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Session 62PD Pension Surplus Management

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Summary: Most pension sponsors prefer surpluses in their pension plans. To get the most benefit out of having a surplus, the sponsor must set goals and manage assets to meet their objectives. This session deals with asset/liability management and developing investment policies.

Mr. A. Eric Thorlacius: I think we're very fortunate to have an extremely distinguished panel. Each one of these speakers could easily speak for the entire session. We have four different speakers with different perspectives to talk about pension surplus management.

Professor John Mulvey from Princeton University is going to take what I would call an academic perspective, although he certainly has plenty of experience in the real world, and has worked with clients such as Pacific Mutual, American Express, my own organization, Towers Perrin, and many others, and has certainly presented many innovative ideas in the area of asset/liability management.

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Following him, we have John Sweeney, who is the chief investment officer of USF&G; and one of his responsibilities there is leading the pension fund management. John wears a number of hats, and has a long history in this area. He has done many innovative things. In addition to leading the pension fund, he also leads the investment management area within USF&G of an organization called Falcon Asset Management that has \$12 billion in assets.

Our next speaker was originally going to be Ron Ryan from Ryan Labs. Unfortunately, Ron was unable to make it, but I think we're privileged to have Douglas Love as his replacement. Doug is the managing director of Ryan Labs. For those of you who do not know, Ryan Labs has about \$7.5 billion under management, about half of which is pension fund money.

Finally, I will take the consulting perspective. I work for Towers Perrin, and have worked with a wide range of different pension situations. I'm going to turn it over to Professor Mulvey to begin.

Mr. John M. Mulvey: I'd like to describe some models that have been developed by various companies, and also just share with you some of the thoughts I had about where the direction of asset/liability modeling might be going in the future. The title I've given here is "Wealth Management Strategies for Long-Term Investors."

Actuaries have been superb at recognizing that decisions made today have important implications for the long term. You've developed effective methods for measuring the health of pension plans, insurance companies, etc. I wrote an article by the name of "It Always Pays To Look Ahead," and I think you can empathize with that title. However, as the world of finance has become more complex in global and scope, the actuarial profession will need more precise tools for evaluating financial health.

I teach at an engineering school at Princeton, and engineers study disasters quite often. And over the past years, we've had a number of financial disasters; the savings and loan debacle, Orange County's, Barings, Lloyds of London. These events, I believe, could have been largely avoided by employing the emerging technology for multiperiod asset/liability management. I will focus on this technology.

I have some references to share. One is notable. It's the handbook that North Holland has put out called *Finance*, and it's a 1,000-page reference on all the different, modern techniques in finance as of this year. So that's a good background reference, and I have written an article in there on asset/liability management.

Now, how do these disasters occur? First, let's think about the notion of risk and the many faces of risk. Most indicators of risk, such as data or volatility, involve individual securities. Some measures attempt to assess the overall risk into the entire market.

Asset/liability systems depict a natural evolution in their progress of risk analysis. These steps can be depicted as a risk-analysis ladder. This is our risk analysis ladder. And as in a tennis ladder, which some of you might have been in recently, it gets more difficult as you move up this ladder. At the bottom of the ladder, we look at individual securities and analyzing risk as we saw before. Then one looks at the second rung, which is Markowitz's model, mean variance or other indicators of risk for general markets.

As we start to move up the ladder, we end up with more complexity; looking at the dynamics of asset-only markets, moving into dynamic asset/liability models, and finally what I call total integrated risk management where you're considering not only the assets and the liabilities of an organization, but also the goals of an organization. So this is called total integrated risk management. At the top, full organizational risks are evaluated and managed, including one's goals. Most financial organizations occupy the first two rungs.

They fail to integrate the long-term impacts of their investment or liability management decisions on the total organization. In this regard, the financial disasters such as Orange County's are a result of not seeing where you were driving. Certainly, a sailor would not go out and bog without radar. How should a large institution or wealthy individual make critical strategic decisions without a radar-like system to help them to see further into the future?

Consider the long-term implications of today's decisions. A simple illustration is apparent, e.g., who puts aside money each year in order to reach a goal in several years such as funding a child's tuition or purchasing a retirement annuity. I face a decision of this type; I have three children, eleven years old, eight years old, and seven years old, who are headed for private universities, and perhaps, even Princeton.

How much should I save each year? I'm going to start today and put some money aside, and whenever I do this I have to add a little bit. Eric, do you want to add a little bit to the ink on there because the tuition keeps going up 3–5% above inflation each year?

Mr. Thorlacius: Add to income each year?

Mr. Mulvey: We have to add a little bit on the asset side and also on the liability side. How much should I save each year? Three issues complicate this decision. First, savings must be invested and reinvested each year between now and the last year of education, which is approximately ten years away, if she doesn't go to medical school. Second, the actual cost of tuition depends upon inflation. And for the past 40 years, tuition has risen 3–5% above inflation. Of course, investment returns are uncertain when measured against the saving goals. How do we achieve this 3–5% return above inflation each year?

Last, the notion of risk entails multiple issues occurring at a time that spans over a decade. A systematic process is needed in order to conduct the proper investment and savings strategy. Now what's the safest investment for Clare? Any ideas about where I should put my money to have the safest possible investment starting today? I've asked this question many times, but rarely have found a satisfactory answer. I won't ask the panel here, but what about the audience? What's the safest place to put your money? The least risky place?

From the Floor: Are you talking safe as related to your goals?

Mr. Mulvey: Yes, that's right. I want to have an investment that will minimize the deviation of the return relative to my goals.

From the Floor: T-Bills.

Mr. Mulvey: T-Bills would not really be that safe because they've historically had returns only at about the rate of inflation, and that's not necessarily guaranteed, of course.

I gave this talk at the financial engineering meeting a couple of months ago in New York, and I said perhaps someone will engineer a fool-proof product similar to the index-linked bonds in the U.K. Somebody in the Treasury Department must have been in the audience because they're now going to issue those bonds, which will pay somewhere around 3–5% above inflation. So, in fact, that would be the safest investment.

T-Bills will not be as safe because they're not guaranteed. It's difficult, in many cases, to find investments that move with your liabilities. But, in this case, the government is sort of helping us with these index-linked bonds that are coming out. At Princeton, they pay half the tuition of wherever my children go to school, so I have to be sure I stay at Princeton.

Now, let's discuss some examples of moving up this risk ladder. Today, leading international financial firms are beginning to manage their overall risk (what I call wealth management) over extended time periods. Prominent examples include the Frank Russell Company, Towers Perrin, Allstate Insurance, Falcon Asset Management, Unilever, and others. These systems assist pension fund investors, banks, insurance companies, and other leverage institutions.

The Frank Russell system is designed as a multitiered model to integrate assets and liabilities for an insurance company. This model consists of a large stochastic linear program. The objective is to maximize the firm's expected profit, net of penalty cost at the end of a multiyear horizon subject to constraints on meeting our county ratios and other general linear restrictions. I'd be happy to give you a reference to this, and that is also mentioned in that finance handbook.

This result is a large optimization model where you measure the future in terms of multiple scenarios. So instead of having a single scenario to predict the future, we're going to have multiple scenarios. And it ends up being a large optimization problem. As you might realize, it's quite an expensive system because it includes a variety of tasks for your future economics, variables, and economic returns.

The second example is the Towers Perrins system, and I'll let Eric tell you more about that system. It is used to buy pension plans in insurance companies, and is based on a stochastic program with decision rules that simplify the structure and allow you to do things such as how to sample test, or certain differences between the Towers Perrin system and the Russell system. Unilever, a \$50 billion company, uses its software to analyze its pension plans around the world.

The third example is the home account, and this system is used by individuals. There's a prototype of it on the World Wide Web. This system integrates assets and liabilities for individuals. So there are a number of examples.

Trying to manage your assets and liabilities in the context of your goals—the structure of these systems is an optimization model with discreet time and discreet scenarios.

Let me just say that these methods require a vast number of computations because you're basically taking into account future paths, and perhaps just putting up the scenario paths will give you some sense of the complexity of the problems. But what you're trying to do is measure—decide today what to do, but then think of the future; what you're going to do if certain events occur. So you have to model contingent decisions and manage them in a way that you end up at the end with some solution that minimizes your risk over the long term.

So it's a complicated process, but it does depend on generating scenarios for future economic events, and also linking that to an investment that would manage your investments and your policy over time. There are a variety of ways of going about that.

So let me just conclude. As organizations move up to the risk ladder, there's a commensurate increase in the information technology needed to carry out an exercise. As you actuaries evaluate new products with complex payoffs, the asset/liability decision requires more realistic models beyond the scope of single period efficient frontiers. Long-term planning with probabilistic assessments becomes essential in this environment, and multiperiod approaches help an investor trade off the short and the long in the long run.

In summary, the three key phrases were: invest for a purpose. Think about the goals that you're using the investments for. Use asset/liability modeling leading to total integrated risk management where you would link the pension plans to the organizational objectives. Finally, financial engineering, which has become quite important recently, will lead to custom-tailored products.

And actuaries ought to be the ones who distinguish speculative investment strategies from hedging strategies. Instead of saying all options are bad and we shouldn't consider them, say some are speculative and some are hedged. The actuaries ought to be able to pinpoint which is which, understand the risks that are inherent in these types of instruments, and find mechanisms for managing a risk.

Mr. Thorlacius: And we'll turn it now over to John Sweeney who will talk about how some of these concepts apply in practice.

Mr. John C. Sweeney: The discussion that I'm going to go through really compliments what John Mulvey was talking about because it is the answer to the problem I'm going to portray here which is that we used the Towers Perrin system in the end to solve for this small problem, and it really reflects much of what John was talking about. What I'd really like to talk about is the challenges in pension fund management. I have already mentioned the fact that the system and the solution that we chose was to go with an asset/liability modeling (ALM) surplus optimization approach using Towers Perrin as a consultant.

But prior to that we had two other consultants on board, and I want to put it in the context of what was happening with USF&G at the time. They were asset-only consultants, and the answers that they gave versus the answer that an ALM system gave are considerably different. I'll briefly talk about the lessons we learned. I'm not sure that the asset consultants necessarily learned much.

What was going on at USF&G prior to 1993, until about the middle of 1992? For those of you who don't know, USF&G had been a very prosperous insurance company for close to 100 years. But in the late 1980s, it got off into a diversification plan that led them down the path of possible bankruptcy. A team was brought in in early 1991 to start the turnaround and try and save the company. It did save the company, and since then the company has been very successful. We are now one of the darlings of Wall Street.

But prior to that, there were some real questions about whether or not we were going to make it. And using the techniques that John was talking about, we solved the internal problems of the insurance company and we didn't even consider the pension fund at that time. At the end of 1992 and the beginning of 1993, we started taking a look at the pension fund and what was going on. At that time, the pension fund was also being run out of the human resource department, which is very typical of most large corporations. I would suggest to you that it's probably inappropriate for most large corporations.

I was called in as a chief investment officer to sit on the board of the pension committee and analyze what was going on. The first thing we did was try to figure out what the drivers were—the financial factors that we had to look at given USF&G's position.

Looking at it from the business driver side, it's obvious that things were going on in the work force, and I'll come back to that in a second. The work force at USF&G was changing dramatically. The demographics were changing with the change in the work force. We were one of the original downsizers, or reengineers, if you will, but we were forced to do it. Elimination of about half of the work force in one fell swoop, had an impact, obviously, on the pension fund, the demographics, and so on.

Payroll levels were changing, and wage inflation is a constant that you have to look at. We were aware of that driver. The benefits offered and the payout levels were also influx at that time and we were trying to figure out how to cut expenses, the usual associated problems with the turnaround.

One of the things that we worried about was the status vis-a-vis the PBGC list—the black list, if you will. We were worried about winding up on the PBGC's 50 most underfunded funds. Now, we didn't want to wind up there. One of the problems at USF&G was it had an investment group and a pension consultant who had a timing mechanism. He timed the market, and he timed it with the pension fund, and he kept them out of the bull market in the 1980s.

He was in cash the entire time, but he had a very creative actuary, and the actuary changed the assumptions. I know that he did it all in good stead. He was a fine member of the actuarial community, but he had them convinced that there was a 120% funding level to their fund, and that it was in great shape. An outside consultant from Towers Perrin found out that USF&G was about 80% funded. The actuary's timing system hadn't worked, and we were in cash.

I took over the pension fund in late 1992. It was sitting in cash and had been sitting in cash for around seven years and it was not matched to the liabilities in any way. And this was a strategy. Mind you, this is a large company that should have known better. The first thing we did was get rid of the investment group. We sold it, and it's actually still in existence, so watch yourself. We did have this PBGC issue because we were underfunded. We finally recognized that particular issue, but we didn't want to wind up on the PBGC black list.

Finally, the contribution levels were a cash-flow issue for a turnaround situation. We had all these things to worry about, and it made it critical that we make some good decisions and plan for the future.

I won't go through the financial factors. The discount rate, incidentally, was a factor in justifying the 120% funded ratio that it had in the year before. That changed dramatically. Asset-return assumptions changed dramatically. Expense levels and corporate financial objectives had changed so we were forced to change.

We actually did take a long-term view, as John indicated, and worried about where we were going to be 3 to 5 years out, from both an income and a balance sheet perspective. Finally, there were the applied benefits option (ABO) liability, and the associated problems that come from that.

So that's some of the background. I didn't mean to spend as much time on it. But you'll see that these things created a unique situation at USF&G. The funding level implications could have been dire for us. Although we were aware of the fact that if the ABO exceeded assets at year-end, the difference might be covered by these existing balance sheet accruals or a direct charge to the shareholder equity. The asset-only pension consultant didn't appear to be aware of that, and that became an issue later on.

If the plan was underfunded by a dollar, as you know, the equity charge that was on the balance sheet would reverse, and a prepaid expense would hit the balance sheet. At that time, the charge would have been approximately \$100 million, which, in a turnaround situation, could have been very dramatic for us. I'm pointing all this out simply because the consultant is in a subset of an actuarial

consulting firm, so this person should have known better but didn't pay attention to that at all.

The firm was going to do one thing—the thing that it does well. I'll show you what that is. But the problem we had was, if we missed on the ABO, we would have a major hit to the balance sheet. We have a major hit to the balance sheet, and the turnaround situation, that was shaky to begin with, could have really put the nails in the coffin. So it was a major problem for us.

The turnaround was underway in 1993 and did reduce employees from 12,500 down to 7,500. Actually, we got down eventually to about 6,000 people. And our focus was really on operating earnings and surplus adequacy, and that was not just the surplus of the pension fund, but surplus of the corporation itself for the two insurance companies.

Among the original asset actuarial consulting recommendations was to set up a game plan. They developed a new investment policy or game plan for the company. They evaluated and selected investment managers and then suggested the set of investment managers. They said they would go on and evaluate the performance on an ongoing basis. So they were going to give us a new investment policy. They were going to select all the managers that we needed to install the policy. And finally, they would then measure the performance. That's what an asset consultant does mostly.

The problem with that answer is that it didn't at all address the fundamental problem with the liabilities. They didn't look at it. They should have been aware of it. As I say, they did have an actuarial consulting arm to it. And after we pointed it out to them, they came back and said, "Oh, we were going to look at that eventually," but it was always after the fact. The investment policy was an issue, but it wasn't an issue of hiring a new manager or set of managers, or even checking out their performance vis-a-vis some outside index that we couldn't care less about at the time.

The problem was this dramatic shift in the plan participants. Things were going on in the plant that they had to be aware of. The range of outcomes under uncertain economic conditions were going to be severe, and we had this PBGC issue with the black list and the ABO liability. The potential problems for USF&G were just awfully large, and we just didn't feel that changing managers, and then measuring them against an outside index was really going to do us much good.

From the Floor: Can you tell me why the black list was a concern to you? I understand why going broke was a concern.

Mr. Sweeney: It was optics, if you will. That's what senior management would call it. We had enough problems to deal with rather than having to deal with the PBGC black list. So it was just an optics kind of issue.

We figured out the correct approach in the end. We brought in Towers Perrin, and, incidentally, there's a bias here. Eric works for them. I'm a former Towers Perrin consultant myself, so I guess we did have a bias, and we did do asset/liability management. And that was the particular focus of the study itself. We looked at the issues surrounding the assets in the plan with the liabilities really as the pusher, or the push behind where we were going to go with our investment strategy. So we developed a fair understanding of the liabilities and the corporate financial objectives of the firm and what it wanted to achieve. We determined the appropriate funding levels and contributions based on these demographic and actuarial modeling changes that were going on. We had to do extensive modeling.

And then, finally, we're going to select, and we did select an optimal asset allocation strategy giving the specific liability characteristics. I don't want to get into the details of it, but it would shock you, as consultants in the pension area, to find that it was not a 60–40 distribution of equity to bonds. It was about an 80% bond position because we tried to take the volatility out of the liability and match it to the liabilities as best we could, and we put 20% or so into equity. We just got the money back into the market, which was critical.

But we matched up to the liabilities, and we recognized that we were going to take a hit in the event that the stock market should have a 35% year as it did last year. But we were committed to lowering the volatility of the liabilities and the impact on the balance sheet, and that was really our goal. So that's how we structured the portfolio.

Since then, I will say it's changed, and we're at a 50–50 allocation. But for the first couple of years, from 1993 up until just recently, we really matched up mostly on a bond basis. So it was 80% bonds. That was a solution. I won't get into the debate on whether there was another alternative.

We used the Towers Perrin modeling system. We did extensive scenario analysis, and then came back and figured out that was the way to go. And we recognized what we were giving up and decided that it was worth the effort despite the fact that a 35% year did occur and we had a bull market, although it was fun in 1994 when the market went negative. If anybody ever forgets that, we actually had a negative return in 1994 in the stock market. So it really, in the end, turned out very well, and we are now well-positioned. The turnaround has been completed at USF&G,

and the pension fund itself is back on its feet, and we're back into the market at about a 50–50 distribution of bonds and equities.

But what we figured we learned is that first, the investment strategy and the asset allocation has to be made within the context of the liabilities and where they're headed; not just the static liabilities, but with the growth of the pension fund. I should say the employee base and where that was going. Incidentally, the employee-based demographics changed dramatically because the older folks took an early retirement, and many of them were forced out who were in the intermediate ages. So we really wind up with a very young work force in the end with the reengineering going from 12,000 to 6,000 employees.

Second, the business organization strategy and company's financial objectives did have and should have a significant impact on the pension fund and how you do at making funding decisions. You should have good decisions independent of financial objectives of the company, but when the company is teetering on the brink of disaster, it's nice to integrate both of those decisions, and we learned that particular lesson rather quickly.

And now for my little diatribe. They overemphasize the selection of investment managers, and underemphasize the important issues of ALM and surplus optimization to probably the detriment of the industry itself. So if I have a plea, it should be that the asset consultants get their act together and start looking at this on an ALM basis.

From the Floor: You mentioned your current asset allocation is 50–50. Does that reflect your current view of the market?

Mr. Sweeney: We have done another extensive ALM study, and it's just being implemented. We're not driven by market decisions at all.

From the Floor: Are you getting less driven by volatility? Is that why you're taking on more equity?

Mr. Sweeney: Yes we were driven by volatility initially, yes. And now, it's not as much of an issue. That's right. We have a surplus, and we feel comfortable with where we are.

From the Floor: So now you're going to be focusing more on the asset allocation liability structure and less of volatility and less of trying to time the market?

Mr. Sweeney: That's right, and, hence, the change in the asset allocation.

From the Floor: Getting back to your choice of bonds. Bonds can be volatile, too, if you have them on a market basis.

Mr. Sweeney: That's right. The issue was the longer term one. We didn't have a problem with the bond allocation. It was tied in the liability structure here, and the analysis we went through was the duration. So we tied it to the duration of liabilities. I mean the T-Bills are not riskless in a five-year horizon. There's much risk out there.

Mr. Douglas Love: I'm going to try to focus on four or five very key points rather than an overall architecture. The first point is what we were talking about earlier when we were getting together before this talk. Asset/liability management for pensions, and including liabilities in the consideration of investment policy has been around for more than 15 years. Only in the last year or so have you begun to see conferences and programs like this reemerge; but it has been around for a long time, and it was a very hot topic in the early 1980s. But it started at least around 1978.

There are a couple of reasons why it's taking so long and will continue to take a while. One is the infatuation with market indexes, the idea is that if you're a good asset manager, you beat the market. The market is defined by a market index. So the objective, by and large, has been beat the market. The market is defined by indexes. And I'll come back to that in a little bit. One of the things that's on the horizon that I think is going to help this issue is that there is a great deal of growth in an unrelated consulting business called value-based management, or working with chief financial officers and boards of directors to maximize shareholder value.

Now, if you look at maximizing shareholder value, you're maximizing cash flow. Therefore, you're minimizing the present value of future contributions to a pension plan. But it boils down in one way or another to asset/liability management because you have to consider both sides of the balance sheet. You can't get to maximizing shareholder value by looking at, at least in the pension box, assets only. You have to go through liabilities in order to get to projected future contributions, as we all know. It's obvious that if you're going to maximize shareholder value inclusive of pension finance, you have to go through liabilities. You can't go around them. You must go through them. I think that this is going to be, in a way, the thing that's going to help the cause of this session.

The 15-year Treasury strip is significant because what has been drilled into people's heads is that stocks beat bonds. The empirical evidence is that the case resides in comparing the Standard & Poor's (S&P) 500 with bond market indexes. Bond market indexes have volatility, durations, interest rate exposure, or whatever you

want to call it that gives them a volatility only one-third that of stocks. In a rational market, there's no way you're going to be on the S&P 500 on average through time with an asset that has only one-third of the volatility. The market is not that crazy; it isn't priced that way.

You must have assets of roughly equivalent risk before you can expect them to have roughly equivalent return over the long term. The market would be inefficient if that were not true. As matter of fact, if you look at the Ryan Lab's Web page, you would see we run a daily competition that shows for every day, every month, and every quarter how the S&P 500 is doing relative to the 15-year Treasury strip. The 15-year Treasury strip has the duration of a typical company's pension liabilities. Now, that's relevant.

Financial Accounting Standard (FAS) 106, came after 1987, but the Securities and Exchange Commission adopted it for appropriate financial disclosure for corporations. The statement said that the retirement obligations (and this means postretirement, but they also applied it to pensions) should be marked to market using high-quality zero-coupon bonds. There are no high-quality zero-coupon bonds beyond ten years other than Treasury strips, and many of the ones that are out there are callable, which is not permitted under this statement. So the basic element, if you will, for marking liabilities to management is the strip curve.

What we're looking at is being long and short various positions in this space, and the liabilities or my future projected cash flows, which I'm short, and the asset portfolio, stocks and bonds, and so forth, is what I'm long. So the issue then is how do I somehow optimize the combination of these two?

But there are a couple of other issues that you need to be warned about when you look at this kind of a framework. Number one, we are dealing in pension funds with a mixture of real claims and nominal claims. What do I mean by that? A retiree is promised dollars in retirement. An active employee is promised to be indexed until his or her retirement date for wages and inflation relative to final pay. That is a claim on future consumption so that on the date the employee retires what he or she can buy in consumption is related to what the employee could buy in consumption from his or her salary just prior to retirement. That's a real claim. Bonds are nominal claims.

Let me give you an example of a real claim. Real estate has a lag, because you must wait for the existing tenants to get out of their contract to reprice the contract upwards. Something that's geared to inflation is a real claim because it's denominated, if you will, on consumption rather than in dollars. Stocks are real claims.

They are claims on real manufacturing capacity, franchise values, technology, or whatever.

I think the National Bureau of Economic Research has done studies that show that dividends, on average, get indexed for inflation. So what happens is that if you're thinking about things in this dimension, this dimension does one thing. It confuses the difference between real claims and nominal claims. The bonds are nominal claims, stocks and other things that might be on here are real claims. That's a real problem.

We had the good news, supposedly, of index bonds issued by the Treasury. We don't know what they'd be priced at by the market. History suggests that they might be priced at something like 3.5% real returns built into the yield. Now, if that's the case, and you're going to use those in the SEC/FAS framework and mark to market using these bonds, companies are in for a big shock in present valuing their active liabilities because that would be the appropriate set of instruments to do it from. If we use those bonds rather than those nominal bonds, it would cause a really big jump in the present value of those liabilities. These are a couple of considerations to think about.

Another thing that you have to think about in terms of mean variance or the average return volatility framework is the problem with convexity; it's something that's very important, and particularly and expressly so in the options market because that's what's being traded in the options market. Convexity is securities that have nonlinear behavior. You cannot put into a mean variance or standard deviation framework securities or situations that have a symmetric payoff and returns. Although it's done all the time, it's a no-no and it's very important in modern pension asset/liability management because there has been a major convexity problem in the last four or five years that has been introduced into pension ALM or surplus management. I've tried to give you a picture of it here.

Formerly, if this is pension assets, and this is pension liabilities minus pension assets, you had a 45 degree relationship between the two. That is, as assets went up, the surplus went up, and as assets went down, the surplus went down relative to the liabilities. But recently, things have changed and negative convexity, if anybody knows about options, is an undesirable phenomenon that has been introduced into the relationship. If I have a surplus, my surplus assets, in terms of their value to the stockholders, what stands between the value of pension surplus and the stock-holders, is now an excise tax.

Now, I can avoid the excise tax to get some of those assets by not making contributions and letting the liabilities grow relative to the assets by not making contribu-

tions, but that takes time, and time is money. So one way or another, the value of a dollar of pension surplus today is less than a dollar. Marginally, an increased dollar of pension surplus is worth less than a dollar to the stockholders because the only way they can get it is by either paying an excise tax or having to wait in terms of the cash loads to contribute less. So there's a present value lost there.

On the downside, if I'm underfunded I now pay extra PBGC penalty premiums, but only if I'm underfunded. So I have now induced a kink at full funding with a negative convexity object function, or you might want to call it target function. That gets very tricky and changes ALM optimization considerably, because whenever you have a kink payoff structure, it demands one of two things: either that you expressly own an option of some kind on the other side to hedge it, or that the asset mix has to dynamically change depending upon where you are. So you either need a dynamically changing asset mix to cope with this negative convexity, or you need to expressly own some kind of stock/bond-related options to hedge it out if you're going to have an optimal policy.

Now, I'd like to make one more point. I'm going to call this the Lessons of 1995 and 1996. Let's discuss a typical popular asset allocation: 5% stocks, 30% bonds, 60% domestic stocks, and 5% international stocks. That portfolio in 1995 returned 29%. That's good, isn't it? Pension liabilities, however, in 1995, because of the big drop in interest rates, returned almost 42%. So re-marking to market pension liabilities between the end of the year and the beginning of the year resulted in a 42% gain in the present value of the liabilities marked to market. So if you started out exactly fully funded, there would have been a 12% loss in pension net worth.

From the Floor: Can I ask you about combined pension liabilities? Is that essentially the present value of accumulated benefits?

Mr. Love: It's the present value of accumulated benefits marked to market. It turned out that after we did this exercise, Salomon Brothers came out with a similar exercise, and I think this number differed by less than 1%.

This went into reverse in the first six months of 1994. The bond market did lousy and the stock market did quite well. So the reverse of this gearing effect in 1994 so far. Another point to make is that, to the extent that a plan is underfunded, it amounts to leverage. I've done this exercise assuming full funding at the beginning of the year. If it were underfunded at the beginning of the year, this picture would have been even worse because now you're leveraged. You hold more bonds short than you have assets. So the leverage effect was even worse for an underfunded plan.

Now, here we get to kind of a punch line. The 30% bonds, you'll note, were invested in the bond market, the Lehman aggregate bond market index, as a matter of fact, which is the premiere or most popular index on which to charge and benchmark bond managers. I've already sensitized you to the fact that you want to consider hedging real claims with real assets, namely stocks and nominal claims with nominal excise, which are bonds. The real claims become nominal assets when somebody retires. They're not really indexed after that except on an ad hoc basis.

One of the reasons that people have resisted asset/liability management so far, I believe, is because the notion in the investment managers' and the CFOs' minds is that bonds will always underperform stocks and, therefore, they don't want to own them. So my point is if you don't want to own them, why own any of them? And they say, well, we can't take the volatility of being all in stocks. And now we all know that the volatility should be relative to the liabilities, not absolute volatility, but volatility relative to liabilities.

The second objection to owning more bonds came from long term investors. The misnomer is that, in the long term, stocks will beat bonds; we don't care about short run year-to-year volatility. I say, why are you managing every day your foreign exchange risks or foreign exchange exposure? Why are you managing every day your raw materials exposure in the Chicago futures markets especially if you're a long-term investor?

These are issues that are reemerging. I think that the impact, now that the actuary reports are in for 1995, will hopefully drive home to many people that they had a big problem in 1995. I hope that as senior management takes maximizing shareholder value more seriously, and goes through all the details including what it means for pensions, that we'll get somewhere. But it's not going to be easy because modeling liabilities well is not simple, and with pension legislation going through what it has gone through in the last four or five years, we have introduced negative option elements into defined-pension plans from the standpoint of negative convexity.

And this is sort of a political statement. We are killing the golden goose. Defined-contribution plans, which are very popular, I think, in the long run, for our society, are bad. The big problem with defined-benefit plans is portability. Two things with defined-benefit plans give them a problem. One is lack of portability, and two is lack of expressed understanding of what the employee, in fact, owns. If the employees value their pension at less than market value, then you can do a swap with them. You can bribe them. You can say, I'll give you cash or I'll give you a 401(k) plan in return for a pension plan. The stockholders are better off so they'll

do it. So if the employees value it at less than market value, the stockholders shouldn't offer it. So employee communication is key. I think portability, which a 401(k) has, is key.

We all know that the typical asset mix in 401(k) plans is not aggressive enough. In the long run, defined-contribution plans will not generate the average value of assets at the end that a defined-benefit plan will because an institution has a longer horizon and can absorb more volatility than an individual can. So, first, there will be less pension capital evolving over the long term as we move away from defined-benefit plans and to defined-contribution plans. And second, there's a hidden put back to the stockholders in those plans.

Some day, there's going to be another major market crash. I don't know when it's going to be, but some day it's going to happen. And what will happen is a whole generation of people with defined-contribution plans will find that purchasing any kind of a life annuity or whatever when they retire is very difficult. They're going to get on *The Today Show* and they're going to go to Congress and they're going to cry. And Congress is going to turn back to the plan sponsors and say, "Make them whole." And the plan sponsors are going to send their lawyers down with the contract. Plan sponsors will say, "The contract says we don't have any obligation. It was their plan, it was a defined-contribution plan." Congress is going to reply, we don't care; make them whole.

So I'm not that big a fan of defined-contribution plans, and I think asset/liability management is what should be used, and has been for a long time. I hope we get there faster than we have been getting there.

Mr. Thorlacius: A fascinating talk, as were the other two speeches. I am going to try to hit some highlights in my presentation, and then leave some time for discussion of all these different ideas. I'm sure there must be some interesting thoughts going through everybody's mind.

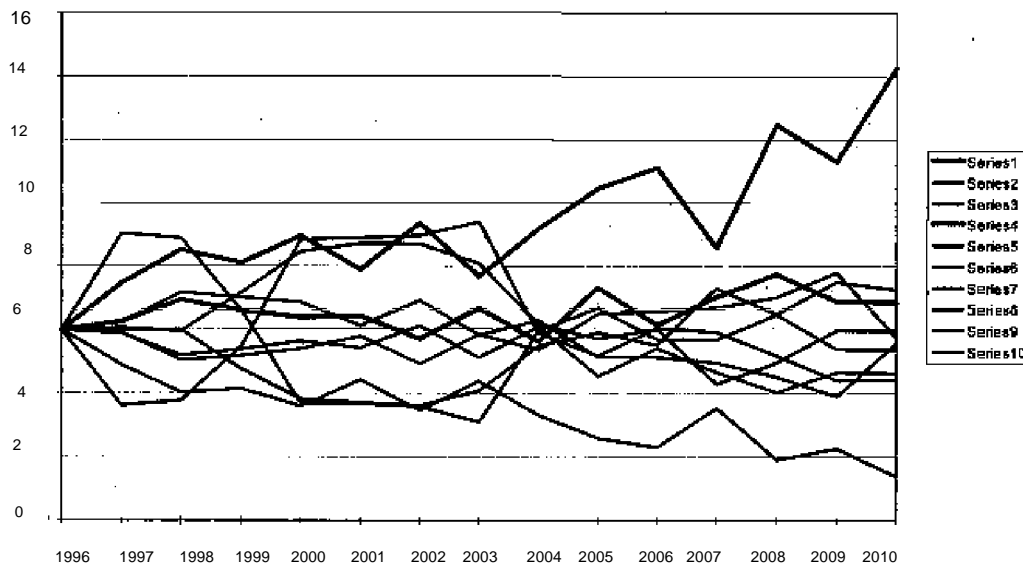
I would like to focus on one of the primary tools that I use with clients to try to explore these different issues, and that's simulation or modeling. It used to be called Monte Carlo analysis.

What is it? You create a large number of individual simulations that tell what happens to interest rates, or what happens to inflation returns on different asset classes. You repeat this process and it gives you a sense of the range of things that could happen as well as reward expectations. You start with some of these fundamental variables, and you build up to what the financial effects are.

One of the things that is often underestimated is the value of this technique as a useful tool for helping you understand what your objectives are, which I think is a very hard thing to do. It can help you understand the dynamics in the situation. So I think it can help you with much of the understanding and goal-setting issues before you get to the decision-making step. And I think that's something that's underappreciated.

I'm going to begin by just giving you a sense of the simulation concept. I'm sure many of you are familiar with it. What I've done in Chart 1 is I've plotted ten different simulations that come out of the model for which I have used long-term interest rates. It's just the first ten simulations. Typically, we'll use 500 or 1,000 simulations. You can see the different paths of interest rates. Some of them go up, some of them go down.

CHART 1
RANGE OF SIMULATIONS
T BOND YIELDS - FIRST 10 SIMULATIONS

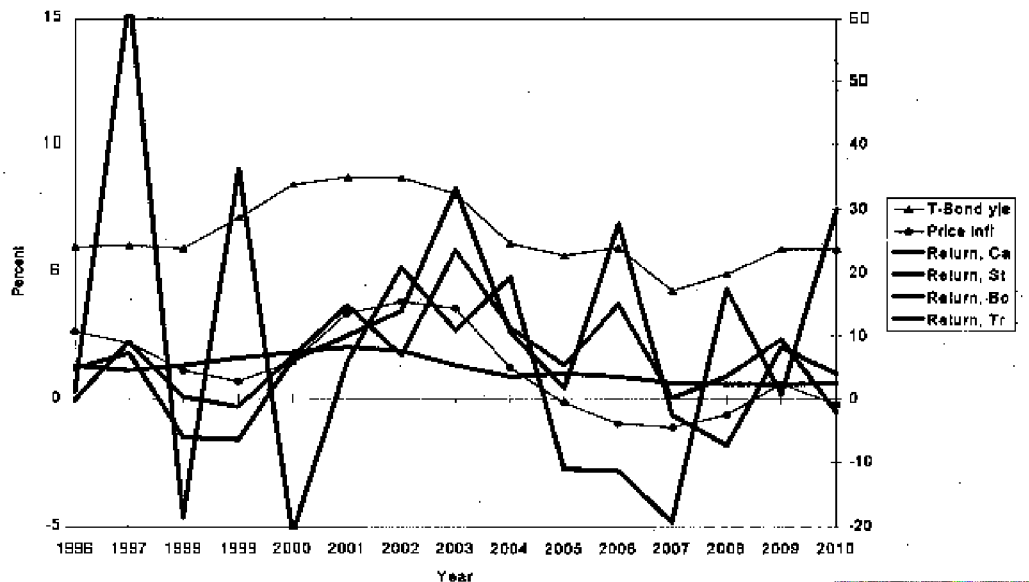


But interest rates aren't the only important thing. There's inflation that is usually important in pension plans. There are returns on the different asset classes that you would consider. In Chart 2 you have an individual simulation.

You see the spike which is stock returns. I'm not saying this is what's going to happen, but in this particular scenario, in 1996, stock returns are flat, and in 1997, they go through the roof. In 1998, the market takes a big hit. I don't know. It's just one of the simulations. You can see all the different other asset classes. If I had more time, I'd show you that if this is the way interest rates are moving in relation-

ship to bond returns, which is something that I've seen in many models, there's a real disconnect. They have interest rates and bond returns, but you get some strange relationships. You'll have scenarios where interest rates go up and bond returns go up. It doesn't happen in the real world, and that's one of the keys with modeling. To accurately reflect the dynamics, you do need a fairly sophisticated model.

CHART 2
INDIVIDUAL SIMULATION
MULTIPLE VARIABLES



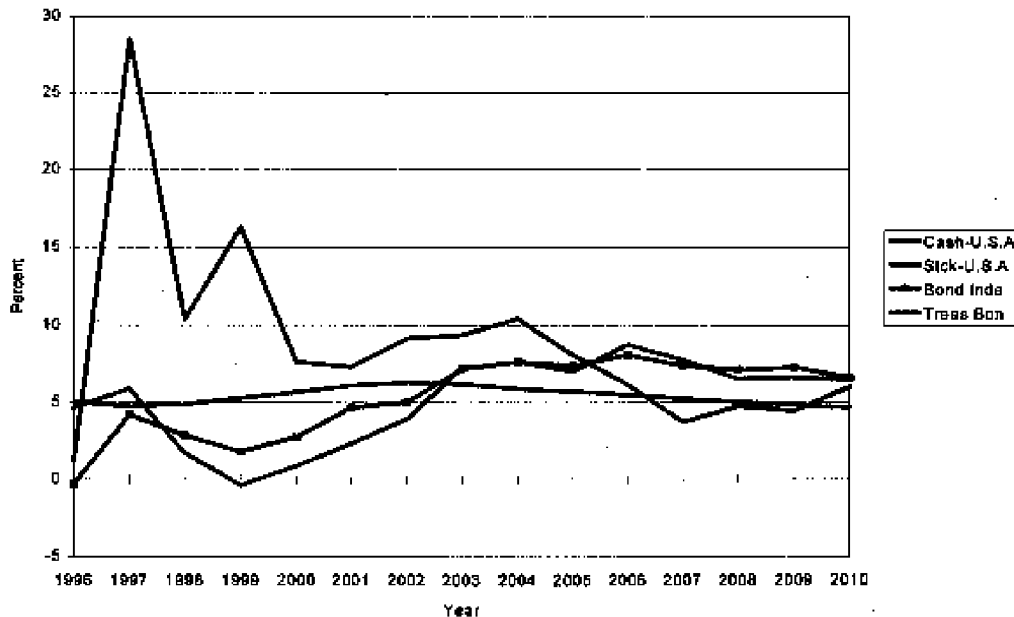
Another thing that I comment on is that many models really concentrate on the single period effects that you have. If you buy into this, there are long-term issues that are important as well, and when you study the financial markets, you find, for instance, things like equities. There's something there called a negative serial correlation. That is, if things go up one year, it's more than likely that the next year they will go down. Over the long term, they sort of balance each other out.

That is more dramatically obvious if you think of bond returns. Take the example of a ten-year zero-coupon bond. Interest rates change in that first year, and to keep it really simple, we'll just say buy and hold. If interest rates go down, that first year, the bond value goes up. If you go out to the tenth year, in every single simulation, you'll have the same result.

So you have all these simulations. Obviously, if you have 500 simulations, you're not going to be able to look at each individual one. So a technique that we usually use in presenting these results is we present the percentile distributions, and this is compound inflation (Chart 3). In something like bond returns, there might have

been a narrowing effect. With inflation, it actually sort of widens out and stays relatively wide. That's because inflation, unlike bond returns or stock returns, is positively serial correlated. If inflation starts to go up, it's more likely to stay up. If inflation goes up one year, your best expectation for the next year is not that it will not be lower. I think it's going to stay high.

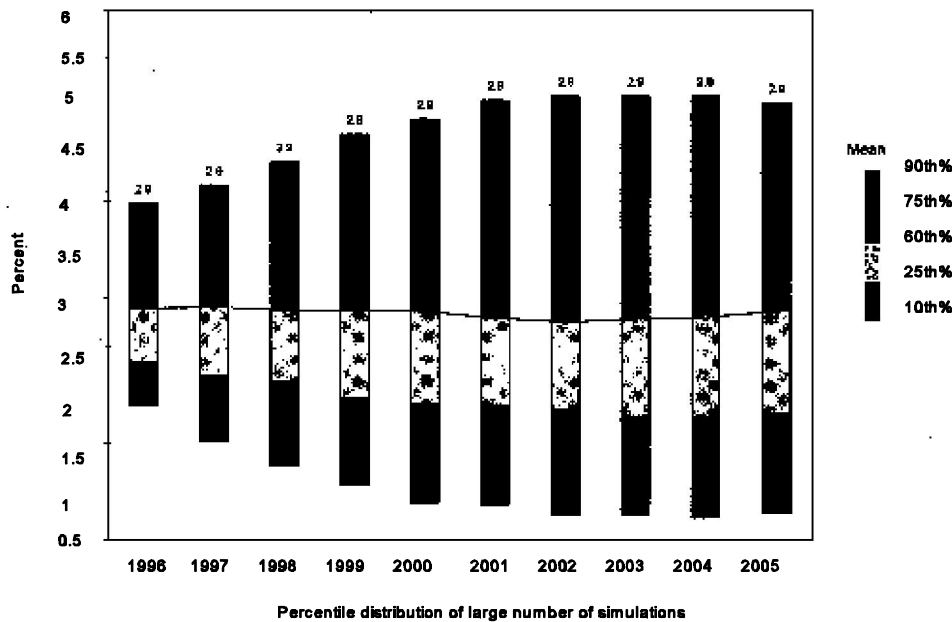
CHART 3
COMPOUND RETURNS



The percentile distributions plotted in Chart 4 are the 90th, the 75th, 50th, 25th, and the 10th. If I have 500 scenarios, the 10% is the level at which 10% of them are below that level and 90% are above. So on 500 simulations that means 50 of them are below and 450 are above. It's similar to the other things.

One of the things that I think is readily apparent to anyone who's heavily involved in the pension financing situation is it's not simple. We have expense methodology and funding methodology. I went to the minimum funding contribution session at this meeting; stunningly complex stuff. You have the PBGC issue. You have a bunch of different stakeholders. You have the plan sponsor and the beneficiaries. You have active employees, management, and different time horizons. There are long-term time horizons, and, as John was suggesting, those short-term effects can be very important. All of those different time horizons are important to varying degrees. There are quite a wide range of asset classes. There's different kinds of tactical choices. Contributions can have a significant influence.

CHART 4
U.S. PRICE INFLATION (COMPOUND)



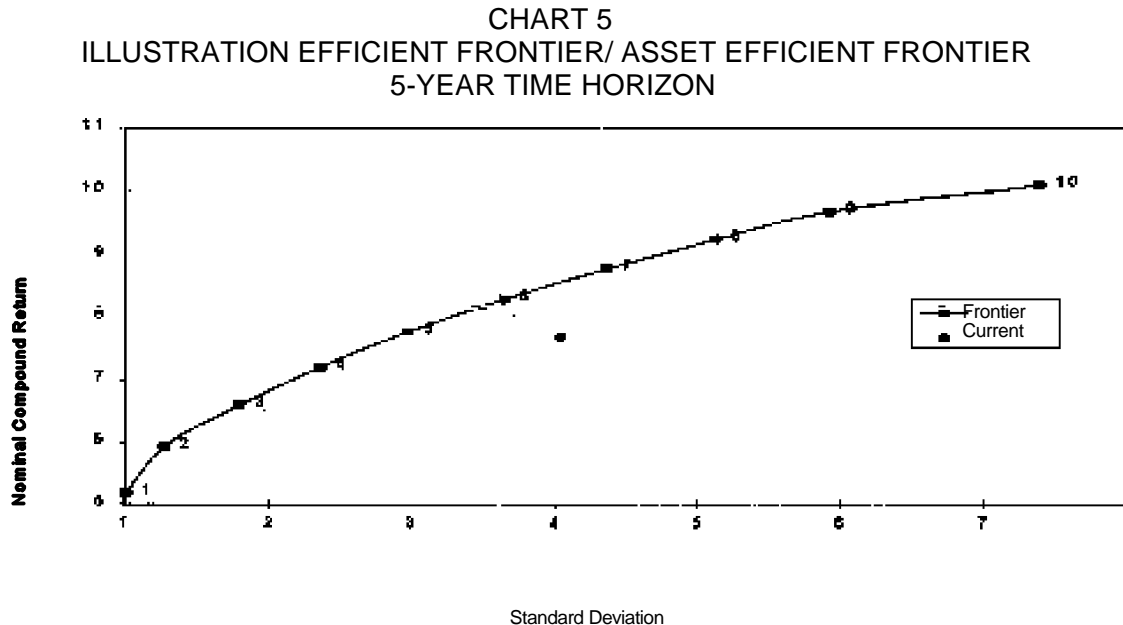
Trying to figure out what it is you're trying to do is not an easy task. How would simulations help that? You might say funded ratios are important, and pension expense is important. Contributions over five years are important. They all are important. Some things are more important than others. What you can do is start with what are we doing currently, and project that out and see what happens to these different things.

And one of the things that I've found is that when you do that, certain things become more important. You look at it and you say, a funded ratio is important, but the regulatory requirements mean that usually that's not a great issue because of funding requirements. It depends on the situation. And maybe you look at it and you look at pension expense and you see that maybe it's not so much the absolute level—it's the change from year to year that's very important.

I'm not going to tell you what the right answer is, but I'm just trying to give you that sense of creating these projections and looking at actual results. Sometimes you get a much clearer understanding of what it is you're trying to achieve. I'm not saying that if you do this, all of a sudden the light will go on and it will be clear, but it does give you that stronger understanding of the situation, and I think that's quite a useful element.

Now you think you have figured out what it is that you're trying to do. Then you get to determining what kind of a strategy does the best job of achieving that So

there has been some illusions to the efficient frontier concept, and I'm sure we've all heard it. Chart 5 is a basic efficient frontier. This is a five-year time frame with nominal expected return as the reward measure and standard deviation as a risk measure.



For those of you who are not aware, the efficient frontier is that set of portfolios that have the greatest level of reward for any level of risk. So there is no strategy within those that you've considered that's above this line and that's going to offer a higher reward at a given risk level.

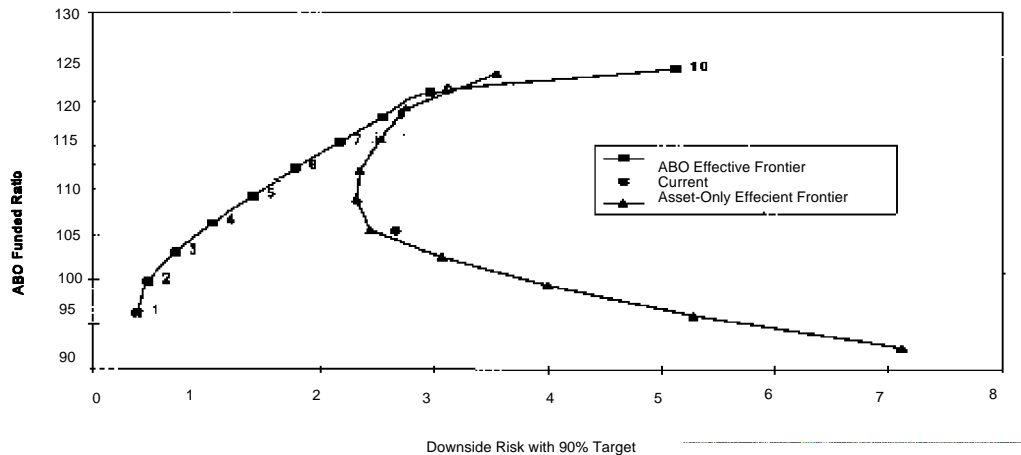
But one thing I don't think many people realize is that there's not just one efficient frontier. That efficient frontier from an asset/liability basis can be very different than those from an asset-only basis (Chart 6). I took ABO surplus (market value of assets less the ABO liability), the expected level, and the standard deviation of that as my risk and reward for an asset/liability context. You have a number of them. You can use different time horizons to different elements. I plotted those ten portfolios from my asset-only efficient frontier. You see my lowest risk, the asset-only portfolio is just horrible. It has a much higher level of risk than any of the considered asset/liability efficient frontier portfolios, and certainly a considerably lower reward.

The term of the bonds can play a heavy influence there. Different perspectives give you different answers. An efficient frontier is not a single concept. There are many different ways you can interpret it.

If you can stay away from abstract notions, it really helps to understand the situation. And for me, understanding the dynamics is the most important thing that you

can achieve with this type of an approach. That better understanding means I understand why long bonds will help me, so I'm going to go with that kind of strategy. But, yes, if effectively used, it's great. I don't tend to use that though.

CHART 6
ILLUSTRATION EFFICIENT FRONTIER/ ABO SURPLUS EFFICIENT FRONTIER
5-YEAR TIME HORIZON



I think there's a session tomorrow that talks about different risk measures. One of the great things about simulations is that if you have 500 simulations, you can be as creative as you want to be to break down the results. You can look at different kinds of downside risks because you just got the simulations. You can pry it apart any way you like, and then sort of achieve that understanding.

Let me close by commenting on a couple of other issues about simulation. You can't underestimate the importance of the model construction. Just any old model is not the right thing to use. So you want to make sure you understand the model that you're using. That's important so that you can understand the weaknesses of that model. Any model is just a model. It is not a perfect reflection of reality; it certainly doesn't reflect all the potential issues. You want to understand that model to be able to use it effectively.

The different assumptions you make about different asset classes can have a very large impact. If you believe stock returns are going to be, on average, 4% higher than a bond index, that's going to have an impact on your analytical results, and you can't underestimate that issue. The thing I love about simulations is you have enormous flexibility. You can be as creative as you possibly want to be.

You should be able to use the model and say, "I've used this model and I better understand my situation, and that understanding has led me to this stronger decision."

From the Floor: Much of this seems to perceive the assumption that companies are interested in absolute measures of risk. I deal with different companies and one of them in particular doesn't fixate at all on the volatility of the contributions. It looks at how that compares to other companies in its business. You end up with an analysis that says, if you want to stabilize the contribution or the expense, you go and buy many bonds. But what you've done is stabilize it from absolute terms. If the stock market then does well in your industry, you have the highest pension cost. And the company doesn't have an easy time dealing with that. It doesn't have an easy time deciding what it is trying to accomplish. Is that common? Do other people have to deal with that?

Mr. Love: There's a couple of things. One, you might ask Bill Quinn at American Airlines. AMR is one of the few companies in the land that is really doing ALM with a vengeance. It, therefore, looks very different than its competitors when their results are compared. This is human nature. There's the asymmetry of penalties and rewards in real life. If you lose money the same way everybody else lost money, your job is secure. If you lost money and nobody else did what you did, your job is not so secure.

I remember giving testimony in California one time. I said that there's two kinds of right. There's a right for my institution, and there's a right for my career. And it seems to me that one of the principal functions of any board of directors is to make sure that the two are the same. But in real life, they're not enough. But that's a real board of directors function. If you're ever on a board, you want to go through your organization line by line, person by person and say, is this person's career risk incentives going in the same direction as the stockholders? And if it's not, then you must do something about it. If they were, then you would do things correctly. But you wind up with this other problem because people are playing golf with their buddy and if they did something different than their buddy, and everybody else did something, they're under a lot of pressure.

From the Floor: I don't understand that. It's not fair that the board would say we don't care how our costs compare to our competitors. Our main concern is that we have a stable cost even if it stays at a higher level than our competitors.

Mr. Love: Well, I would accept that as an objective function if it were linked all the way through to the ability for me to price my products competitively. That's the real concern that must be underlying that concern if it's a real legitimate one. And that is if we all lose money together or make money together, our prices will stay in

line. But what I can't afford is for people to take all the business away because I can't price my product competitively against them. So that may be a legitimate concern as well. It should be couched in those terms. Why do you want to be the same as everybody else? What are the economic reasons?

Mr. Thorlacius: I would agree with that comment; that it is a real concern. Maybe the result that you reach is a deviation away from the industry that doesn't take you to the level that your analysis might suggest because of those very real world concerns. You do have to reflect that. You can't get away from that. You can sort of try to make progress to change that situation, but, yes, I think you have to consider it.

From the Floor: What do you do, if anything, to try to ensure that the assumptions are consistent with market pricing of assets at the time you're running the model?

Mr. Thorlacius: The question was, when you run the models, what kind of steps do you take? And I think you're directing that question to me. To ensure that the pricing is consistent with current market levels, our modeling system actually allows you to directly input current levels of interest rates as the starting point. We directly reflect things like dividend yields and the equity market, current exchange rate, and imbalances based on purchase power parity levels. So we do try to reflect those issues.

The difficulty with that, however, is when you start reflecting those kinds of issues, you get into a real assumption-setting issue in terms of whether, for instance, you put in interest rates that reflect a very steep interest rate curve and you assume that; long-term interest rates would stay at that kind of level, then you're really putting in an assumption that says long-term bonds are relatively attractive to lower-term bonds. So then you can sort of move away and you can say that maybe in the long term we'd have a different assumption.

No matter what you do, your judgment is going to be reflected in that. I think that the way that you approach that is you have to be aware of what it is that you're trying to accomplish in a given set of analysis. If what you're trying to do is develop a policy, then you want to try to develop a set of assumptions that have expectations where the spread between the returns of different asset classes are what you might call normative where you're not reflecting great differences. That's another one of the complicating issues in this kind of analysis.

From the Floor: You need to make sure as part of those assumptions that you don't become a market, but put in dividend ratios to make the market look overpriced.

You told the model already that you think you know the stock market is going to go down.

Mr. Thorlacius: The gentleman was pointing out that one of the troubles that you have if you're getting sophisticated with your model is your model is going to potentially tell you to make tactical choices. For any of you who have used models or done this kind of analysis, one of the things that you find is a higher expected reward at any significant level is just a big hammer, and it drives its way through and that pushes those kind of choices.

You have to be aware of what you're trying to do and think in a given situation if you do really want to make tactical choices. The other thing that you want to be aware of in a pension fund situation is do you have the management staff to support those choices. You don't want to make a tactical choice right now and then just leave that tactical choice there because you don't have the ability to revise that three or six months or a year later. You must be aware of that type of an issue.

From the Floor: Maybe three years down the road you'll have a major switch in your asset allocation. I've not seen any of these asset/liability models that take that into consideration, but then, that is exactly how the real world works. Is that a major problem?

Mr. Thorlacius: In regards to John Sweeney's situation with USF&G, there was a transition from a strategy of having 20% equity at first to 50% equity later. It would be unlikely, and you wouldn't have reflected that change early on. Is that a great problem?

Mr. Sweeney: Yes. It's interesting because the question is timely and related to what Doug was saying we sort of did. It came out of the strategy itself. Last year we were 80% bonds. Our liability duration was in the range of 10.5–11. Our bonds were 13 duration. We had a spectacular year. I didn't do the numbers on it, but it was very good. So we didn't have the problem, and we look much better.

In fact, we corrected and made some switches at that point. We did a major new study because we felt that there was a major difference in where we were at the end of 1995 vis-a-vis where we were at the end of 1992. In all these cases, when you're doing a two-to-five year, or a three-to-five year strategy, you can assume that answer stays correct for that entire time frame. Things change within the organization, as ours did. You must go back and look at those assumptions and figure out whether or not they are relevant to the original strategy.

From the Floor: But that wasn't quite my point. It should have been considered that you would be changing your strategy two years later. I've never seen a model that does that. And that gives you a different answer than it did originally.

Mr. Sweeney: Yes. The models that are multiperiod have the ability to adjust the mix based on your wealth changes. So, in this case, the wealth—the surplus increased so it would be natural to move up the efficient frontier. And the more accurate methods take that into account. Rather than fixing a mix period by period, it's sort of fix-mix strategy. In a decision-tree context or scenario-tree context, allow the mix to change based on your surplus.

And that, certainly, is what the Russell and a number of other models do; take that into account. However, that is a bit speculative in some ways. It's much more complicated to solve the problem than to deal with a dynamically balanced mix where you're adjusting what you want to be and whether you want to take into account that realistic aspect.

Mr. Thorlacius: In a perfect world, you would reflect those issues. And with our kind of model, my experiences have been that we very rarely have tried to do that. It just makes the thing so complex. There are so many different things that could happen. You just can't possibly anticipate all of them. One of the examples that I like for that is actually in individual retirement planning. Does anybody contemplate the fact that they might get divorced and have to give away half of what they have?

From the Floor: Is there a rough rule of thumb as to the size of the pension fund where studies like this make sense? The second question is, how often do you do these studies? Is there a rule of thumb on what could be the three to five year? Or is it adopted as circumstances change?

Mr. Thorlacius: John, is there a rule of thumb about how large the fund should be before it becomes worth doing a great deal of analysis? Second, how often might you want to redo the analysis to reflect changing considerations? Maybe I could ask John to comment on that from his perspective, and then I'll offer some observations of my own.

Mr. Sweeney: In our own work, and this is more on the insurance side, we use a \$100 million level. We know we can't do anything less than a \$100 million level. We can't do the optimal, if you will, so we use that as our benchmark. I don't know about the pension area. It's probably similar.

How often do you do it? When I was practicing in the field, we used to say you should look at it every three to five years. If you're doing a strategic plan in that area, it should correspond to that plan. Frankly, my own view is that it should be done every year. You can go back in and take a look at it to see where you are. And, in fact, that's what we were doing when we made our transition because things had changed. We had gotten much better. The situation at the corporation had changed. When you have a dramatic shift one way or the other, for the good or for the worse in a corporation, what you came up with three years ago is not going to be adequate. I think you have to keep looking at that. If there's dramatic change within a year, you ought to be looking at it. If something were to happen after you've done this, and it would change the picture entirely, then you would go and do the study again because it's a different situation.

There is no quick fix or correct answer to it. It's a tool, as Eric was saying, to get an idea of where you ought to be. And that really means you're going to have to be dynamic about it. You're going to have to change with the change itself.