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MATCHING LIABILITIES AND ASSETS

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Recorder: RICHARD DASKAIS

- o Pension forecast methodology
- o Stochastic versus deterministic
- o Development of asset investment policy and pension contribution policy

MR. RICHARD DASKAIS: Don Brackey is a principal in asset planning at Mercer in Chicago. Bill Quinn is the president of AMR Investment Management. AMR Investment Management is a subsidiary of AMR, which is the parent company of American Airlines. Bill is basically responsible for managing about \$6 billion of assets. About \$4 billion is in the pension plans of AMR and its subsidiaries, about \$1 billion is in cash, and about \$1 billion of outside assets have been entrusted to AMR's investment management by unaffiliated plan sponsors.

First, I will make some fairly extensive introductory remarks. Then Don Brackey will give us some examples of the analytical work that he and his firm has done. And last, Bill Quinn will tell us about the asset-liability matching that he has accomplished for AMR, starting with a very large program in 1987.

Why should a plan sponsor or plan fiduciary consider matching assets and liabilities? The obvious answer, of course, is to reduce or eliminate volatility of costs, volatility of contributions, volatility of funded status.

More plan sponsors are more concerned with upward volatility of cost and contributions and downward volatility in funded status than with changes in the other direction. And to the extent that any plan participants read statements, they may similarly be concerned with volatility in those directions. But of course, many plan sponsors don't like volatility at all, because it gives them something to explain. It changes company reported earnings, so even favorable volatility, if it's at all temporary, is an undesirable characteristic for many plan sponsors.

Another reason to reduce volatility is that there may be a lack of symmetry in the risks and rewards of volatility. Many plans which are very heavily funded may be in the situation where the plan sponsor has very little to gain from extraordinarily good asset performance, because it's just going to increase a surplus that will not be, at least in a cash sense, usable for the sponsor for many years. But on the other hand, unfavorable volatility may result in a nearer term increase in contributions and pension costs.

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What we want to do when matching assets and liabilities is to match the sensitivity to changes in factors that drive costs, contributions and funded status.

Funded status, of course, is a comparison of liabilities, however they may be defined, with assets, however they may be defined. If we can invest the assets so that they match the sensitivity of the liabilities to changes in the factors which drive liabilities, then changes in these factors will not affect the funded status.

Matching to reduce or eliminate volatility of costs or contributions is a little more tricky. Under virtually all cost or contribution actuarial methods, the cost or contribution includes two elements. First, there is an interest and perhaps, amortization element on the net funded status, the difference between the assets and the liabilities. Second, there is the normal cost or service cost element. It's impossible to match assets with liabilities so as to eliminate the volatility of both the funded status and the cost or contributions. If we match the assets and liabilities so that there is no volatility of funded status, we will, of course, have a change in cost or contributions due to the change in normal cost or service cost as interest rates change.

What are liabilities sensitive to? They are obviously sensitive to changes in the plan. They are sensitive to the decrement experience and perhaps, some other experience such as the election of joint and survivor options, and they're sensitive to changes in assumptions as to future decrement and other experience. All the factors that I've mentioned thus far are what I would consider noneconomic factors.

Liabilities are also sensitive to economic factors, which are changes in current pay, changes in assumed future pay increases, and changes in assumed interest rates or discount rates.

Normal costs are sensitive to precisely the same factors and, in addition, are sensitive to the number and pay of the participants.

How about assets? What are they sensitive to? They're obviously sensitive to the interest or discount rate as exhibited by yields on fixed income instruments. By definition, a change of interest rate changes the value of a fixed income asset. Changes in interest rates will also affect the value of stocks and real estate. This seems to be generally agreed upon, but the exact degree to which changes in interest rates affect values of stock and real estate is not agreed upon. Many writers believe that the so-called duration of stocks has a first digit of 3; the question is whether it's followed by a zero. In other words, it's somewhere between 3 and 30.

Corporate profits and the general level of economic activity, of course, affect the value of stocks and real estate. And everybody seems to believe that there is a relationship between inflation and interest rates, corporate profits, and the level of economic activity, but I don't think there is any general agreement as to the precise relationship among those factors.

Let's recapitulate the factors that are common to the assets and the liabilities. We have the interest rate, which affects the discount rate on the liability side and affects the value

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of the fixed income and, to some indeterminate extent, the value of the stock and real estate investments. We've got inflation which is somehow tied in with interest rates, which affects current pay and which probably affects the assumed rates of future pay increases. And last, general economic conditions affect everything; we're not sure exactly how.

How would we go about constructing a match? First, we would probably disregard general economic conditions as being too nebulous to really quantify. Then, suppose we think we know complex, or simple, relationships among three variables -- inflation, pay increases (both those that have been experienced in the last year and the assumed future pay increases) and interest rates or yields on fixed income investments. We can then determine the effect of a change in the interest rate on the liabilities, find assets with exactly the same sensitivity to interest rates, and buy them in the right quantities and other characteristics. Then we have matched the funded status of the liabilities and assets so that the funded status of the plan will not change with changes in interest rates and corresponding changes in inflation and pay increases, as long as we're right about the mathematical relationships among inflation, pay increases and interest rates.

If we do this, we can match the funded status but we can't match the cost. I'm using the term "cost" meaning accounting costs, not contributions. I believe many, if not most, plan sponsors are more concerned with cost than they are with funded status. If we buy assets whose value will change so that we have also matched the change in normal cost, so that the plan sponsor can expect the same cost, irrespective of changes in the interest rate or in other factors, then we will have overmatched the sensitivity of the liabilities to changes in interest rates, with the result that if we have a rise in interest rates, we will find that we have a decline in funded status.

The reason that most companies have not fully matched, and maybe not even considered matching, the assets and liabilities is that if we buy the assets that will match the liabilities, we give up expected return. In order to match liabilities with assets, we have to buy fixed income assets. If we buy fixed income assets, and fully match the volatility and have no other volatile assets, such as stocks and real estate, we have given up the presumed additional expected return that we expect from stocks and real estate.

We can, of course, match the liabilities with fixed income assets but in many cases, that requires us to buy relatively long fixed income assets, perhaps including a significant component of zero coupon bonds or treasury strips. This further gives up expected return, even within the fixed income sector, because we have, in the last several years, typically had a negatively sloped yield curve at the long durations. In other words, the yield on a 30-year bond is less than the yield on a 15-year bond.

Further, because of the limited availability of long duration investments, the pension fund will have to buy higher quality investments, typically treasuries, and will find therefore, that it's giving up the additional expected return that it anticipates from lower than AAA-rated securities.

The conclusions that have been reached by many plan sponsors are that they don't want to give up the additional expected return on stocks and perhaps real estate, even though

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holding these prevents matching assets to liabilities. They are willing to lengthen the fixed income investment duration, provided it doesn't give up too much yield. Of course, what constitutes giving up too much yield is decided from time to time by each plan sponsor. And in spite of the supposed advantages or the apparent advantages of matching assets and liabilities, nobody wants to match the assets and the liabilities if he expects that interest rates are going to rise. He would rather have the favorable volatility of cost, the decreasing cost and the increase in funded status, if he keeps his assets short and doesn't take the losses associated with the rise in interest rates.

Now last, and perhaps it should have been first, I want to talk a little bit about why we're having this session now, instead of fifteen years ago.

Traditionally, pre-ERISA, actuaries changed interest rate assumptions very slowly. One of my former colleagues at Goldman Sachs remarked that "actuaries use a 25-year moving average to determine their assumptions." Actuaries didn't mark the liabilities to market. The liabilities were determined on the basis of an assumed interest or discount rate which was not expected to change. In practice, the sensitivity of the liabilities to changes in interest rates was zero. Consequently, the asset that matched the sensitivity of the liabilities to interest rates was cash or cash equivalents. If we valued assets at cost, or close to it, almost any asset matched the sensitivity of the liabilities to changes in interest rates. Both had a zero sensitivity or duration.

Well, ERISA came along and required that assets reflect market value and that the actuary use assumptions that are reasonable and were the actuary's best estimate of anticipated future experience. My investment banking colleagues still said that actuaries were using a 25-year moving average, and of course, as permitted by ERISA and the regulations, they smooth the recognition of asset performance, good or bad.

Financial Accounting Statements 35 and 36 appear to require some sort of market-related liability, at least for the report of funded status of the plan under Statement 35 and the mirror image from the plan sponsor under Statement 36. Some companies did, in fact, change the discount rate with changes in bond yields, but by and large, many actuaries continued to use the 25-year moving average. They may have moved it down to a 23-year moving average.

Finally, Financial Accounting Statement (FAS) 87 which was issued in 1985 and Omnibus Budget Reconciliation Act (OBRA) 1987, with which you're all familiar, required much more firmly the use of market value of liabilities for some purposes. This, in turn, encouraged a lot of plan sponsors to view the economic liabilities, the real economic liabilities, as being sensitive to market interest rates, irrespective of the accounting and contribution requirements. As there was more recognition of the market value of assets and liabilities as the appropriate values to use for various purposes, including real economic analysis, that fostered interest in matching.

Last and not least, the people, including many of you who are vendors of asset-liability studies, and the people (including me) who were interested in trading stocks and bonds, have encouraged plan sponsors to look at matching.

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Let's last look at the investment manager's outlook. Typically the investment manager, inside or outside the plan sponsor, is not an expert or specialist on liabilities. Often he doesn't really understand them. He wants his performance to be measured by and his compensation to be determined by things he understands and controls. That means assets, not liabilities, not surplus, not cost or contributions. And he has been encouraged to expect his superiors, whether they are the investment committee or higher financial officers of the company, to measure his performance in an asset-only framework, against the performance of other funds and against the performance of market averages. He is therefore, very often, not terribly interested in matching assets and liabilities, even if he has been educated by vendors of various trading and consulting services.

MR. DONALD G. BRACKEY: During the past few years, I've had the opportunity to work with a number of actuaries and plan sponsors in forecasting studies of various types. From the actuarial standpoint, those studies have focused on alternative actuarial methods and assumptions, primarily, but also some benefit issues. From the investment standpoint, which we're focusing on more today, they have related to three primary issues. What should the allocation be to equities and some of the more risky asset categories? Second, how broadly should the portfolio be diversified, in terms of exposure to less traditional asset categories, such as real estate, venture capital, international and other asset categories. Third, and most recently, how should the fixed income portfolio be structured?

There's a mixed view on these issues in the academic community, and in much of the published literature. Martin Leibowitz of Salomon Brothers has published a number of articles in the *Financial Analysts Journal*. He's one of the leading proponents of extending the fixed income structure generally. He makes the comment that one dimension of riskiness in pension liabilities is their sensitivity to interest rates. This source of risk can be neutralized by creating an immunized bond portfolio that precisely funds those liabilities. That's one school of thought.

A few years back I spent some time with a firm called Dimensional Fund Advisors. They have the contradictory view. They also have some of the leading financial thinkers in the country working with them. Eugene Fama from the University of Chicago is a highly regarded investment theorist, considered to be the father of the random walk theory and the efficient market hypothesis.

Rex Sinquefeld, along with Roger Ibbotson, publishes a lot of the data that asset planning consultants use in various studies in which they analyze some of the various investment issues. Their view is that in a longer term perspective, the liabilities of pension funds are tied to inflation. Thus, using portfolio investments to hedge liabilities implies that those returns should keep pace with inflation. If they were here today, they would probably be looking at some long histories and saying, on a real return basis, over a long period of time, short- to intermediate-term fixed income structures have provided comparable, if not greater rates of return, and the volatility of those real returns has been considerably lower.

Plan sponsor reaction to these views and analysis that has been completed by many of us in the consulting community has, in my view, been quite mixed. Where some plan

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sponsors have made dramatic changes in lengthening fixed income structures, others make the comment that we just view the fixed income category as another diversifying asset class. We're going to leave our objectives and guidelines for fixed income portfolios the same. What does that mean? Practically speaking, they're using the Shearson Lehman Hutton Index as a benchmark. It has a duration of about five under most typical interest rate scenarios.

I think probably the largest group of plan sponsors out there is still in a "wait and see" category. Many of them are aware of some of these studies, but they may not have come fully to grips with these issues, or they've adopted a "wait and see" attitude. One of the main things that I think consultants and others of us in the community can do, is to help plan sponsors come to a clearer understanding of these issues because they are going to be the ultimate decision makers. Forecasting studies of various types are useful in advancing this process.

There are deterministic forecasts that I'm going to touch on initially. Under those forecasts, you specify the economic and demographic assumptions.

One particular plan had purchased annuities for people who had retired, and we merely projected benefit payments. They had a maximum benefit in the plan of something like \$20,000-25,000 a year. Not a lot of inflation sensitivity. What was the projected payment stream? It started at \$4 million and grew to \$91 million by the end of 30 years, and continued growth thereafter. To help this particular committee understand how the interest rate affects the present value of the accrued benefit stream, we merely discounted it at different interest rates -- 3%, 4%, 8%, 9%, 10% -- and looked at those discounted values for various periods of time. They wanted to focus on 30 years. At the time we did the study, interest rates were around 9% and the present value was \$31.9 million. If interest rates declined to 8%, that value increased to \$36.6 million. That is about a 14% change. For that particular situation, we did a lot of different analyses, but they primarily focused on that schedule. The client went through some committee debate, and decided to take a portion of the fixed income assets, about a third of the portfolio, and invest in a fixed income strategy, with a duration of 13 or 14 years.

What happens to that present value as you change the interest rate from 8% to 4%? It increases to \$67.7 million. That is about an 84% change. Think of your typical pension plan fixed income portfolio. What would happen to the value of those assets if interest rates declined by 4%? If they have a duration of five years which is most typical, they'll grow by about 20%. Liabilities are growing by 84% and assets are growing by 20%, so obviously there is going to be a big change in surplus which is going to be reported.

The next few examples go to the other end of the spectrum and are very complex in their formulation and analysis. Some plan sponsors get much more benefit out of the deterministic kinds of analysis; others are very firm about wanting to use probabilistic studies. Those studies involve estimates of real returns on the various asset categories, standard deviations of returns, correlations of returns, inflation assumptions, etc.

In one study we analyzed a lot of different investment mixes and for some of those we looked at extending the fixed income portfolio duration. We've have three Policies 1A

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through 1C which are an allocation of 55% to bonds, which is what we're going to sensitivity test, and 45% to equities and some other asset categories. We've have three cases: fixed income duration of 5, which is where most pension plans are currently, a fixed income duration of 12 under Policy C, which is a measure of their accumulated benefit obligation sensitivity (ABO), and 9 which is kind of an intermediate duration.

The variables that we looked at, among others, included the ABO funded status, pension expense, in a dollar amount and as a percent of pay, contributions and discounted contributions. The ABO funded status through the simulation period was valued based on settlement rates that also were simulated, so you could have a range of interest rates that you were considering.

Discounted contributions is a variable I like to use, because it seems to mean something to financial people. To get that value, we typically will ask a plan sponsor for a cost of capital. An after-tax cost of capital typically is somewhere between 10% and 12%.

We did this for both a career average and a final average plan. Obviously, with both type of plans you've got differing degrees of inflation sensitivity. As Dick mentioned, I think the plan sponsors are most concerned with the adverse conditions; the favorable conditions tend to take care of themselves. For the career average plan, looking at the adverse or the pessimistic, what we call the 25th percentile, and the catastrophe or the 95th percentile, as you extend the fixed income duration, the projected funded status under Policy 1A at 56% increases to 70% under 1B, and 83% under 1C, so that's a fairly dramatic increase in your benefit security based on that particular measure of security. Similarly, at the 25th percentile, you're getting some improvement -- from 90% on up to 108%.

The results for the final average plan were very similar in direction. At the 55th percentile, funded status increased from 59% on up to 86% under Policy C. At the 25th percentile from 107-127%.

For the career average plan, we found that there was a great deal of benefit in stabilizing pension expense by extending fixed income duration. Those results trended from 16.3% of pay to 9.6% of pay under Policy 1B, and 6.5% under 1C. A similar trend, but not as dramatic at the 75th percentile.

Contrast this with the results under the final average plan. Again, at the end of the 10-year period, pension expense was 9.8% under Policy 1A. There was some improvement under 1B, down to 9.2% which was noteworthy, and then as you extended further, pension expense had moved back up again to the 9.8% level. The trend is similar at the 75th percentile, going from 6.2% of pay down to 5.7% and then back up to 6.5% of pay.

The next few examples look at contribution ranges and I think one of the assumptions that we made here is worth noting. We assumed, as opposed to the pension expense case, that the assumptions the actuary was using would remain constant during a simulation period. The pension expense assumptions were changing to reflect the economic environment. In this situation, the greater volatility of the real returns had an impact on contributions, and instead of narrowing, they tended to widen. So there are

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contributions, discounted contributions at the 95th percentile, growing from \$224 million to \$232 million and \$245 million; a similar pattern at the 75th percentile.

For the final average plan, the results were generally similar under the catastrophe situation. There is an increase from \$367 million on out to \$408 million, at the 75th percentile, about the same, although a slight improvement at the 75th percentile under 1B, and then increasing again under 1C to \$319 million.

One of the challenges in doing forecasting studies of various types, whether it's deterministic or probabilistic, is you're going to create reams of data that have to be communicated and understood in some meaningful way. I found it to be somewhat beneficial to take some of these situations and try to summarize them in terms of objectives, and get people focused and moving towards a reasonable decision process. At the 50th, 75th and 95th percentiles, we summarized those results, assuming that their time horizon was 10 years. We could have picked 5 years or 15 years. That type of output would have been available.

At the 50th percentile, the longer duration strategies tend to produce more favorable results in all cases. Now this was not surprising because we had assumed that at that point in time, we would pick up some in real return as we extended the duration. The short to intermediate strategy assumed a real return on bonds at 3%, the longer duration Policy 1B and 1C strategies assumed a real return .5% higher of 3.5%. At the 95th percentile, we get some conflicting results. The discounted contribution objective tended to become more unfavorable as we extended duration and we got the worst results with the longest duration strategy. This contrasts totally with the results, if our objectives were to maximize the ABO funded status. There we got the best results by extending fixed income duration. Similarly, for minimizing pension expense, the results were favorable for the career average plan as we extended and the best results were with the longest duration strategy. Under the final average plan, we got favorable results if we went to the intermediate strategy and they became more unfavorable as we further extended fixed income duration.

MR. DASKAIS: Don, can I interrupt with a question? This assumes that the contribution is being determined on the basis of assumptions that do not change, irrespective of the changes in the yield environment?

MR. BRACKEY: Correct. Let's move back from the more complex probabilistic environment and look at a deterministic forecast. You can create forecasts that make longer duration strategies look attractive and also tend to make them look less attractive. An example was deliberately chosen to make it look less attractive but it does represent an economic scenario that I think deserves some thought, before people extend duration. And that is the rapidly rising inflation scenario. We've assumed that the plan assets earned 11% and the expected inflation was an assumption of 5%. Contributions remained at zero for part of the projection period, then increased toward the level of about \$50 million about midway through the period, and remained at that level. Rapidly rising inflation, which was starting at 5% and building to 11% over a 4-5 year period, resulted in a pattern of very rapidly rising contributions, building from a low level up to \$200 million at the end of the projection period.

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As I looked at this, I was reminded of a Chinese proverb I read recently. It was, "If you don't change direction, you may end up where you're headed." The concern I have, and I guess the question I raise is, if you get into a period of rapidly rising inflation and it persists, what happens at that point? Your plan asset values on a market basis have eroded, benefit security, benefit adequacy may be a concern, what do you do at that point? I think that issue needs to be considered. What conclusions can you reach? Other people's may differ from mine, but the conclusions that I've reached at this point in time are that if you have a very long time horizon, your main objective is to fully protect against changes in inflation. Assume that real returns are comparable in short- to intermediate-term fixed income instruments, versus longer fixed income instruments. Then your portfolio should be concentrated in the short- to intermediate-term sector. At the other extreme, if you have a shorter time horizon, or if you have different objectives, which are focused on stabilizing balance sheet and pension expense information in the short to intermediate term, you may want to move to the other extreme and have a much longer duration strategy.

The third observation I would make is that the current position of plan sponsors, which is that their portfolios have a duration of about 5, has nothing to do with either pension liabilities or necessarily plan sponsor objectives. That is just a function of what the fixed income markets look like. On average they have a duration of 5. That's where we are and I think that to get beyond that, plan sponsors need to do forecasts so that they can identify fixed income strategies that better fit their longer term objectives, time horizons and risk tolerances.

The last point I would make is that I think that if actuaries get more involved in forecasting, plan sponsors are going to have a better understanding of the relationship between assets and liabilities, and their appreciation and understanding of the defined benefit plan is going to increase.

MR. DASKAIS: I talked a little about the qualitative considerations and Don has talked about some quantitative ones, now Bill is going to tell us about the real world.

MR. WILLIAM F. QUINN: As Dick mentioned, my job is to explain to you a little bit about what we did at American and why we did it, give you some of our views and some of the issues that we think plan sponsors need to look at in this variety of roles. We were one of the first to get involved in this and we did our fund in 1987, but I've been looking at matching assets and liabilities through dedications since 1980, when we did a large dedicated bond fund. So I've been involved in this process quite a long time and have dealt with actuaries quite a bit, both our own, as well as working with some of our outside vendors.

Since the purpose of my being here is to take the actuarial hat off and talk about the practical world, I'll do that right now. One of my general observations is that as Don indicated, on the whole question of matching assets and liabilities, there is no one answer. I think different companies have different characteristics, different time horizons, different situations. I'm going to tell you what we did at American and I'm going to explain the whys and wherefores and where we think it fits, beyond our scope, but it's not for everybody.

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We're clearly a company in a highly competitive environment. We're in a highly cyclical industry. During the time we've been doing this, we've been going through the throes of a deregulation process, a highly competitive environment where a lot of our competitors of five years ago aren't around today, and a lot of the decisions we made were to make sure we would be around today, and we would be prospering. We have an older work force and we have some other unique characteristics.

All of those things come to play in our decisions of matching assets and liabilities and integrating our investment policy, not only with the liability policy structure of the fund, but also with the corporate finance requirements of the company. We look at pension expense as part of our other corporate finance functions, just like we would raising debt or equity, or repaying debt. How do we want to repay this large debt? How do we want to fund this pension plan? It's integrated within an overall plan, as far as American is concerned, with a growth plan that we have had for the last several years. We were buying an awful lot of aircraft. We've grown from 250 aircraft to 500 aircraft over the last five years and that's taken over \$1.5 billion in expenditures. So some of our objectives in funding pension plans are closely tied to that overall growth plan.

Having said that, I think it's important to step back for a second and ask, what is the plan sponsor's obligation? What does he need to look at before deciding how he's going to match his assets and liabilities? And I think the one thing we sometimes all forget, my colleagues and myself, is we're there really to meet the pension promise to our employees. We've made them a very strong promise to have certain kinds of payments after retirement and it's our job to ensure that they're there. I think we get caught up sometimes in the latest trends, and whether it's things like index arbitrage or various investment trends, we have to refocus back and remember that's the number one goal we have.

Second, our obligation to our employer is to meet that promise at the lowest cost without incurring undue risk. And again, we define risk in our business as the cyclical nature of the business, the competitive nature of the business, and how we can least afford to put more money in the pension plan in an economic downturn or recession in our environment. So our investment policies are clearly geared to protecting the downside and not losing that money when things are bad and if that means incurring a little higher cost when things get better, we're willing to do that. It's clearly something that we recognize.

A third point, which was highly debated about four or five years ago, was that it's our view to fund the plans without jeopardizing the ongoing business. This really sort of gets back to the asset reversion question -- whose assets are they? Should you be putting money in? It's clearly our view that the success of that ongoing business, the prosperity of that business clearly leads to success and ensuring the security of the benefits for our employees. So we've got to balance that aspect with the funding aspect. In our case we're buying airplanes, we're growing, we're becoming a bigger part of the market, because we think our employees will have jobs for a long period of time. We'll be able to make bigger pension contributions and increase that security. To date, that's been a successful venture for both ourselves and our employees and our pension plan.

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Last, I think, sponsors really do need to focus on both the assets and liabilities. I think one of the biggest weaknesses of the corporate sponsor world is that generally the finance people look at the investments, the human resources people look at the pension benefit administration side and nobody is looking at the liabilities and they're falling right through the cracks. Very few firms are really looking. I think that's a role that I would ask the actuarial profession to help the corporate world with, since you're dealing with both sides of the equation, to start making people think about these issues, as Don said, look at the alternatives and help them to come up with answers. Right now, a lot of people just aren't focused on it because they've got their own little kingdoms within the corporate world, and they're trying to do their own things and they're measured against things they understand, investment returns, etc. It's your job, I think, to help the corporations to understand what their whole role is and focus on these issues.

This reminds me a little bit of a story about a chief financial officer who brought in his accountant, his lawyer and his actuary and asked them the simple question of "What's two plus two?" He asked the accountant and the accountant said, "Obviously it's four. You know we can cite many studies on that, and how it's come out to be four." Then he asked the lawyer and the lawyer said, "I agree, it's four. We've got a lot of legal opinions that cite that, and some court cases." And then he asked the actuary, and he said, "Well what do you want it to be?" And I don't mean that negatively. I really think it's the actuary's job to understand management's objectives and what it is trying to accomplish within the security requirements of the plan, and help it to meet those objectives. I don't think enough of that is being done, although I have seen some improvement in the last several years.

To help you understand what we did at American Airlines, I've listed some background information of where we were as a plan on December 31, 1986. Basically, our plan had \$1.7 billion in assets. Of that, \$550 million was actively invested in the U.S. stock and bond markets. We had \$150 million in the international market, which is a pretty large percentage there. And we continued to grow that actually, and then we had a dedicated bond fund of \$1 billion. Now that dedicated bond fund started to grow back in 1980. We purchased a \$250 million bond fund in 1980; I think the interest rate was 15.3%. We added to it in 1981 at about 14.75%. We were paying cash flows to our retirees, it was a cash matched retiree fund. With a couple of additions it grew to \$1 billion. So it was a great investment decision at the time.

But there we were in 1986 with this \$1 billion asset that represented a significant portion of our overall fixed benefit plan. Our liability at that time was approximately \$1.6 billion. And that was the projected benefit obligation (PBO) side of the calculation. We were looking at a number of things confronting us at that stage of the game. One of them was that the dedicated bond fund no longer met the objectives for which it was originally established. We bought it at 15%, but with the reduction in interest rates, the yield to maturity basically had declined to 9%, so in our opinion, the return on the stocks versus the bonds wasn't as favorable as when we actually purchased it. Second, with the constant problem of bonds being called at these lower interest rates, we couldn't assure that those bonds would be out there. And we started to perceive some of the quality problems that have been evidence in the last six months or a year or two years with the

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junk bond markets, and deterioration of corporate quality. So we were faced with that dilemma.

On the other hand we had the introduction of FAS 87, which effectively eliminated some of the accounting benefit that we got through the dedicated bond fund, by having those liabilities valued at 15%. That was going to go out the window. And then lastly, our big concern was a more intermediate term concern about our cost. Interest rates had declined from 15-9% and we weren't sure where the economy was going. We thought rates could go lower. Our big concern was the fact that if rates went down to some unrealistic number of 3-4%, our pension expense would go right through the roof. At a time when the economy was very slow, our industry would be getting hammered, and conversely, some of our competitors had no fixed benefit plan. So their cost wouldn't be going anywhere. So we'd be getting hammered with a high cost and be at a very large competitive disadvantage.

Given that kind of a background, the objectives of what we were trying to accomplish at that time were several-fold. First and foremost was to protect the pension surplus. As I said, we had \$1.7 billion in assets, \$1.6 billion in liabilities, so we were about adequately funded. Our vested obligation was somewhat lower, I think somewhere around \$1.3 billion. So we wanted to make sure that stayed intact through what we thought would be tough economic times.

Second, we wanted to eliminate the deficiencies in the dedicated bond fund. We talked about the call risk and the quality risks. So we wanted to unwind that bond fund to some degree, to sort of solve those problems.

Third, we did have a desire to increase the equity exposure of the fund. Now we were about 65% in fixed income and we wanted to get somewhere closer to 50% to help the longer-term situation.

Fourth, we wanted to reduce the pension expense volatility. It's our corporate view basically, that we take our business risks in flying the public around the country. And what we're trying to do is eliminate the cost disadvantages that come from extraneous or indirect areas, such as pension funds and a variety of other areas. We want to make the business by getting our share of the traffic, getting a premium, getting the right prices, controlling our costs, and outperforming our competitors. So we don't want to have a competitive disadvantage occur in one of these indirect areas, but as Dick indicated, we sure don't mind taking a competitive advantage when it possibly comes along, which is really our last point. As I said, Continental Airlines, which was a major competitor at that time, had no fixed benefit plans, so they had no exposure to declining interest rates. United and Delta have a different asset allocation exposure which we took a hard look at, and made some of these decisions. And we felt that with an economic downturn, somewhere out there on the horizon, this would give us a competitive advantage, as well as protect us against our lower cost competitors.

What did we do? What we did was purchase a hedged asset liability optimization bond fund. We call it HALO. The biggest problem when we did this was to come up with a good acronym so that everybody would know what we were doing.

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Basically our liability, as I said, was \$1.6 billion and had a duration of approximately 9 years. Our actual duration of our liability was a little bit larger, it was somewhere in the 10-year range, given our senior work force. We made another change, again with the help of some of our actuarial colleagues, making a decision to float our salary assumption with our discount rate. That's built in so there would be a one-for-one change; if interest rates did fall, we'd just lower our salary assumption. Having come from a regulated environment, it's clearly our view that a lot of the people on our payroll have salaries that existed prederegulation and are higher than they should be. And we effectively said that those people would not keep up the standard of living as inflation increased. So we would really reduce the salary assumptions as interest rates declined.

We're working off of \$1.6 billion liability with a 9-year duration. We purchased an \$800 million bond fund with an 18-year duration. So we, approximately, reduced the bond exposure from two-thirds down to a half, and just extended it out on the duration end, to get the interest sensitivity and matching that we would like to have. By doing that, as Dick indicated, the markets didn't let us keep the same composite of quality, corporate issuers. We're almost forced to go out and have a high concentration in government and agency bonds, strips, coupons and things of that nature, which indirectly improve the quality of the fund. We also eliminated a lot of the call risks that we were concerned about. Third, it freed up approximately \$200 million for other equity investments, which was one of our goals.

We produced what we call a "dollar duration" match of assets and liabilities. It generally met the objectives we were trying to accomplish; however, it wasn't a perfect match. There were certain risks that still exist in the portfolio. One of them is unparallel yield curve moves. Our discount rate is based on a point in the yield curve, as in a point of time, at the year end, December 31. The fact that our bond fund doesn't have all its bonds in the same quality bond fund, at that point in the yield curve, could allow for different shifts. The other fact is that we use a BBB bond rate for our discount rate. And this portfolio is heavily in government securities. So we've got a basis risk that we worry about and try to manage over time. So those could result in certain mismatches of our assets and liabilities.

However, when we went into this, our goal was to minimize the volatility of our pension expense, as a direct result of interest rate changes. And the band of expense that we basically defined was near \$50 million. We had already reduced our pension expense over the years from \$100 million a year to about \$50 million. What we wanted to do at this stage was *not* to have interest rates cause more than a \$10 million hiccup on an annual basis. We could live with a band of volatility up to 20% or \$10 million on a \$50 million pension expense number. So we were matching this whole portfolio to that concept, in that area.

The tombstone of what we did with Goldman Sachs at the time sort of shows how investment bankers work. It's an \$800 million bond fund. It's advertised as \$4.2 billion. The difference is we paid \$800 million and it will be worth \$4.2 billion at maturity, some 30 years on out.

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The key question now that we're three years down the road is: How is it working? We go back and look on an annual basis, and evaluate the hedge position, and we also evaluate the change in our liabilities from factors other than interest rates, like new employees and actual salary increases, and adjust the bond fund. So it's a different number today. It's approaching \$1 billion.

Our discount rate declined from 10.25-9.75% at January 1, 1990, which increased our PBO by approximately \$85 million. The portfolio declined by less though. There was only a .25% decline in interest rates on the portfolio. Again, that's the mismatch between the bond rate that we used for our discount liability factor, and the portfolio which is a heavy concentration of government securities. So there was a smaller decline in the government securities market. However, our gain was \$67 million. And when you net the two and do all the other kinds of calculations that are necessary to come up with an annual expense calculation, our impact was somewhat under \$2 million, well within the \$10 million tolerance level. And we do this same calculation looking forward each year. If interest rates go up or down by 100 or 200 or 300 basis points, what would happen to us the following year? We're really taking a hard look both through the rear view mirror as well as on a prospective base, to make sure we're still meeting our requirements.

In conclusion, as I indicated before, we think it's really important for actuaries to work with plan sponsors, to focus on the asset liability equation and how that fits within the corporate finance plan. As I said, we don't think it's for everybody. New young companies that are starting their pension plans have no real concerns and have a stable earnings growth, may not even opt for something like this. But people that are in cyclical businesses, people who have some nearer term concerns, should be taking a hard look at an asset liability match like this.

The other reason I think that people need to look at this is when we did this in 1987, we thought we were the last company in the world that would ever be affected by a takeover or leveraged buy-out (LBO) environment. We thought nobody would be nuts enough to want to get into the airline business. It's cyclical, capital intense, fuel intense, people intense. It has unions. I don't have to tell you what happened last year. The whole airline environment changed by Marvin Davis and Donald Trump and those people. Getting back to the original objective of a pension fund, it is to meet the pension promise. If something occurred in our company, our pension fund would have protected our employees. They would have had their pension fund. It wouldn't have been raided. We were at the right funding level. Somebody couldn't have come in and taken a surplus. On the other hand, in any kind of interest rate environment during whatever period of time that kind of activity occurred, the fund would have been fully protected and had a small surplus to pay the benefits we had promised. So we think we've protected the employees, even in an unlikely situation like that. But those things are unpredictable.

Again, I would emphasize, the actuarial profession can help us in that area. Understand what the objectives of your clients are, come up with the resources and the solutions. You've got the answers that a lot of us in the financial community aren't aware of, and you can help us meet our objectives.

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MR. BRACKEY: I have one comment. Bill mentioned earlier that they prefer in calculating their pension expense to redetermine the salary scale and possibly examine some other actuarial assumptions as settlement rates change. I think that in terms of managing pension expense, this kind of approach can be very helpful. In my view, it doesn't make a lot of sense to have inflationary conditions changing, settlement rates changing and then leave the salary scale the same. However, I think if you talk with a number of actuaries, the view is quite mixed on that particular issue. And I guess I'd be curious if you people have views that contradict the approach that American Airlines is following there.

MR. BRIAN C. TERNOEY: I agree with you and not just on the salary scale, but things like withdrawal rates. One of the comments I think Dick made was on taking into account these other economic variables, and not leaving it to the interest rate risk. The accountants have pointed that out for us, by making changes in interest rates more important. But the same process really does apply to those other economic assumptions. And, I think that if we did get more involved in changing salary scales and withdrawal rates for various reasons, to reflect the other changes in the economy, then you'd really see a lot more opportunity to match against other economic variables and other asset classes might fit better the asset liability matching patterns. But it's we, as actuaries, who are holding back that process because we keep turning it into a bond formula, and the liabilities are not.

MR. DASKAIS: Brian, what is typically the attitude of your clients as to integrating the changes in assumed pay increases with the changes in interest rates in the projections that you do?

MR. TERNOEY: Well again, it's not so much the attitude of the clients, because they don't understand it. They don't see the connections and so there are really very few clients who have both investment advisors and actuaries, where people are working close enough to take the risks so to speak. They see it as a risk of, "Gee, if I change my number this way this year, what will happen next year?" Which is exactly what forecasting should show to them. So there are really not too many situations where you have a combination of experts who are willing to try it out.

MR. QUINN: I think that points out my views, and I agree with you that most corporation managers don't understand the process. I think they can tell you where they're going and what they want to accomplish and how you can help them to get there, with some of these kinds of other changes that are on the forefront.

MR. TERNOEY: I agree. I wish I had heard of some experiments in this area. I would like to find classes of assets that move better with the liabilities. I would think that there are cyclical segments of equities that move similar to say, employment patterns or inflationary patterns that might change liabilities. They're certainly segments of equities that you ought to be able to match with, if you really were doing more dynamic changes in the inflation part of the salary assumptions.

MR. QUINN: I think that's difficult for two reasons. One is the market has, to some extent, a mind of its own and moves on sentiment and other factors, expectations, other

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than just economic changes. And second, consider classes of stocks within the market, or the general market. I think studies will tell you that 70% of the move in the stock is based on the market move and not the individual stock characteristics.

MR. TERNOEY: But that's where I think investment people can learn something, where a lot of that does wash out in the annual process of evaluation. I agree with you. I don't have an answer to any of this. But that's where the actuary can show the investment person that a lot of that washes away with some of the averaging techniques that are used. I think these are good questions, but I don't have good answers. I am curious about any activity that is going on in that area. It's sort of the threshold that we seem to be on now, to take another step. Liability forecasting and then tying that into assets was a big step forward a few years ago, and I think we're on the threshold and I don't know if anyone is really going to take the next steps or not.

MR. STEVEN D. BRYSON: I'm kind of intrigued and surprised at the thought of the salary scales moving up and down from year to year because of the changes in the discount rate. Perhaps I'm being overly simplistic. I still view the actuarial assumptions that go into pension expense, other than the discount rate, to be long-term estimates, rather than short-term estimates. So just because treasuries or governments or corporates might go up or down by 100 basis points from one year to the next, doesn't necessarily change my view of what salaries are going to do. I want you to know that I'm coming from a small plan perspective. I don't have any plans that are anywhere close to the size of American Airlines. With regard to salary adjustments in smaller plans, I think that those salary changes have less to do with the overall economy than they do with their own individual circumstances. Of course, there will be a correlation. But take, for instance, a small real estate firm that might have 50 people on the payroll, and their compensations are going to vary radically from year to year. It's going to depend mostly upon the local economy, rather than the kinds of forces that may affect yields on government bonds or corporate bonds. I don't want to disagree with what American has done, but from my perspective, I would not want to change my salary scale assumption on a year-to-year basis.

MR. QUINN: We do that for accounting purposes. We don't do it for funding purposes. That's number one. Number two, I think it's our view that effectively FAS 87 forces you to take a snapshot view of what the plan's liabilities are at that date and account for it based on that data. Once you introduce one short-term factor and use others as long-term factors that aren't tied together you will get the wrong answer. You've got to be consistent and tie all the data together to get the right answer.

MR. DASKAIS: Let me try and run through the theory which obviously involves a certain number of assumptions. I think the basic assumption is that interest rates in the market represent a combination of a real return and a compensation for expected inflation. If you further make the assumption that real return is constant, then the expected inflation over future years varies directly with the changes in bond yields. If you then assume that expected future pay increases have a real element which does not change, and an expected inflation element, which of course, is the same as the expected inflation in the bond yield, you come out, based upon all of these assumptions, with the mathematical conclusion that the expected future rate of pay increases (not the actual

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increases that have occurred in the one year, but the expected future increases) will vary directly with bond yields. It need not be one-for-one.

That's the theory. Now whether or not real interest rates can be expected to remain stable, no one knows. At Goldman Sachs we were going to construct some indices. We had to decide in producing these indices what the best indication of expected future inflation was. The management of Goldman Sachs came to a very simple way of resolving this problem, that we close down our pension department.

MR. QUINN: I would just add to what Dick is saying, that that's the assumption that we build into our projected liabilities. The actual salary assumption is something we review annually and determine whether we want to change it or not. We don't necessarily change it every year, but the longer-term assumption is that it should fluctuate with the inflation rate and the long-term bond rate.

MR. BRYSON: I'm not disagreeing with you when you're talking about very large corporations. Because I think there the salaries will be very sensitive to the same forces that affect the whole nation. But within the context of the small plan, I don't necessarily agree that the same forces that are at work on the rates that you use to set your discount rate, would also apply to future expectations of salaries for that small company.

MR. BRACKEY: The footnote that I'd like to add to this discussion is that I think, if the situation is large enough, or the deviations are large enough, that the actuary should, as a matter of practice, go back to the client, discuss the situation, discuss objectives so that you can come up with a modification of assumptions, if appropriate, which better fits the situation. Obviously, if you're dealing with plans of various sizes, that becomes more difficult as the plans become smaller. But I think there is a risk to the profession by just ignoring these changes in settlement rates without reacting more proactively to those situations.

MR. ROBERT M. KATZ: I'm with the World Bank and the theory is in practice in our plan. First of all, we have a very large pension plan and all our benefits are fully indexed. We have a little bit different scenario from the ones you have all described. However, all of our financial work is based on real rates of return. Nominal rates of return are nice but not really particularly important. And we use the idea of a constant real rate of return over time. Our salary scale consists of two pieces -- an explicit inflation piece and a real rate of salary growth. If we change assumptions on the inflation rate, with a corresponding change in nominal return, we'll change the salary scale, but it's only to keep things in sync. So the only thing that we're really looking at is what the real rate of salary growth is going to be. And that's a completely separate animal, but this is just really to confirm, Dick, what you were saying. That's your theory in practice.

MR. DASKAIS: Don, I'd like to ask you if you would care to go into more detail on the assumptions that you and your clients have typically used in producing those numbers. In other words, the relationships among inflation, interest rates, pay increases.

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MR. BRACKEY: I would be willing to go into some detail on that but I really don't want to go into a lot of detail on that question. I guess I will address it generally. In formulating the assumptions for these kinds of studies, we've typically had real returns, again, standard deviations with correlations as part of the assumptions. Inflation is a variable, settlement rates are a variable, and you need a consistent relationship between your liability assumptions and your asset assumptions. That's about as far as I want to go on that question.

I would like to raise a question again, which I think is a fundamental question here that may need further analysis as we think about the fixed income structure. And that is, what is the nature of the promise that we're making the plan participants here? And that was the first objective that Bill alluded to. He mentioned that they had concerns about the short term. If you have a long-term focus, again, what is the nature of that promise? Is it to provide a certain level of benefit, adequacy and some inflation protection or, is the promise to provide benefits that have accrued to date with the opportunity to discontinue the plan, or whatever, going forward?

A second question I have relates to the high inflation scenario and I have to address this to Bill. How much concern do you have currently about the potential for a high inflation scenario, a persistent inflation scenario, and how do you address that situation, if it arises from the perspective of the erosion of the plan participant's benefits?

MR. QUINN: I guess I'll answer that in a couple of ways. One is, as I indicated, 50% of the fund's assets are dedicated to this matching or hedging process. The other 50% are actively managed in the active markets that would presumably capture the inflation. Again, using a real rate of return versus a nominal rate of return, if you had 11% inflation, my expectation is that stocks would be returning closer to 17% or 18%. And those kinds of returns on 50% of the assets would go a long way towards making up any shortfalls. Conversely, there would be some shortfalls that we would need to make up through future contributions, but in that kind of high growth environment, we would expect that the airline would be making a lot of money, and therefore, would be able to afford some slightly higher contributions.

MR. W. MICHAEL CARTER: I would just like to make a comment on one of the comments that Don made on presenting the results of one of these asset liability studies to the client. And just reiterate what he said. When you generate one of the asset liability studies, it is incredible the number of numbers that come out. Particularly if you are doing a probabilistic approach to the study. And I think the real challenge is to find a way to communicate the reams of numbers in a way that the client can understand and get a feel for where the study is headed. One of the aspects of presenting the results as a complicating factor, is that in some cases, the 75th and 95th percentile are your best cases. And in other cases, the 75th and 95th percentile are your worst cases. If the client starts looking at one, at the top end of all those bars, they're going to miss the picture. And Don, I'd be interested in some of the comments you might have in actually presenting these results to your clients. Because I've run into the same thing.

MR. BRACKEY: I'd comment on your allusion as to what is pessimistic and optimistic. That can certainly change if you're looking at funded status and pension expense,

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sometimes high inflation and high interest rates may be very attractive. I think that further, it's very beneficial in almost all situations, even for clients who only want to do probabilistic forecasts, to identify a number of deterministic scenarios of various types, so that you can get an understanding of what types of economic conditions are leading to certain results, which can then be fit better into the business situation.

MR. DASKAIS: Along those lines I would like to mention one of my experiences with Bill Quinn. I worked with him over a period of a couple of years, and we started out with a relatively simple, one-page report. Two years later, we had a much "better" system and we gave Bill the reports and Bill asked, "Where the hell is the one-page report?"

FROM THE FLOOR: I'm going to amplify that if I might, because I'm on the client side. And we do these studies and I can remember just the other day throwing away several working notebooks and studies done over the past few years. And why did I do that? Because I'm interested in the one-page reports. My word to those of you who are in the study business is, ask the client what he is looking for. What is the main question that he is looking for? Tell me this number, or this percentage, and for gosh sakes, make the first page of your report that number, that percentage, whatever. Then say, here's Annex A, 47,000 pages of computer output, but answer the main question.

MR. JEAN-LOUIS MASSE: I guess there are more clients here than I expected. We (Canadian Pacific) are looking into this matching of assets and liabilities on the pensioner side and not looking at the active members. We're pretty large, about \$250 million annual cash outs and we're interested in this cost of matching. There are essentially two ways of matching. One is matching the amounts of benefits every year and another one is to match durations. What's the difference in the cost of matching? Is one better than the other? I understand that most people who do some matching match durations. But the other one is a much simpler concept for management to appreciate. I'm looking for an answer here, hopefully -- why not match cash flows as opposed to match durations?

MR. QUINN: Our experience is we did have a cash match, one for retirees only, back in the early 1980s. With the efficiency of the markets though, if you matched durations, you could spend less dollars to get the match and although the yields on those bonds are probably less than a cash-matched bond fund, the way the yield curve works, you free up more assets to be actively managed within the other pools of your accounts that return more in the line of 12-13%. So the net cost is much lower from our perspective.

MR. BRACKEY: Bill alluded to the opportunity to duration match and have a lower percentage of the assets in the fixed income groups, so you can have a higher percentage in equities. Further, let's assume that you don't do that and you're going to maintain a certain percentage in fixed income. Then how does duration matching work versus cash flow matching? I would suggest a process rather than an answer to that question. The process I would suggest, is to go to some people in the investment management business, who within a matter of a few minutes or hours, can give you a cash-matched portfolio and a duration-matched portfolio and the present value of each. I think you'll find there is a material difference in those two present values, and obviously it will depend on

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economic conditions at the time you request the information. But I'm sure there are a number of firms you can find that would be happy to provide that information to you.

MR. DASKAIS: There is one question I'd like to raise, which I think is interesting. It came out as a result of the work that I've done and it gets into the assumptions. Traditionally, the argument for real estate as a pension fund investment has been that although it appears to have a lower expected return than stocks and probably a lower expected return than bonds, its returns are negatively correlated with those of bonds. And therefore you get more protection for the fund as a whole, by investing some of the money that you might otherwise invest in bonds in real estate. Obviously, it also has some high inflation correlations. However, when you get away from an asset-only environment to an asset and liability environment, you don't want the negative correlation of real estate with bonds, because it also means that the real estate investment is negatively correlated with liabilities. If you follow that to its conclusion, and if you don't change the basic expected return assumptions that many plan sponsors and investment bankers and economists and theorists are using, there is virtually no case for investment of a pension fund in real estate. Have any of you, either on the panel, or in the audience, had any opportunity to think about this question?

MR. BRACKEY: I would agree that in the asset-only framework, it's quite obvious that the real estate asset category is an efficient diversifier. Again we're working with a couple of components here, the fixed income component and the equity component. Within that asset liability framework, I think the real estate category, thinking of it as part of the more aggressive assets, is still, I guess in my intuitive view, a useful diversification vehicle. You get into a question of assumptions here, and the assumptions you make are going to buy us the conclusions. When you say it's negatively correlated with bonds, how negative? My recollection would be, it's probably a fairly low negative correlation. With regard to real return expectations, if you went back three or four years ago, a lot of the studies were incorporating real returns on real estate in the 4-5% neighborhood and real returns on bonds at 3%. So you've got some additional return expectation. Now whether or not that's most appropriate is certainly subject to debate. But my feeling is that even as we translate into the new environments, it's going to provide some advantages, but I also think it's a category that has to be further analyzed in this context. I would further say that it also starts to relate to the objectives and whether or not they are more real return and long-term-oriented, or shorter term and balance sheet, financial-statement-oriented.

MR. QUINN: I think the old theory used to be, you're right, it was the inflation hedge and bond was the deflation hedge. But as a New Yorker who moved to Dallas in 1979, I can tell you there's been inflation here and there have not been any returns on real estate. Actually, there's been deflation in real estate. So I think what you've learned is that it's the old story, real estate is not necessarily purely an asset class that goes up with inflation. It's based on a lot of other variables -- location, location, location and things of that nature. So our view has been to take a little different view. We look at real estate as an equity alternative. We look for unique opportunities within the real estate market if we think we can get better returns than equities, but not purely as an asset class to be an inflation hedge.