn't need to report income; it maximizes its profits and the present value of all its future profits.

By definition, the present value of all its future profits equals the value of the company. We could say the first objective is to maximize the value of the firm by maximizing the value of the equity. Market value is the first thing that we can get to. What you really want to do is maximize the value of the assets minus the value of the liabilities. Here's where a hint of the total return comes in. There is a grain of truth to the philosophy that says the insurance investment manager should maximize the total return.

If all I do is take care of the assets and maximize the assets and total return, that doesn't work out in practice. All a private insurer does is sell variable annuities. One of the things that motivates purchasers at a retail level is yield. When I get a higher yield on my product, I get more sales. If that is going to affect the number of liabilities I have, it will impact the total equation. The feedback between the

forward and nonforward term performances and assets and liabilities. Even in that stylized case of the privately-held insurer and a separate account business, I cannot focus just on maximizing my return. The investment manager winds up being part of the business unit, not a separate stand-alone profit center. This kind of highlights the role of the actuary.

Next consider a mutual insurer. There is a 10% probability out of these stakes that you will go bankrupt. The rest of the 90%, you have a great value for your firm, that is not going to work. Many people think of risk as a linear constraint that is easy to solve or some sort of strength optimization problem. Unfortunately, this is not fully realistic. You don't measure risk in simple terms that lend themselves to linear optimization. What they want to do is articulate a vision of risk for every state of the world, for every possible outcome. I want to discount more equity for real positive outcomes, and I want to value more heavily the really bad outcome. In other words, have some utility function over the different states that really discount lottery sorts of winnings and really penalize bankruptcy scenarios.

Then you get into more and more constraints such as regulatory and accounting issues and these can be hard to quantify. As a result some people don't even try. This is bad because when you make an investment strategy, you haven't figured out what you have to do.

The central issue is, Does this strategy really accomplish the goals that the business wants to get into? The first step is to know thyself. As an investment manager, that is the one thing I want to get through to my clients when they are talking to me about their business and what they want to accomplish.

I also want to talk about risk measures and duration. Let's take a typical bond with a 10-year maturity at 7.25% callable in 5 years. How do we measure risk on this bond? How do we measure duration? You have modified duration to maturity. It's great but what if the rate falls? The modified duration, if it's called, is 4.1%. That is substantially different. What happens if the rates rise? Then it will be a 10-year bond. Option-adjusted duration merely measures price gains from equivalent-rising and equivalent-falling interest rates. The net result is when you look at an effective duration, you get a number that's not right for rising interest rates and it's also not right for falling interest rates. It's never right! This is the problem that you have looking at your duration of your non-fixed-maturity bonds with a simple-measure duration.

One other thing I want to talk about is model consistency. Many of the problems that we deal with on the investment side are similar to those on the asset side. The most similar problem is trying to come up with an interest-rate penalty, because we

use different models. It's not the same as what's used on the asset side. It's a big problem and that's why we are comparing apples and oranges. What you want is consistency on both sides, which means you have to build your own interest-rate generator and use it across the firm.

The last thing I want to talk about is option exercise. That's an option that I call rational exercise. Rates fall and fund is calm. Rates rise and fund does a decline. There are lots of options that do not get rational labels optimally exercised. The most common example is mortgaged-backed securities. There are people with 12% mortgages on their homes and they do not refinance. There are some people with 6% mortgages and they want to prepay. There are people with measly interest rates on their loans and there are other people with a 9% surrender. We have to have some model of behavior to examine this behavior. There are a number of lessons to be learned between pre-payment models on the asset side and surrender and lapse models on the liability side.

Mr. Harry R. Miller: I've been with VALIC, which is an American General company, for the last two years. Before that I spent 14 years outside the real world as a consultant with Milliman & Robertson, working in various fields.

Part of the first year I was at VALIC I worked on developing the ALM framework that we use inside of VALIC. I will talk a little bit about it.

I will provide more background on two important issues Denny referred to in his talk which are feedback and control. The investment strategy, the ALM strategy, and the business strategy form three concentric circles. I will focus on the ALM strategy which forms the middle circle and Denny's point that it's important to have feedback and control. I'll also discuss some of the unique issues you encounter when you start dealing with variable annuities.

A little background may help you to understand where my comments are coming from. VALIC has more than $25 billion in annuities. We're in the retirement products marketplace. We sell a mixture of general account and separate account products. We are a subsidiary of American General. American General also handles the investment functions of VALIC.

I'm sure you all are familiar with the book, *Men Are from Mars, Women Are from Venus*. I think you could very easily change the title to refer to actuaries and investment people, given the difficulty they often have communicating.

We have developed a concept, and it's really not a unique concept, that we call the ALM conceptual framework. By that I mean we've simply taken a bunch of these

ideas and put them together into one package that everybody can relate to and understand.

The first part of the ALM conceptual framework is the common theoretical base. That's really just saying we want everybody to be working off the same page and using a common language. This helps to avoid getting into the men-are-from-Mars-women-are-from-Venus concept. When we discuss something, both sides say, "I know exactly what they're talking about."

One of the first things we figured out is not to assume that the investment people and the product people know what each other is talking about. It took us a couple of months to figure out that neither one of us knew what the other was doing. Once we understood this, we were able to work together to build a common language and a common set of goals.

The second part of our conceptual framework is the control system. Feedback and control are very important issues. At American General we like to talk about control systems. One nice thing about developing a control system is that you actually have to figure out what it is you're trying to control. A control system has, as we view it, four parts.

The first part of a control system is the standard. You have to determine what you're trying to control, and what you want to achieve. Examples include achieving a target return on equity (ROE), or having a duration mismatch of not more than X.

The second part of the control system is the measurement system. This is the process you're actually going to use to measure whether you are meeting these standards. It could be special ALM measures, the statutory or GAAP financial, or some other internal financial. The key is to determine which system you're actually going to use to measure your progress.

The third part of the control system is the actual measurement. Once you have a measurement system, at some point you actually have to perform the calculations.

The fourth part of the control system is the adjustment process. You take the measurement and come to the conclusion that you have a deviation from the standard. Now what do you do? There has to be some process by which you have a set of procedures that will help to bring a deviation from standard back into standard.

The other point that Denny referred to as a key function of this whole framework is coordination and communication. In our organization, the investment manager is

in a separate entity. All the people involved in the process are not under one common management. So coordination and communication are important.

Much of my time is spent talking, building alliances, and understanding what other areas are trying to achieve. This involves asking questions such as, how does your business unit operate? What are its goals? What are its opportunities? What are the problems you foresee? What problems are you trying to solve? What do you hope the investment management process will provide for you in terms of its contribution to the overall objectives of the organization?

Practical and programmatic procedures can't be overestimated. Denny's "keep it simple" philosophy is very true. He pointed out that what you want to understand is what drives the results and focus on that. You can easily get lost putting lots of little variations in the models. Does adding a couple of extra plans really add to the whole process? Does that really give you a better answer, or just a more complicated answer? It is important to focus on the key items and not get lost in all the little paths that you can go down.

What we do is limit the number of measures we look at in order to develop trend sheets so management can understand the relationships that occur over time between these measures. This helps keep you focused because you have to keep it at a high enough level that senior management can look at it. This discipline helps to make sure that you stay focused on the key elements.

The measurement system is probably one of the key items in this framework, and the one that actuaries are most interested in. We came up with a measurement system designed to generate statistical measures that provide relevant information on the risk/return trade-off. The key item we're talking about here is the risk/return trade-off. If you eliminate risk entirely, you should expect to earn the risk-free rate of return. So there is always a trade-off between the level of risk you take and the return you get.

What we want to do is provide senior managers with the relevant information on the risk/return trade-off so they can select the right point on the efficient frontier where the can position the company to achieve its overall objectives.

One question that came up is whether duration and convexity is all you need to look at. Should we have to look at any other measures? We concluded that duration and convexity by themselves may have limitations. The measures that we look at and talk about fit into three categories: profitability, solvency, and competitiveness. These happen to be three of the four categories that are stated in the organizational goals for our company.

We break them down into the same measures that are the focus of senior management. This helps to keep them interested. This also helps them understand how the items we present fit into the organization as a whole. That makes it a little more useful for them. It ties them back to something real and it makes it easier for them to deal with.

Let's turn to some of the issues related to variable annuities. Not much work has typically been done related to variable annuities, that is, the amounts in the separate account. Larry Gorski hasn't mentioned this too many times in his annual Halloween surprise letters. However, I'm sure it's going to be mentioned more and more by regulators in the future.

You do get into some very interesting questions when you start thinking about the interaction between general account and separate account products. For example, is there a negative correlation with interest rate movements in terms of flow into and out of the general and separate accounts?

Typically, if interest rates go up, that will hurt equity returns. Fixed investments will look good and money will flow into the general account. When interest rates rise you also tend to lose money out of the general account to higher lapses, but the funds flowing back in from the separate accounts may tend to offset this.

You may see differences in premium allocations over time. The relative attractiveness of the two areas may change where the cash is flowing. Your investment manager is probably very interested in understanding and getting your insight on that. If he or she is expecting to have X dollars of cash flow to invest and knows that this relationship exists, that may influence some of his or her investment decisions.

One of the interesting points that we have been exploring in more detail is the determination of the competitor rate on separate account products. Do you base it off the treasury rates? Is it the return on the Fidelity Magellan fund? This is important if you want to take into account the dynamic flows back and forth between general and separate account products.

To sum up, the key items we've talked about are communications—which is a very big key to this process, and something actuaries admittedly aren't great at—control, feedback, simplicity, and practicality.

Mr. Albert V. Sekac: I work at American General and I've been there for five years. Before that, I worked for a GIC consulting firm in Louisville, Kentucky where I was performing due diligence on U.S. and Canadian insurance companies, so I had a

good feeling for what the state of ALM was, at least as it had existed four or five years ago. That was probably one of the few times that you'll see the product-side actuary precede the asset-side actuary. I'd also like to say that I've attended many sessions at this meeting, where there have been excellent speakers discussing ALM in one fashion or the other. Some of my remarks may be similar to those speakers' comments, but that's purely coincidental.

Because the title of the session was "Investment Strategy Formulation and Implementation," and because I'm an actuary, I'd like to define those terms, at least from my perspective. Also, this discussion is going to be couched in terms of my current company's environment.

The investment process, I would say, is asset selection taking into account current financial market conditions and liability or product-side needs.

Investment strategy is defined as a high-level policy construct. Investment strategy formulation, from my perspective, would be the quantitative work in the modeling process that you do in order to try to frame up what strategies may be appropriate. Implementation is the real-world impact you have on the portfolio management process. Portfolio management means both asset portfolio management and product portfolio management.

The organizational structure of my company consists of a corporate investment department and six operating companies of which VALIC is the largest. For my purposes, this means that the investment function is centralized. The product management functions are decentralized. You may be working under a different kind of organizational structure.

Bear in mind, however, that the organizational structure and the constraints will determine what strategies are possible for you. As a matter of fact, if you have only one company, you can argue that the constraints will probably force you into sub-optimal strategies. A brief list of constraints is shown below.

INVESTMENT STRATEGY CONSTRAINTS

I. Corporate
   A. Regulatory
   B. Rating Agency
   C. Capital Budgeting and Allocation
   D. Accounting
II. Investment
   A. Size ($ amount per security)
   B. Industry
   C. Permissible Asset Classes
   D. Investment Performance
III. Operating Company
   A. Growth
   B. Profitability
      1. Statutory
      2. GAAP—Amount and ROE
      3. Product Line
   C. Rating Agency Considerations

Keep in mind that senior management's commitment to ALM is integral. Unless your senior management buys into what you're doing and how you're trying to do it, you're not going to be making much headway.

I think the process of having senior management involved has been evolutionary. First we had the valuation actuary cash-flow testing requirement. This was the industry's initial exposure to ALM; since then, many companies have extrapolated and built on this. Some companies are oriented to ALM from a product-side perspective and other companies are oriented to an investment-side perspective.

At American General, we're attacking ALM from both sides of the balance sheet. We have commitment from the office of the chairman, the chief investment officer, and the senior management of each operating company. What makes this thing work? The answer is the formalized review or reporting process.

The senior ALM committee consists of senior management. It meets annually. The strategic ALM committee meets quarterly. In real life, this means that the senior ALM committee sets goals, broad strategic goals. The strategic committee prioritizes what has to be done. Finally, we have ALM work groups that meet as often as necessary to satisfy management's requirements.

In reality, the ALM process is very much a bottom-up process. There's a lot of input to, and feedback from, senior management in all our organizations.

I'm going to tell you a little anecdote. I car pool with a person who manages a high-yield portfolio. One day, tweaking me a little, he said, "I bought a bond three

days ago and I sold it, netting $75,000 for the company. What have you done?" Well, what value do we add to our companies?

I attended a session here which asked, how do we evaluate the performance of an ALM manager? The conclusion was that it is very difficult to do that quantitatively. We can't say we added $75,000 to the bottom line. I believe the best we can say is that we gave management some worthwhile advice and meaningful input.

Computers, databases, and systems are the tools that you need to formulate and implement an investment strategy.

For us, state-of-the-art hardware means the latest, fastest, and largest personal computers. I don't want to be an advertiser for Microsoft, but currently we are using Windows 3.0, and we'll probably be using Windows NT in 1997.

We have a dedicated ALM LAN system simply because our processing was slowing down everyone else'S. Integration of systems, including portfolio management investment analytic systems, and investment accounting systems, is really a requisite. We have our own investment database that contains information from our investment accounting system and other systems. It is the data foundation upon which our entire ALM process depends.

A cross-checking function is essential. Management likes to have results cross-checked as extensively as possible. If we have generated CMO duration, convexity statistics, or prepayment cash flows from one system, we'll cross-check them on other systems. And in the same view, management also will elicit the aid of external consultants, not only to check our numerical results, but also to check the methodology.

Utility software is software you use to do the type of analysis the other software won't do. The software wraps things up in a neat package for presentation purposes—for example, statistical analyses packages, report writers, colored graphs, and spreadsheets.

Analysis should be the quantitative part of the process for actuaries. The list below highlights key elements of analysis.

ANALYSIS—DEFINE OBJECTIVE

I. Assumption Formulation
II. Input Data Validation
III. Verification of Algorithms
IV. Interest Rate Scenario Generation
    A. Small Set
    B. Large Set
V. Reward Measures
    A. Present Value
    B. Accumulated Value
    C. Utility Weighted
    D. Scenario Dimension
    E. Time Dimension
VI. Risk Measures
    A. Definition of "Worst Case"
    B. Multi-Year
    C. Tail of the Distribution
VII. Sensitivity Testing
    A. Dynamic Feedback Information
    B. Change Assumptions
    C. Reiterate

Harry said that I would talk about risk and reward measures and so I will. Where we are now is what I'll call "evolutionary." We've been dabbling with a variety of risk and reward measures. We've been setting integrated ranges on these risk and reward measures so that we have, for example, different ranges for solvency measures, for competitive measures, and for profitability measures.

We are trying to eliminate those measures that are inefficient. In terms of risk measures, I would say for you to concentrate on the tail of the distribution types of measures. One example of such a measure is one called linear partial moments.

I'm going to conclude by saying, and I think other people have said this in the same or slightly different words, whatever you do you have to be accurate, you have to be clear, and you have to be understandable. To demonstrate what I mean, I will give you an example. What in the world does the present value of liability cash flow mean?

You must define what comprises liability cash flows. Are premiums included or are they not? Is new business included or not? What's your present value discount mechanism? Is it a 15% return on capital or some other hurdle-rate target? Is it a Treasury yield curve? If you are doing multi-scenario analysis, is it the series of one year forward rates on each one of your scenarios?

You also have to be certain that everyone understands what you mean. Believe me, depending upon how you go about defining these items, you're going to get wildly divergent results.

I will say that our most important objective relates to our discussion about senior management's commitment. These people are your ultimate clients. My ultimate clients are corporate senior management and the management in the operating companies. As long as we can meet their expectations, we are doing our job.

Mr. Frederick W. Jackson: I work for Scudder. We're an international investment firm. Nationwide, we have about $100 billion of assets under management. Since 1981, we have been focusing on insurance companies. We have about $30 billion of the total $100 billion in insurance assets under management. After 19 years of working in insurance companies, I came over about four years ago and, as they say, "joined the other side." I'm one exam away from getting my chartered financial analyst designation.

Investment people really do have a different way of viewing things. They also have really different language. I must put everything in context. I think the investment strategy always has to be in context of the ALM risk profile. That has been my job since I was hired at our company.

I try to work with 10–15 different portfolio managers who deal with our clients. They always start with duration, modified duration. They want to know what the duration is. I agree with Andy that duration is not the greatest measure, but it is a starting point for our folks. I have to get by that with each client and with each portfolio manager, so that's where I start.

My presentation reflects how we relate to senior management, marketing people, and the investment professionals. It's very much a communication issue. I try to keep things simple so that we don't get bogged down in so much detail. These individuals are not interested in many of the actuarial issues. They want to know what will show up that they can deal with, and what they can do to change the performance of the company and the way they keep score.

Liability structures are always key drivers. The return targets that the investment manager has are always a function of the company's market presence, its desire to maintain a marketing capability in a certain area. With annuities or other products, the yield-curve shape affects the current profitability of products that you're going to be marketing. It's more difficult right now to make a profit on single premium deferred annuity (SPDA) products than it may have been over the past ten years.

I will switch between new business and in-force management in my discussion. Regarding constraints, I'll skip fairly quickly over the investment management guidelines (credit quality, asset allocation/diversification, duration targets, capital gain/loss authority, ALM mismatch tolerance), because I think Denny covered them fairly well in his discussion.

The regulators and rating agencies are starting to have a greater impact. With the new risk-based capital proposal on C–3 risk, we may be looking at ALM becoming a required part of your C–3 risk calculation capital requirements.

Duration is also an issue at the rating agencies. Without really knowing why, one or two agencies tend to insist that you have duration mismatches of no more than one. That's not always the best way to optimize your return goals.

Regarding interest sensitivity, flux is a flag that indicates which CMOs are volatile. It points regulators towards companies with increased volatility in their CMO portfolio. They'll look at the cash-flow testing at that point. Standard & Poors has a mortgage-backed security capital "hair-cut" measures the volatility of mortgage-backed securities in different interest rate environments.
A.M. Best has an annuity initiative this year. I don't know how many companies this has impacted. A.M. Best has a questionnaire that asks you about your individual annuities and group annuities, distribution system, surrender charges, etc. They're asking many companies a lot of questions.

I've talked to the people at A.M. Best. They want to take this information and use it in their analysis of your firm to see whether you have a good ALM discipline in place. If you don't and you're carrying either assets or liabilities or assets and liabilities that are interest sensitive and you don't have a good capability in place, it's going to affect your rating. So these rating agencies, by means of their constraints, are getting involved. They're trying to hold our feet to the fire.

Let's discuss duration management again. I think scenario testing is a better measure. It gives you a better feel for your risk profile. This particular company we worked with, had a problem with the modified duration mismatch. I agree with Andy that this is not a good measure of negative convexity for mortgage backed securities, but it is a starting point for our clients.

A company asked us to look at its annuity portfolio. The company had a duration of liabilities of around three years and a portfolio interest-crediting strategy. The company had an asset duration of around ten years. It had no idea that there was this kind of duration mismatch. We told the company that this is the kind of thing that it is really looking at.

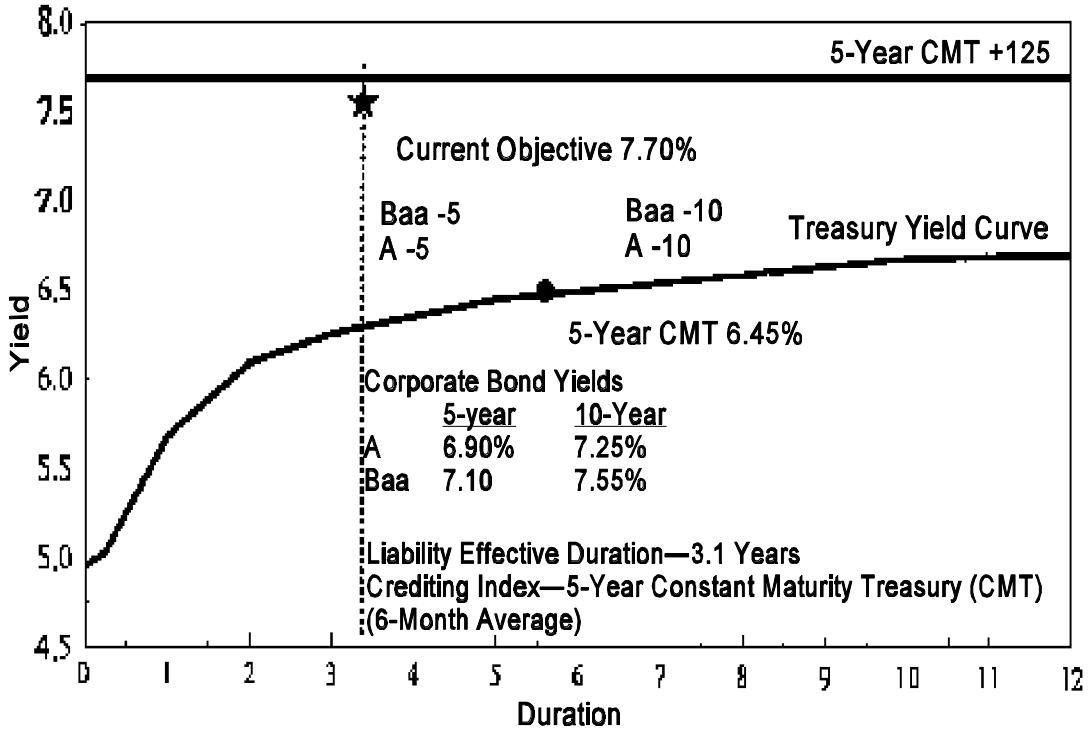
You're talking about the rising interest rate environment being the major risk. The risk is exaggerated when you have such a large duration mismatch. If you had a duration mismatch of 1.5 instead, and your initial duration of your assets is around 4.5, you would have a much more narrow risk profile. This perception was new to senior management. This company realized they had a little problem.

Going back to duration, at another company there was duration mismatch of 2.5. We haven't finished work at the company. Some scenario testing will help us get a better handle on what to do about a mismatch of 2.5.

We all agreed that perhaps it was too much of a mismatch. We had been working over the last nine months to get that mismatch down from 2.5 to 1.9. As of September 1996, the duration mismatch is around 1.5, and we're evaluating whether or not that's an appropriate place to be right now. We didn't move dramatically, pr instantaneously to fix that by purchasing derivatives or restructuring the portfolio. It was a slow reduction in mismatch over time.

I can't do Chart 1 justice in this short time frame, so I will point out that this case is a new business situation where the yield target for the investment manager is 7.7% and assets back an SPDA.

CHART 1
SPDA ASSET/YIELD DURATION OBJECTIVES



With the competitor rate being the five-year constant maturity treasury (CMT), the company wants to be able to credit 6.45%. This is just to get an idea of what a company does when it realizes it can't get there. The highest yield it can get and maintain investment-grade quality is Baa bonds. At 7.55% it fails to meet 7.7%. If the company is looking to get maybe 150 basis points instead of 125, it is well short.

So what do you do in that situation? The company credited less than the five-year CMT, and it is not selling much business. A conservative approach—it is letting other lines sell. The marketing people aren't happy that the company chose a conservative approach.

Let's contrast that company with another company that I dealt with probably three or four years ago. The second company had a very, very popular annuity product—the 10% SPDA.

A 10% total commission is one that everybody recognizes as quite high. There's a "toaster" interest rate of about 150 basis points over renewal. You have 85 basis points in the first year. We're looking for an 85 basis points spread in the first year, and a 235 basis points at renewal years. Now if that isn't an invitation to hot money, I don't know what is.

In addition the company had a "market" interest crediting strategy and a duration mismatch of 5 to 1. The assets were about 5 or 5.5. Liability duration was around 1.

We suggested a shorter asset duration. When I started with Scudder about three-and-a-half years ago, our investment manager had been doing a good job comparing total return to the benchmarks. He wasn't completely comfortable with what was happening with the incoming money, and the investment department at the company was not either. So we were asked to look closely at this.

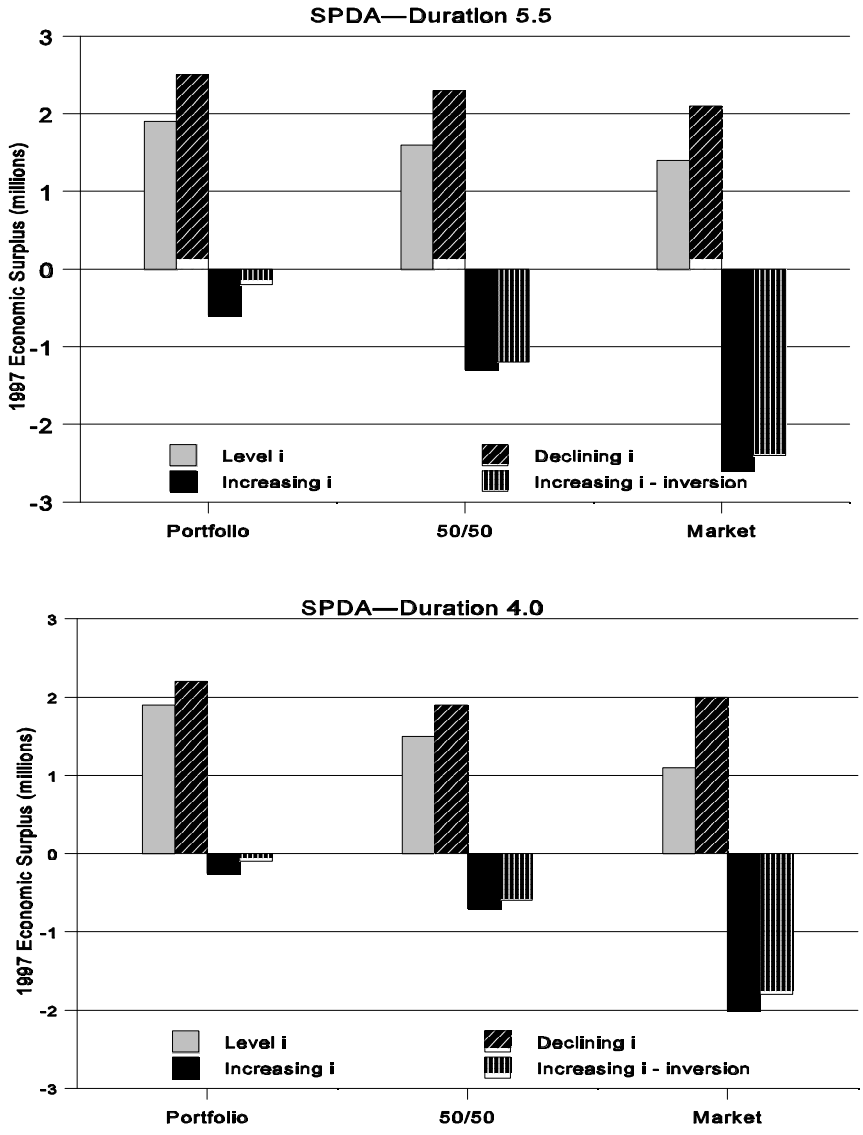
We made a recommendation based on our work: shorten the asset duration, look at interest crediting, consider a portfolio interest-crediting rate instead of a rate based on current market returns, reduce the commission level, and close the "toaster" gap.

Chart 2 is self-explanatory. It was made for senior management to try to reach them without a technical focus. We said to senior management, "This is what your risk profile looks like. Here the gray is the level, striped is declining, and the black is the increasing interest rate environments." Satisfactory if interest rates stay level or if they fall. On an economic surplus basis at the end of five years, however, if interest rates rise, you will really be impacted negatively. This was news to senior

management. We suggested that they move closer to a portfolio interest-crediting strategy that has a liability duration closer to 3 than 1. We also suggested that they shorten the asset duration. This would result in a not- too-dissimilar result if interest rates stayed level or fell, but they wouldn't be impacted negatively if interest rates rose. Here you can't separate the investment strategy and the interest crediting strategy. They are part of a complete ALM picture.

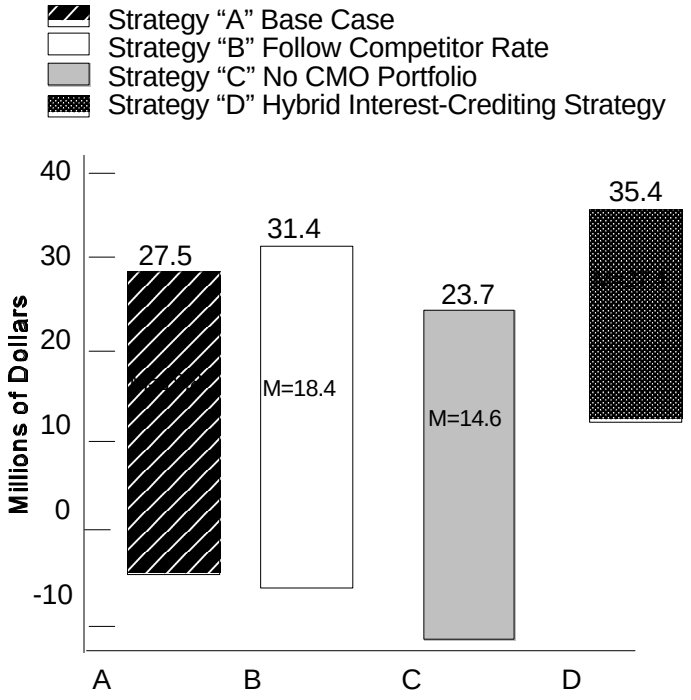
Moving more towards the scenario testing approach, let's look at another company. We chose 38 scenarios, but not more because of run time. We wanted to get something done and in front of management before it lost interest completely, so we dealt with 38 scenarios. I don't know why its 38 scenarios instead of 50 scenarios or more, but I took the lead from the client.

CHART 2
NEW PRODUCT INTRODUCTION SUPPORT



In Chart 3 we're looking at volatility results, a mean or average result. This is a stock company. When we initially started looking at surplus, I wasn't very comfortable that this was the only way to look at the results, but we started here. The mean result was an increase in surplus over five years of $18.8 million, and we had some volatility in those 38 scenarios with a high of 27 and a low of –0.5.

CHART 3
FIVE-YEAR SURPLUS DETAIL FOR FOUR STRATEGIES
38 ECONOMIC SCENARIOS, M =MEAN SURPLUS INCREASE



Surplus Volatility Summary	"A"	"B"	"C"	"D"
Level Scenario Surplus	23.5	21.5	19.1	31.2
Mean Surplus	18.8	18.4	14.6	27.4
75th Percentile Surplus	26.1	27.6	22.8	33.8
25th Percentile Surplus	14.0	13.0	9.5	23.8

We explained to management that Chart 3 was indicative of the risk profile for this annuity block of business. When we took a look at some alternative approaches once we had a baseline risk profile established, this is what management thought it was doing currently. We asked what happened if it adopted a marketing interest crediting strategy instead of the portfolio interest-crediting approach of the baseline strategy. A similar mean of $18.4 million resulted, with more volatility around that mean.

Another alternative strategy was unloading a CMO portfolio, which we would have thought had more volatility, and increasing the size of the noncallable bond portfolio. The result was surprising. It lowered the mean. We discovered that the noncallable bond portfolio we radioed up was a very high-risk portfolio. The default rates were expected to be very high, so this was not viewed as a surplus-enhancing move.

The last scenario we looked at in this initial go-around was a modified interest-crediting strategy, a hybrid interest-crediting strategy. Instead of going with a 183-basis-point fixed spread, we looked to see what would happen if we didn't maintain that fixed level throughout. If interest rates were going down, we looked more closely at what the market demanded, what the competitor rate really required us to credit. We tested some runs reflecting the fact that the company would not always get 183 basis points. In some situations it would get 200 or 250 basis points when market conditions allowed.

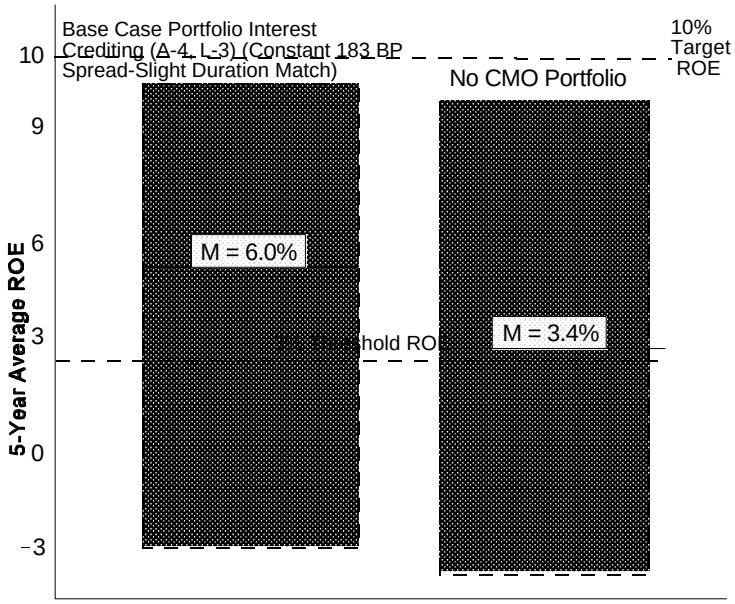
This strategy gave the highest mean return. The mean was around $27.4 million. We showed these results to senior management, but we also put the results in a slightly different context.

Recall that this was a stock company that was very much focused on ROE, because ROE obviously impacts its stock price, and its target return. In Chart 4 I have changed the results a little bit from the company's target ROE. The company was below its target of 10%. I have set the target at 10% ROE. We set a 3% threshold ROE. The baseline run with the surplus of $18.8 million produced only a mean five-year average ROE of 6%.

This was unsatisfactory, so we looked at the three alternatives. The noncallable bond portfolio alternative was even less satisfactory. In Chart 5 the mean ROE was less than 4%. The market-crediting strategy had an mean ROE almost identical to the baseline run of 5.9%, but a lot of volatility around the mean. The one that was most interesting, that we're still talking about with the company, is the hybrid-crediting strategy (Chart 5).

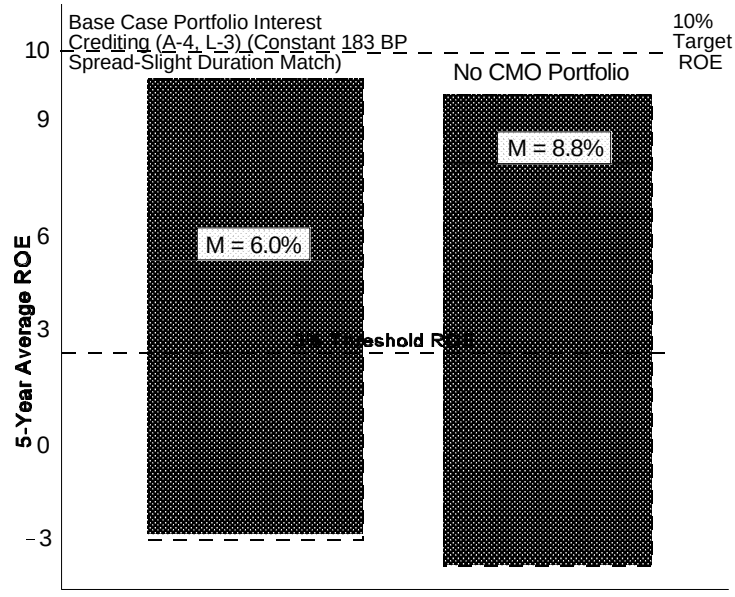
The mean ROE was more on the order of 8.8%. It got rid of some of the scenarios that actually produced negative results. Some are still below the threshold level. The downside risk that we'd have to consider is whether we'd hedge there or determine what we could do about specific scenarios that were unacceptable. The mean result was up at the 8.8% range, and some results were actually above the threshold. So this is where we are with this company right now.

CHART 4
STRATEGY "C": REPLACE CMO PORTFOLIO
WITH PROPORTIONATE INCREASE
IN NONCALLABLE BOND PORTFOLIO



A = Asset, L = Liability, M = Mean

CHART 5
STRATEGY "D": HYBRID CREDITING STRATEGY



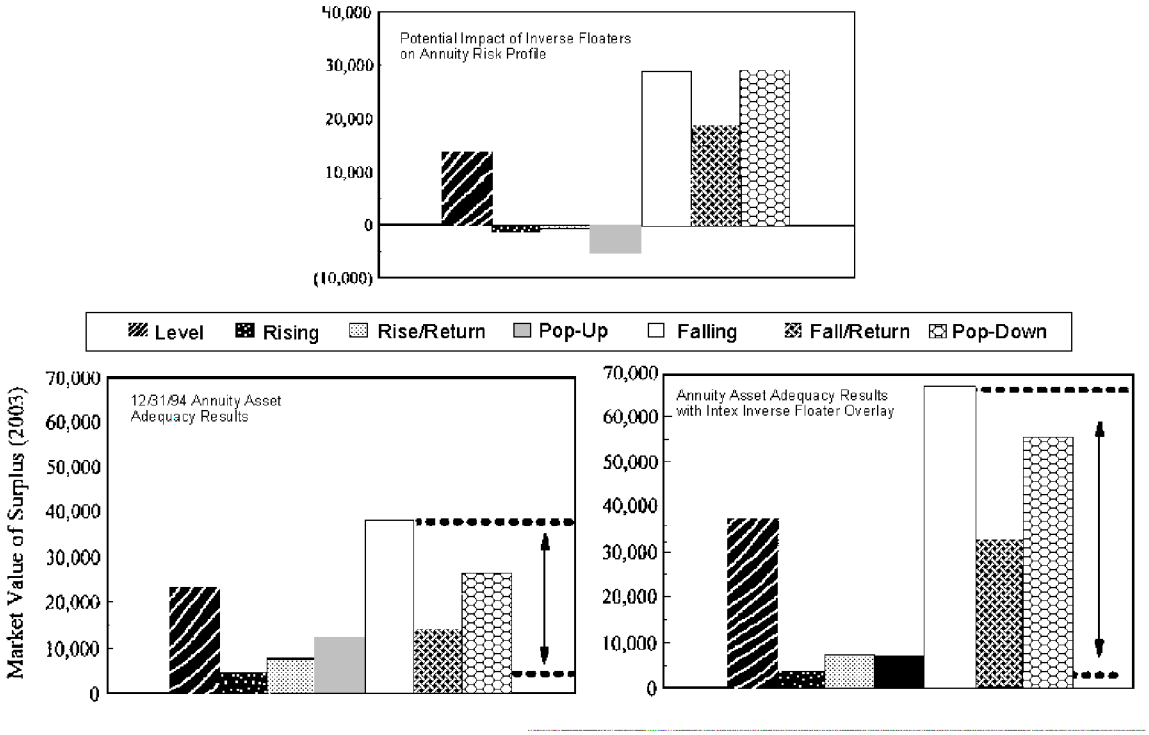
A = Asset, L = Liability, M = Mean

A company came to us and said, "We think we have a hedging strategy in place, for an SPDA portfolio." Can you help us look at this and evaluate how good a hedge it

is?" We looked at it and found the company's strategy was to purchase CMO inverse floaters.

I did some modeling using INTEX. I could have used CMS, or I could have used the Salomon Brothers Yield Book, but we used INTEX. The graph in Chart 6 shows a picture of the market value at the end of ten years, which was part of the issue. At the end of ten years, what would happen to those CMO inverse floaters?

CHART 6
"INTEX OVERLAY" DEMONSTRATION (TAX EFFECTS IGNORED)
CHANGE IN MARKET VALUE OF ASSETS



In rising interest-rate environments the three bars below the line would have a worse market value. In level or falling interest-rate environments, the CMO inverse floaters would have a very positive increase in market value.

We overlaid these results onto the year-end asset adequacy results, which made it clear that the investment position was not a hedge of the annuity business. The position actually increased risk in rising interest-rate environments, but only slightly. It also appeared to improve both the level interest-crediting scenario situation and the falling interest-rate situation.

I approached our CMO expert, someone probably with Andy Chow's expertise, and said, "This looks reasonable to me. Our portfolio manager thinks it's reasonable."

The CMO expert said, "It's reasonable if you are looking one or two years out." If you had a stable market for CMOs, one that was going to be there in ten years, he said that this was a good analysis. However, he said, "I don't trust the situation right now." This was in early 1995. He said that the CMO market really was not solid. He was right. We went back and made a recommendation that the company undo the position. It sold the CMO inverse floaters, made some profit, and the CMO market has been shaky ever since.

So this was not a case of good modeling going forward because of the context of looking ten years out. Be careful about your models. Question them.

From the Floor: I enjoyed all your presentations, and I got a lot out of all of them.

I'd like to ask Andrew Chow a question about the arbitrage-free interest-rate generator. There has been some discussion about using arbitrage-free generators for a realistic generator, and I've been told not to use an arbitrage-free generator when doing investment strategy. I've done it, but I've been told not to. I'd be interested in hearing from some of the panelists, especially Andrew, what they might have to say about that.

Mr. Chow: This is just from the investment perspective. I know that from the modeling perspective sometimes people don't like to use arbitrage-free generators because you sometimes get strange results.

If you do 10,000 paths, you're going to get some paths with 80% interest rates or 1% interest rates.

From the asset perspective, you have to use an arbitrage-free path interest-rate generator. If you don't, you're not going to get good market values for your assets. Given that you trade those assets, or at least we trade those assets somewhat frequently, the last thing you want to do is sell a bond that has a market value of X, and sell it for X minus 1%—and do it repeatedly just because your interest rate paths were not more realistic. You must determine what the market value is.

From the Floor: And that might not necessarily be a realistic reflection of where the rates are heading. But it's perhaps more a reflection of the premium that the market might require for investing in longer-term securities. So it might be a good mechanism for pricing, but it's not necessarily the best mechanism for modeling and stochastically projecting over longer periods.

Mr. Chow: I just have one other point to add. On the liability side, you trade your liabilities every day, you sell your liabilities every day at a particular price—usually

par—but with a particular structure, the market value of that liability may not be par.

For product pricing purposes and product design purposes, you must use an arbitrage-free interest-rate generator. I would also use it for business planning purposes because I'm on the asset side. I'd still use an arbitrage-free interest-rate generator. If you view extreme interest rate cases as particularly anomalous, there is going to be one out of one thousand paths. Throw it out.

From the Floor: I have a question for Andy. Andy, you were critical of the duration measure. I was wondering what other risk measures you might prefer?

Mr. Chow: As Rick mentioned, the thing about duration is it is one of the few measures that actuaries and investment people have at least pseudo-defined—95%—so when we're talking about it we understand each other.

As a result, it does get used. Keep in mind that duration becomes less and less valuable and more and more distorted the more options you have involved in your portfolio. If you're talking about a GIC portfolio, where the optionality on the liability side is not very high, and you're matching it with fixed-maturity corporate bonds, use duration, and use it all the time.

On the other hand, if you're talking about a portfolio that has a lot of mortgage-backed securities, a lot of callable, sinkable corporate bonds, and you have annuities, then duration is much more impressionable. At that point in time your scenario analysis is a way that you can get some sort of idea about how your bonds will perform in your portfolio, and your liabilities will perform up and down for certain interest rate changes without requiring an excessive amount of work.

From the Floor: I will just add, I agree with Andy: it's a way to get the two sides talking. It's a common ground. It does fall apart, but it is a way to get the two sides in discussions and that's critical.

I agree with what was said. I would say that in terms of any short-term analysis where you're going to buy and sell an asset, you need to be arbitrage free. That's what I term "trading."

If you're going to do longer-term accrued liability analysis, I think it's probably not as necessary as a condition. In other words, I tend to think about using just a variety of scenarios and understanding them. But that's not the case where I'm getting a value and then selling or buying something in a market, so I think that's an important distinction.