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**INTEGRATING THE ACTUARIAL/INVESTMENT FUNCTION**

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Recorder: GREGORY J. CARNEY

- o Initial concerns from each side
- o Needed initial and ongoing coordination
- o Effect of company philosophies
- o Realized and potential results
- o Pitfalls

MR. GREGORY J. CARNEY: Welcome to Integrating the Actuarial/Investment Function. This is the first session that is being sponsored by the Investment Section, and we certainly picked an auspicious time to start an Investment Section in light of the recent developments in the stock market.

I'm your guest moderator today. Mr. D. Alan Little was supposed to be the moderator, but unfortunately he had a last minute commitment that prohibited him from attending this meeting. Stepping in as moderator is really easy because the moderator's job is done before the session and involves getting the experts to talk about the topic and letting them speak. Mr. Little's done a fantastic job in putting together the experts for this session.

Richard S. Robertson will begin our presentation today. He's Executive Vice President of Lincoln National; he's their Chief Financial Officer, which includes financial reporting, investor relations, strategic planning; and he's a member of Lincoln National's Investment Policy Committee. Mr. Robertson will present today's topic from a planning perspective and will discuss the various approaches that Lincoln National has tried.

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Graham R. McDonald will be our second presenter. Mr. McDonald is Vice President of Group Pensions for Great West Life, located at its U.S. headquarters in Denver. He is in charge of all aspects of the group pension division which includes product development, pricing, underwriting, financial reporting, administration, and so on. Mr. McDonald's comments will be from a practical standpoint; he'll be discussing the issues the company is concerned with and the approaches that Great West has taken.

Mr. Irwin T. Vanderhoof will complete the presentation of today's topic. He is Chief Actuary and Chief Investment Officer for the Equitable Individual lines. He has a Ph.D. in Finance and is the Adjoint Associate Professor of Finance at New York University. Mr. Vanderhoof has written numerous papers and study notes on the topic of investments. His comments are going to be from the perspective of someone who is actually doing this.

This session was really not going to be a panel discussion in the way we think of a normal panel discussion. Instead it will be a "workshop on wheels" and I think that's kind of exciting.

MR. RICHARD S. ROBERTSON: Before I get into the topic of the coordination of the actuarial/investment function, you may be interested in hearing some stories from the front as to what's been going on in terms of the stock market disaster in the last day and a half. I've been doing a lot of coordinating of the actuarial and investment function by telephoning Lincoln National's home office trying to sort things out.

By now, it appears the financial community has settled down a bit and needs to figure out just what is really happening. It's quite clear that these program traders are a significant part of the problem. I'm not real close to this side; maybe you know more about it than I do, but as I understand it, there are all kinds of computer systems in place that are supposedly designed to protect the company from the kind of things that happened on October 19. There are a variety of things these traders do. They use options and futures to some extent, but they also use, in effect, the old stop-loss wherein if a stock goes down so far you immediately sell. In this age traders do it by computer. Either the orders are triggered automatically by computer or they are triggered in such a way that all the trader has to do is press a couple of buttons and the

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order automatically goes out for execution. The problem is that when you have a large number of people trying to do this all at once, you can't protect yourself from a disaster of this magnitude, and apparently that's what happened. Everybody tried to get through a relatively narrow door at the same time with predictable results.

Apparently having a night to think this over and get some human intervention in the system, the finance community was able to sort things out a bit and maybe, they concluded, they had overreacted. But who knows, by now, the market could be up another 200 or down 300. You don't know. The mood this morning is relatively optimistic.

Let me now talk about the coordination of the investment and actuarial function.

Let me start by giving a little history of how our investment operation organization has changed over the years at Lincoln National. Ten years ago we were organized basically the same way that everybody else was organized. We had a completely functional Investment Department. The Operating Departments brought in the money, they turned it over to the Investment Department and said it was the Investment Department's job to get the best return they can, given certain risk parameters. In addition, the Investment Department took the funds and searched the investment markets to see what they could do to get the highest return, found it, and invested it. In general that meant, given that we were constraining them on risks, they usually would get their incremental return by going out for maturities. They were typically investing it for as long as they could. So we wound up with a very long maturity investment portfolio. This didn't bother us at the time, because we didn't see any reasons to worry about how our investments were structured as far as the cash flows were concerned. Our cash flows were positive. They had always been positive and we presumed they would always be positive.

We learned our lesson in the early 1980s. We discovered that interest rates do not necessarily move in small increments and that if interest rates go up sharply and you're holding a long bond portfolio you're going to have some serious problems. And we did. The problems were not so serious that we were ever anywhere close to a solvency problem, but we did have some earnings' problems. We had funds that were invested at 6%, let us say, supporting liabilities where

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we were expected to pay something that resembled a market rate of interest, and we were faced with the rather uncomfortable choice of either having to pay out in interest more money than we were earning in investment returns, or not paying it out and finding that our people had taken the money and given it to somebody who would pay out. We muddled through that the best we could, having higher terminations than we were at all comfortable with, and taking some losses in spread.

In the process, we learned why you must integrate the actuarial and investment functions. We took a number of steps to avoid having that kind of problem again. In light of the kind of markets we're seeing these days, we're very thankful we did. Perhaps the most significant step we took was to move to a complete system of segregated asset management.

We established separate investment portfolios for all of our major lines of business and for many of the smaller ones. We installed a system of portfolio managers to supervise this and then told the operating areas that they now had a shared responsibility with the Investment Department to develop policies to be used to invest their funds and that they were expected to work on a day-to-day basis with the Investment Department in managing those funds. Another change we made at this time, partly out of convenience, was to place an actuary over our Investment operations, Mr. David Silletto, when the Chief Investment Officer retired. This was very helpful in installing this kind of an investment system and making it work.

For reasons I think are understandable, placing an actuary over our investment operations was resisted strongly by the investment professionals. They considered that this change represented a loss of authority and responsibility for them. To some extent it did, but it was more, I think, a transitional thing because it meant that all the skills and talents they had learned over the years, namely, how to invest long, how to get the incremental returns, were being challenged and that they were going to have to learn new skills or find people who had those skills. So it was a very traumatic experience for the investment people.

On the other side of the coin, the operating people really didn't have the skills needed to make this system, a complete system of segregated asset management,

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work. There was going to have to be a period of building skills because most of our operating departments did not have people who had investment expertise. Or if they had such skills, they needed to sharpen them and to learn a lot more about what is being done with the money they bring in. If the operating people were going to contribute to the investment management process, they were going to have to learn how to do it. It has taken us a while to get from where we were to where we want to be and probably even now we're still not there, but over a period of time, we made this system work and it does work very well. I'm very glad in times like this that we have it. We do not have serious mismatch problems between our assets and our liabilities.

There are still problems, of course, in trying to determine exactly what our liability structure is. With the kind of products that we sell, there is no fixed liability structure. There are a lot of variables and that liability structure will have different characteristics at different stages of the economic cycle. But we're close enough to be reasonably confident that we're never again going to get caught in that kind of investment squeeze we found ourselves in during the early 1980s.

More recently, Mr. Silletto, the actuary to whom we gave the responsibility for the investment operations, in turn retired, and we decided that we did not want to replace him with another actuary. At this stage in our organizational development, we concluded that we badly needed another investment professional to run that operation. One cost of all this turmoil is that in trying to build these joint management skills, we got rusty on our investment skills. In particular, we didn't have as sharp a focus to our overall investment scope as we had prior to that time, or was really necessary to do the kind of job we needed to do to compete in the investment markets. So, we're now back where we have a strong investment professional running our Investment Department and he and I work together as closely as we can to coordinate the actuarial/investment function.

Let me talk a little more about the segregated asset accounting system that we have in place. The purpose of the system is to allow the development of investment strategies that are supportive of the needs of the operating areas. We recognize that we need different strategies for a property casualty investment portfolio, for a portfolio of traditional participating or nonparticipating whole life, and for a reinsurance portfolio. As we move down the spectrum, Universal

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Life has certainly a number of interest sensitive characteristics that call for different philosophies. Annuities require a similar philosophy, and of course, pension management requires a very carefully designed strategy to meet the obligations contracted for.

The other purpose of the segregated asset accounting system is to allow us to place the accountability and responsibility for investment management with the people who are being credited with the profits from investment management. In all of our businesses, a significant part of the profit return comes from investments, and unless the manager of those operating units has the authority over the investment strategy and the way funds are to be managed, it is difficult to hold the manager accountable for the profits he produces. So a system of strong profit center accountability almost requires the decentralization of the investment management function, or at least the development of investment strategies.

There are a number of problems with decentralization. Communications, of course, become very, very critical. We've got to have a continuing flow of communications from the operating areas to the investment areas, back to the operating areas, and up to corporate management. It's taken us a fair amount of time to build these communication links and make them work.

There are some problems that are created when you go to smaller investment portfolios. If you're running one investment portfolio for the whole company, or at least for a very large part of the company's assets, you can make reasonably large investments and there is a great deal of value in making large investments. However, as you subdivide the smaller portfolios, you simply can't place \$20 million in assets in an investment portfolio that totals \$100 million. So you've got to either make a lot more investments in a corporation and in the process lose the opportunity to take big pieces, attractive ones, or you've got to have a way of dividing these large investments up among a lot of portfolios, which has some accounting issues, and in the process reduce your flexibility in managing those portfolios. What happens when portfolio A decides they want to sell that investment and portfolio B says, no, we want to keep it? There are things you can do. You can scurry around the rest of the company and try to find someone to buy A's piece. Or maybe B likes it so much they buy some more, then you've got to develop internal prices for the sale. You've got to account

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for a capital gain on portfolio A that doesn't show up on the company's books as a whole. All of these problems are manageable, but for those who are not at all comfortable in the first place, it aggravates the problem of making it work. This is one of the reasons it's taken so many years to get this system to where it performs the way it's supposed to.

At Lincoln National we have also developed investment pools of various kinds. That's an alternative to taking a big investment and splitting it into little pieces. Maybe we can develop, let us say, a commercial mortgage pool and allow operating units to buy pieces of it like a mutual fund. However, that's got some problems too because you do not have as much flexibility in choosing your maturities. You're stuck with whatever kind of asset is in that commercial mortgage pool. Then when you want to sell, we get into some of the same problems involving transfer pricing, recognition of gains and losses. This, however, is an approach that seems to work pretty well for things like equity, real estate, where you can get into real problems trying to place those piecemeal into operating portfolios.

Another problem we've had involved trying to establish appropriate liquidity. We started out by saying, well we'll just let each operating area establish its own liquidity policy, and then if all of the operating areas have sufficient liquidity, it would appear that the company as a whole would have appropriate liquidity. Those of us in the actuarial area realize that when you're dealing with relatively independent risks, the aggregate risk itself is much less than the sum of the individual risks. So we found our company suddenly awash with liquidity and realized that we needed a system that in some way either reduced the perceived liquidity needs of the operating areas or managed the aggregate liquidity on a corporate level.

We've done a little of both. We've established central cash flow management. Rather than trying to maintain liquidity in cash for an operating area, they in essence are being credited with cash equivalents from the corporate office. And the corporate office itself nets those out and invests, in longer maturities, some of the cash that the operating areas have left with it. We've also been trying to convince our operating areas that there is nothing wrong with maintaining a significant part of their liquidity in what amounts to a credit line from the corporation. That has required a change in thinking on the part of people who

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have always viewed cash availability as a plus, and the need to go into debt as a minus. But, we've gotten a long way there and that has had some very beneficial effects on the corporation as a whole.

One major area that needs discussion is: While it may be appropriate for each operating area to develop a policy with respect to how you manage the assets supporting that line of business, there is a need for a great deal of coordination. We do need to put some constraints at the corporate level. We've got to look in aggregate at where we are going to wind up as a corporation. We've got to set some parameters so if the manager of an operating area for some reason wishes to take more risks than we think appropriate at the corporate level, we've got some way of either overriding that, or at least going back and making sure that the manager really understands what he is doing and whether in fact it's an appropriate policy. We need to have some mechanism for getting the expertise we have at the corporate level and using that to develop some consistent corporate positions on where we think the markets are likely to go and how we as a corporation ought to react. To the extent that we are doing some things on a pooled basis, we need to have some directions given at the corporate level as to what those pools consist of. We have established a strong and active corporate level investment policy group. In the final analysis, the investment policy is going to be created by the same people who make corporate policies in general. The Chief Executive Officer is the leader or the chairman of the group, and he will consult with those people who are particularly helpful in developing investment strategies. He will consult with the Chief Investment Officer; he will consult with me; and he will consult with some of the key operating people in trying to help us collectively develop a corporate investment policy.

We also have a more formalized version of this in an Investment Policy Committee that meets regularly, that has an agenda that addresses issues that cross operating unit lines, and that tries to develop constraints within which operating units can manage. We try to develop corporate liquidity policies, try to examine on a corporate basis the extent to which we are exposed to both credit risks and maturity risks. To some extent we try to get incremental income, on a marginal basis, biasing our investments one way or another. If we think the long rates are particularly attractive, we will probably be a little longer than a strict application of matching might imply. That kind of an approach has to be very



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carefully controlled so that we know if we are wrong in our judgments, how much down-side risk we have. Those are the things that are done at the corporate level, and this Investment Policy Committee is active in trying to measure and evaluate those kinds of issues.

We also are in the process of doing a great deal of cash flow modeling. There are some very good systems that are available out there that allow you to project both asset and liability needs. Different economic scenarios allow us to test different strategies for crediting investment income on our interest sensitive products, making assumptions as to what that crediting is going to mean in terms of persistency and making assumptions as to what will happen if we have various differences between our crediting rates and marketing conditions.

By taking these systems and doing a lot of "what if" type testing, we're learning a great deal about how some of our products might perform under certain conditions. These systems are heavily assumption driven, so we're always very cautious about saying this or that is what's going to happen because our model says it's so, but we are getting a lot of experience. We at least know some of the questions to ask as we go into different kinds of economic environments. "What if" testing is proving to be a very useful tool in bringing together the investment, actuarial and product resources, and trying to get them talking to each other as to what we're trying to accomplish together.

This is all I have in the way of prepared comments on the subject. We can come back to some of these things to the extent you think appropriate.

MR. GRAHAM R. MCDONALD: It is a pleasure to be here, and I think that as each of us presents today's topic from our own and our own company's perspectives, you'll see both similarities and differences with respect to what Mr. Robertson has said. Basically, from our perspective, you can look at this subject in very simple terms.

While integration is thought to be nothing more than coordinating and managing in tandem the asset side of the business and the liability side of the business, but it's really a lot more complex than that because the elements of integration really include: investment policy, product design and pricing, risk management,

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earnings' management, and various market strategies that each company might employ.

Here's an issue for you this morning. If you had called your pricing actuary yesterday -- Black Monday, the Stock Market Crash of 1987 -- and asked, "How are things going?" and the pricing actuary said, "Well everything's fine; nothing much new here; how are things going with you?" I suggest that you might have an integration problem in your company.

The industry really has gone through numerous stages on the question of integration. There was the period of Benign Neglect, for Great West, and I think for many of you. During the late 1970s and early 1980s as Mr. Robertson pointed out, many of us were invested longer than we liked. We didn't think that was much of a problem; we had other issues and other opportunities to deal with. Interestingly, an associate of mine who recently spent some time in Japan believes that benign neglect is the current stage of the Japanese industry on the integration question.

Then the industry went through a period of Awareness; we came to realize that something had to be done, and in the early 1980s, some of us went into Panic. We looked at the integration issue not so much from the standpoint of fine tuning our business, but from the standpoint of avoiding catastrophe and so we moved into the Reaction Mode and did all sorts of things. Some companies effected some very significant balance sheet restructuring. That turned out to be a mistake in retrospect, but at the time, where interest rates were, many boards of directors couldn't risk things getting any worse than they already were. Also, through this Reaction stage, companies began getting into immunization, cash flow matching, hedging techniques, more sophisticated pricing techniques, and so on.

I don't think too many companies are in Opportunity Mode yet. A company is in Opportunity Mode if it is able to develop very sophisticated asset liability management and the associated integration, thereby gaining some real market opportunities and a real competitive edge, particularly on the narrow margin business on the pension side.

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Each company has to look at a number of issues, I believe, when it decides how and if it is going to integrate its actuarial and its investment function -- the organization, the business mix, the techniques and tools, the methodology, the quality and extent of the management information systems they have and, most important, the culture. Let me spend time discussing each of these.

First, let's consider organization. Is your company centralized or decentralized? Are you run by line of business or are you functional? Most important, what particular role does the Investment Division play in your company?

As for the business mix, what is the character of your liabilities and the mix between the indeterminate and the determinate, because that will very much affect the types of tools and techniques you'll employ on cash flow projections, the kind of risk management you might want to undertake and certainly the investment policy as well. What is your mix of business between group and individual? Between pension and insurance? The answers to these questions will determine how big an issue the integration of actuarial and investment functions is for your company and what response you might have to it.

It is important that the techniques a company utilizes involve segmentation, and I'll describe four types of segmentation later. In addition, of course, there are the types of models and systems used for such things as cash flow projections and immunization. Some companies are using stochastic processes, optimization models and so on. In fact, Joseph J. Buff with Tillinghast was describing this earlier in this meeting. Basically, they put together a model that looks at the C-1 and the C-3 risks in tandem. In effect they're developing ways of quantifying the "quality" risk of fixed income securities and modeling it at the same time as modeling the risk of interest rate changes.

Finally, and perhaps most importantly, there is the culture of your entire organization. Mr. Robertson referred to it in his presentation. It has to do with questions like "What's the management philosophy?" or statements like "This is the way things are done around here." What are the unique political considerations that might exist, and what are the relative roles both in terms of organization and in terms of power structure of your corporate finance and control people, your line of business people and your investment people? Finally, of course, I believe the board of directors of your company plays a big role. If

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they're largely interested and driven by the C-1 risk, which historically has been the case, you're going to have a very different situation than a company that is more interested in both the C-1 and the C-3 risks.

Now you can integrate the actuarial and investment functions in many ways. You can integrate with full accountability, for example, if the pension division were to report directly to the investment division. Or you can have shared accountability, either managed or unmanaged. "Managed" means there is shared responsibility between line of business and investment, but with someone designated as a portfolio manager who plays a coordinating role in terms of investment policy, and acquisition and liability acquisition.

Let me now share with you a brief Great West Life historical perspective. I would say pre '79 we were in a situation of Benign Neglect. We had other opportunities and other problems, and asset-liability mismatch wasn't a major concern. The early 1980s woke us up in a hurry and we implemented numerous processes and improvements including better reporting, pricing techniques, and investment income allocations.

In terms of communication between the actuarial and investment areas, we've made great strides to the point where we have very extensive daily communication on pricing matters, and in addition, we conduct monthly or more frequent meetings between the senior line of business and senior investment officers where we look at the asset and liability aspects of our business in tandem. We are in a position of shared accountability between line of business and investment.

I'd like to spend a few minutes on four possible methods of segmentation. First, there is Explicit Segmentation; I think that's a fair characterization of what the Lincoln has done. It involves not only separate tagging of assets, but an entire accounting and recordkeeping system behind it. A second method could be called Notional Segmentation. Notional is actually similar to Explicit except that instead of hermetically sealed boxes for each segment, assets are tagged, analyzed and tracked for particular liability characteristics, but they're within the company's overall general account.

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Synthetic Segmentation is a method wherein your investment division becomes effectively a profit center, by promising to or contracting with the lines of business for specific investment yields. And those yields on particular assets will form a basis of performance. The pricers, the line of business people, will measure themselves opposite these yields, and of course, investment people would be measured on performance against actual results versus those promised. I could spend an entire morning discussing the pros and cons of the synthetic segmentation method; suffice to say that it does have some serious problems.

The last method could be called Modeled Segmentation. Basically, it involves modeling the investment results of your organization to achieve such things as better asset liability management, better risk management, better line of business decision making and better investment income allocation. I'd like to discuss model segmentation because that's the one our company has decided to move to.

It compares a little bit to Mr. Robertson's description of forming asset pools, but modeled segmentation carries the concept quite a bit further, and forms a larger number of investment pools, perhaps 15 maybe 20 with specific investment characteristics. For example, there might be a common stock pool, 5-year commercial mortgage pool, 7-year public bond pool and so on. Within each pool assets would be tagged and tracked separately.

Then what you have with modeled segmentation is a model where each line of business, depending on its liability requirements for yield, for risk, for duration and so on, effectively buys a share in one or more of the asset pools. For example, every month a particular pension product might end up buying 20% of one pool, 50% of another pool and 30% of a third pool. The appropriate yields and durations would be locked in and tracked through the model over time.

Basically then, a fairly complicated model tracks all of the assets of the corporation and allocates back to the lines of business the actual results according to the model, taking account of such things as hedging activity as well. Periodically, of course you have to test the integrity of the model by comparing it to actual assets opposite things like repayments, prepayments, rollovers and so on. Modeled Segmentation not only forms the basis for investment income the actual financial results against expected.

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One of the advantages of Modeled Segmentation over explicit business changes is that if you find that those pools are too large or too small, you can redefine them and redefine them quite easily. Also, the model information that is captured allows segmentation. Another one of the advantages of the model approach over explicit segmentation is that it does get around some of the problems that Mr. Robertson identified. For example, Modeled Segmentation avoids some of the sub-optimization that can occur with explicit segmentation regarding issues such as liquidity or sharing assets. In addition, it does give the investment division some more comfort that it can take actions that are in the best interest of the entire company, while at the same time trying to satisfy the needs of each particular line of business segment.

In conclusion, I believe integrating the actuarial or liability function with the asset function is critical to all of our companies' success. The solution that you pick as a company will be unique and it'll depend on the unique characteristics of your organization. However, you need a solution of some type. Otherwise I think your collective assets will be in some serious jeopardy.

**MR. IRWIN T. VANDERHOOF:** After I make the required comments about the economy and the stock market, I'll talk a little bit about the organization of the Equitable.

It is interesting that the debacle over yesterday's stock market crash is being thought of as the same kind of thing as 1929 and not the same thing as 1929. What most people have not latched onto is there is a qualitative, not quantitative, difference in the way the world and the economy work now. They're largely computer driven. Dick Robertson mentioned computer program trading. It's not just that. There always were stop loss orders and there always were margin calls. You can have a debacle in the stock market without program trading simply if there are enough stocks held on margins. The brokers sell everybody out.

What is different is the speed with which the information is disseminated around the country and the speed in which the orders and transactions can be placed and executed. This is really different. It's not just a stock market phenomenon. In every phase of the economy, information is disseminated much more rapidly, and interest rates move now much more rapidly than they

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ever did in history. Bond prices change because of expectations as to what the next announcement of what the money supply is going to be. People are now spending a lot of money to predict what the change in the money supply to be announced on Thursday is going to be. There are studies showing how accurate those predictions are and how errors in those predictions can change the long-term bond market prior to the announcement. That's not going to change.

The level of instability in the economy which we saw yesterday is not going to change. The level of reaction speed is not going to go down. It's going to become a more rapidly moving market, a more rapidly moving economy. Information will be more rapidly disseminated and evaluated which should be good for some of us. Some of us are going to try to stay on top of it. It's bad for people who really believe that the same reaction time that was good enough five or ten years ago is going to be good enough five years from now. It won't be. Everything has to react more rapidly in all of your business decisions.

Maybe I can argue that the whole bit about integration of assets and liabilities is a response to that speed, to the more rapid reaction time that's required. We look back through the history of the insurance business and the economy. We don't see interest rates jumping around the way they did in the late 1970s, early 1980s. We don't see the tremendous need to react to those changes in our business or take it on the chin, the way we did in the early 1980s when interest rates shot up and we were faced with a new word -- disintermediation.

So we get into the question of asset/liability matching. I've been interested in that for a long time. I was very lucky to have gotten interested in that before most other people did, because it gives me the opportunity of telling everybody I'm smart. I called in 1971 that actuaries have got to get interested in investments. And by George, it happened. We're pretty proud of how we've gotten along on this. I've been to a number of workshops. Everybody said, "Now we're talking to the investment people. Isn't that good? We have regular meetings. We talk to them and say we need five years." They say, "Gee whiz, here's something we can get. Haven't we moved a long way?" I think it overstates and understates what's really going on and what has to go on.

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The Equitable now has investing subsidiaries. We don't really have an investment department. What used to be a bond department is now essentially securities. But they have become a subsidiary and try to solicit and manage funds for other organizations. In some cases, we're putting money in. They are soliciting other organizations for the same kinds of funds. We have something called deal flow, which is basically leveraged buy-outs. We put some money into that fund. They are soliciting twice as much money from the outside. They are going their own way. It's a further step in decentralization.

Our real estate people are doing similar things. They buy and sell buildings and mortgages. In some cases, we, the general account, participate in the purchase of a building along with some of their other corporate or state pension fund clients. Again they are encouraged to build up their own fees by taking larger positions than we would want for our own general account, and we'll split them with some of their other customers. That should allow a higher degree of diversification than would otherwise be possible.

We are segmented. We were early on in the segmentation game. I don't view segmentation as a final answer. I view it as an interim step. Segmentation in my view is intended to break down the general account into understandable pieces. When you are dealing with a 100-year-old company that has done everything a company could do, including writing in 15 different countries and having 20 policies left in England, you get a general account that nobody could possibly understand. When you break it down into segments and essentially put specialists into each of the segments, then they may be able to understand the segments. If each of the segments could be understood, there may be a possible final step and that is to put the whole thing back together again to decide that one segment tends to be very short in its liabilities and therefore should have transactions with a segment that has transactions which are very long in its liabilities. An example would be a short term interest sensitive product with structured settlements.

I am Chief Actuary and Chief Investment Officer with practically no staff because all of the investment work is done by the subsidiaries. The actuarial work is predominantly done within the lines of businesses within the segment organization. My particular project is to set up an integrated strategy for



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the crediting of interest-sensitive products for the crediting of rates on our liabilities with the investment policies themselves. And I think we have a long way to go for that.

We are communicating now with our investment people. I think the communication is going to bear its full fruits, really be valuable, when we understand there are vast cultural differences between the actuarial orientation and that of the investment people. I'll talk about two of these differences.

One is time frame. As actuaries, we think in terms of 15 or 20 years. Are we going to make our profit in 15 years or are we going to have a 20-year time frame? For investment people a long-term framework tends to be about eight minutes. They get on the telephone and they are offered three deals. They want to know which deal they should take right away. That is a proper framework for the investment people -- particularly the securities people. If they're lucky they have three minutes to make a decision to take or not take an offer. Our time frame is so long term and theirs tends to be so very short, so immediate, that effective communication is very difficult.

A second cultural difference is an attitude toward risk. I complain a lot about the actuaries at the Equitable and everywhere else as being obsessed by neatness. We have our scenarios, and we have our cash flows for 20 or 30 years. We're so proud of those things. Take your cash flow analysis into the investment people and say, "Gee, in year seven under the 15% rising rate scenario, the cash flow is not too good. What are you going to do about it?" Their eyes have glazed over. And they have no idea of what's going on. It's not an effective communications tool. It can't be. There has to be an effective communications tool that's more immediate for them and more risk-oriented. We like neat assets. We like ones which fit into our projection models and we can project out. The investment people will tell you that's not a place you can make any money. If you want to make money, you have to take some sort of risk. You can decide to take a risk on maturity structure, you can decide to take credit risk. If you want to make a lot of money, you're going to have to take a substantial amount of risk -- either in the form of common stock, convertible bonds, junk bonds, or something. The only thing you can have nice and neat and predictable is failure. Success in this area is always messy.

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I've given you areas where communication is not, I think, really possible between the two cultures right now. I think that calls for some actuarial breakthroughs. I don't believe the investment people left on their own are going to find a way to communicate with us. I hope that as a profession we can find the tools necessary to communicate with them.

Duration is a tremendously useful tool in this regard. Everybody is now badmouthing the Macaulay duration saying we have to get rid of it. We have to have 27-year cash flow statements and then everything will be all right. Everything will be all right for valuation, but in communication with the investment people, Macaulay duration is needed. They know what it is now. You can go in and say, "The duration of the investment portfolio is too long." And they say, "Okay, I can go out and make a bunch of deals over the next week and draw it down." Duration is easy to calculate, easy to work with, easy to change. We need to move, however, to effective duration or actual duration that takes into consideration options built into the assets. We have to have a breakthrough on that.

I think we have to have a breakthrough on convexity -- the second order term. Convexity is something the investment people are learning about and can work with. If we can apply that reason to our liabilities, then we are going to be able to communicate with them and they are going to be able to make the changes in the portfolios more rapidly and more effectively.

A. D. Wilkie in the June 1987 issue of the *Journal of the Institute* has done a recent paper on modeling the options in life insurance policies -- cash value, cash surrender option. He's using Black and Scholes, a basic tool for valuating options. I believe it can be related to risk theoretic work, so it could be the promise of the actuary.

A series of conceptual breakthroughs is going to be necessary to make the process totally effective. I think they have to be made by this profession, rather than the investment people, and have to do basically with short, punchy ways to describe a portfolio and a portfolio's needs. The investment people can, in their time frame, work with and use to correct the total problem of asset/liability integration.

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I talked a little bit about the market and economy -- that's required today. I talked a little bit about the organization of the Equitable. I've talked about breakthroughs that are necessary for us to get the full benefits of the move of the last five years toward asset/liability integration. I think it's going to become more necessary. As I said earlier, the communication of information will speed up in the future. The market is going to move faster not slower. It's going to be up to us to keep up with them.

MR. CARNEY: I would like to open this session up for questions and comments.

MR. DAVID P. ROSENBERG: I guess this is a question primarily for Mr. Vanderhoof. As a pension actuary, I really have no knowledge or very little knowledge of the subject about which the three of you talked so interestingly. I would like to have comments from any of you and particularly from Mr. Vanderhoof because his study notes are the ones I'm most familiar with, on the way in which investment functions could be integrated into the pension plan context. Clearly in the life insurance company context, you have a situation wherein your investment and actuarial people are working for the same employer. In the pension plan context, you're really talking about two groups of professionals, the investment people and the actuaries, enrolled actuaries for the plan who are employed by the client who sponsors the plan. Would any of you have pointers or comments on how perhaps this function, these functions, could be better related, particularly given this rapidity of change in the investment climate that obviously is going to affect, has affected pension plans, I'm sure, in the last few days?

MR. VANDERHOOF: Some years ago, I did some actuarial evaluations for the Equitable and its own pension plan to determine the importance to the pension plan, of the different kinds of things that could happen. Our pension plan contained a Cost of Living Adjustment (COLA) so it would be interesting to see what would happen if you changed your investment strategy and there was a certain level of changes in interest rates, assuming that the COLA affected the interest rates. We did a lot of simulations and you can come to some very interesting conclusions. One conclusion that I came to was that you are allowed in this kind of process to fix one variable. You can say to the pension fund sponsor, would you like to have the contribution that you make every year fixed? Or would you like to have the contribution fixed as a percentage of the

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payroll? Or would you like to have it to be as low as possible or zero for as many years as possible? The conclusion that we reached was that if you go through this whole procedure of doing a series of valuations under different assumptions, you can decide on an asset mix, not necessarily 60% common stocks and 40% long-term bonds, but you can decide on an asset mix that is appropriate for different objectives. You can see the way in which the COLA will impact and make a reasonable assumption as to how to offset by asset mix the effects of that COLA. If you suggest to the pension fund sponsor that maybe it would be appropriate to do studies that focus on what their objective is and how those objectives are likely to be met by different asset mixes, you can probably find an asset mix that is more attractive than others.

MR. ROBERTSON: I started to say that I don't have a lot of personal knowledge about pension fund management, but I do sit on the Lincoln National Corporation Benefits Investment Committee so I at least know about one pension fund of moderate size. We have had those kinds of presentations you described where we brought in consultants who've done a great deal of modeling, tested a lot of economic environments, and used some stochastic processes. There are a lot of new systems out there that I'm very much impressed with, and they demonstrate how your funding strategy is very much integrated with your investment strategy. If you wish to pursue a particular investment strategy that will put some constraints on your funding strategies or if you wish to pursue a certain funding strategy, then there are some things on the asset investment side that you can and cannot do.

After listening for several hours to these kinds of presentations, I suddenly realized this was exactly the same thing we're doing over on the insurance side. Those were the same kind of models, those were the same kinds of problems, and the same kind of testing. It was just the same, and it made sense because it was really the same overall need, namely, the need to examine carefully what our investment strategy was going to be. The way we price our insurance products is almost exactly parallel to the difference between funding strategy and pension and investment strategies. I came away thinking, now I understand what's going on.

MR. CHARLES C. MCLEOD: I have a question for Mr. Robertson although the other speakers are welcome to comment on it. It relates to investment

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performance, which is really taking this integration one step further.

Mr. Robertson, suppose you were president of a company which had the same degree of integration of actuarial investment functions as your own company, and suppose you wanted to introduce an incentive compensation plan for members of the investment division. I will give you four choices of how you can measure performance and I'd like to get your reactions as to each of them. One choice is just to measure the rates of return obtained by the investment division in relation to some external index. The second choice would be to compare the actual rates of return obtained by the investment division with what the investment division quoted was available to the actuaries at the time the product was sold. The third choice would be to compare the actual rates of return with what the pricing actuaries assumed in setting the rate when the product was sold. The fourth is to take a look at the profitability of the particular product line or segment and pay both the investment people and marketing division people on the profitability of that product line.

MR. ROBERTSON: Incentives for investment people is a subject we're struggling with very hard. Most of our current incentives are in the fourth category; that is, we look at the profitability of the operating unit and use that as the measurement. I think absent anything better, that's all right. The problem is that this category only partially measures the contribution investment professionals are making to the profit process.

We must be very careful in determining what incentive we adopt for investment professionals because like anybody else once we adopt an incentive, we're telling them what we expect them to do. And if, for an example, we are paying the investment people on incremental yields, without putting constraints on risk, you can be sure the first thing they'll do is increase the risk they deliver to us. So, we've got to adjust for this in some way, either by putting constraints or by having some kind of risk adjusted returns. I think there are things that can be done along these lines. I suspect there are things that are being done that work quite well, but they've got to be done very, very carefully.

Of the four options mentioned, I would quickly reject the second and the third. The second involved comparing the returns produced by investment people with what they quoted. Well, the easiest way to improve one's performance on that kind of system is to change the way one quotes. I'm sure that would be the

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first thing that would happen, and of course you have the same kinds of problems unless you very carefully weight the return that is being realized with risk parameters. You also have to look at it relative to the market. I don't think it's fair to penalize an investment person because the interest rate environment completely changed in a short period of time. We can't pay them to be predictors, and if we are, then we've got them doing the wrong job. Yet, some of the same problems exist in comparison to what the actuary wants, except you've set the stage for a battle royal between the actuary and investment person over what kind of rate of return is achievable. So I guess the short answer is for lack of anything else, option four, based on the profitability of the operating unit. However, I think we need to work very hard to try to develop good ways of measuring the value that the investment people are delivering to us.

MR. MCDONALD: I would agree except that I would make a distinction between your operating investment professionals, the ones who actually do the deals and the ones who are involved in policy setting. There is an analogy with the decisions many of you make in paying your sales forces. For example, do you pay only for sales or do you also pay for profitability on group life and health business? It's the same issue. You want the results Mr. Robertson indicates but if you put incentives on the issues people feel they can't control, then you run amuck.

If individuals are operating in a very strict investment policy environment in terms of quality and in terms of whatever leeway you give them on duration matching, then it might be quite appropriate to measure the actual results compared to either some index, which I think is better than letting them set their own report card or basing it on actuals. However, if it's the senior investment people who are tied in at the integrating level, then I agree completely with Mr. Robertson.

MR. VANDERHOOF: The Equitable basically has two kinds of systems. In connection with private placements, commercial mortgages, and that sort of thing, our view is that our investment people can get what the market offers them, not a great deal more, and surely not a great deal less, and that is appropriately paid for on a basis of fixed fees. We have certain other funds, I made several references to convertible bonds and what we call our deal flow fund. In the case of convertible bonds, we say, all right, the fee we pay is

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going to be a percentage of the excess book return. None of this market stuff, but book return on our statements, over the return we would have gotten on say, the average of the constant maturity 30-year bonds over the preceding 12 months. Our investment people also get a small fixed fee which is inadequate to cover their expenses. There's a carry-back, carry-forward, so if they lose money, if they lose their booty in any year, they have to make it up in some future years. I believe the advantage of that is not necessarily paying them an incentive fee, but getting them to control the results of the portfolio in the way we want them to do it. In the case of the deal flow fund, the proposal is that the fee is based upon the excess returns over a portfolio of government bonds with the same maturity structure that could have been purchased instead of these LBO funds. I'm trying to move that same kind. I expect to have that same kind of a pattern in place for equity real estate by the end of this year, where the equity real estate people will understand that their own returns on to their subsidiaries depend upon a constant moderately increasing bookable funds by the Equitable.

MR. CARNEY: I like the question; I think that the problem that we have at this time is the performance standards and the measurements of those standards between the actuarial work that we're doing and the asset side.

MR. FRANK J. ALPERT: I think Mr. Vanderhoof has answered part of my question. In setting up this measurement of performance of the investment section, of the alternatives that Mr. McLeod outlined, they all began with return on such and such. My question is, is that return as measured by actuaries with a heavy concentration toward yield? Or is that return as measured by investment people, which is the total market value of the portfolio when they get through with whatever it is they're doing?

MR. VANDERHOOF: The investment professionals say let us manage to market value. In an insurance company context, it'll kill you because what happens is that all of a sudden the market has gone down and the first thing they say is, "Well now, it's time for me to restructure." So they're going to take a lot of losses and the market goes up and they're very happy and they see no reason to restructure anything, so you have no bookable gains. And this can become inconvenient for an insurance company. The investment people are just as pleased as punch, they've got great market value returns. It just never shows

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on your statement that by the time everybody now living has retired, they will be rich. That's not going to do me any good next year. I don't think the way the investment people do it or want to do it is convenient in the insurance company context.

MR. MICHAEL P. STRAMAGLIA: We're talking about integrating the pricing and investment functions. I think there's a third area of the company that has to be integrated with those two areas as well to ensure the success, and that's the actuarial valuation. If you're anticipating a mismatch of gains and losses coming through your asset liability matching system and then if your actuarial valuation is not sufficiently sensitive to the current interest rate environment, your financial reporting won't reflect that same gain or loss. Could I have your comments regarding how your financial reporting system fills that gap?

MR. VANDERHOOF: I'm not sure I really understand the problem that you're addressing. Could you expound on it a little bit more? I don't want to answer the wrong question.

MR. STRAMAGLIA: Sure. If your assets and liabilities are mismatched, then you are generating gains and losses and ideally you would like to see those gains and losses reflected on your income statement. In order to do that, the actuarial valuation has to have the appropriate charge to your reserves to accommodate that change. So we're talking about integrating three areas of the company, I think, rather than just two.

MR. VANDERHOOF: As to exactly how you do it, I just don't happen to know, but I view that the mismatch which you gave as an example as -- I have real questions as to whether that's a legitimate source of gains. I think once you get into your scenario analysis for valuation purposes, New York 126 or something, I think a lot of that gain goes away. Yes, absolutely yes; the answer to your question is yes.

MR. ROBERTSON: Here's one I'm struggling with. In my mind, I make some distinctions between financial reporting and valuation even though they're part of a similar process. However, if you're trying to measure financial performance, then I think of what we're doing as financial reporting. When we think of valuation, I think of primarily establishing liabilities to conform to regulatory



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requirements, and they can be different, particularly if the regulatory requirements are not as well designed as they ought to be (and most regulatory requirements now aren't). I would not use the term integration, or maybe I should. I look at the financial reporting, and to some extent the valuation process, as more scorekeeping or refereeing. The valuation actuaries are describing what is happening, and as such, they need to have clear access to what's going on to know what needs to be done, to understand what it means, and in some cases to be able to determine exactly how you handle it. There is indeed feedback going the other way because they're setting the rules too and the rules are changing.

Clearly the people that are developing investment strategy or product strategy must do so, keeping fully in mind the financial reporting/valuation implications. Now, maybe that's integration, but I look at it as integration of a different sort from what we've been talking about. There certainly is a need for a lot of communication and understanding.

MR. WILLIAM A. HALVORSON: In regard to the question of communication that Mr. Vanderhoof brought up between actuaries and investment people, I've been in the investment side looking at strictly equities for the last four years, and one thing I learned right off the bat was if you're in the investment field to expect errors. You expect rather drastic and catastrophic errors occasionally, and there isn't any investment person that doesn't expect these errors. That brings me back to the scenarios that we do so finely for actuarial projections. I just want some comments; maybe we ought to try to put all of these scenario projections on the graphics that you can put on the computer or on paper, and then always draw these scenarios with the magic markers rather than fine lines. This would help the investment people to understand what you're talking about, because they know that there's no chance that you're going to be within 1% of your fine line. They don't understand anybody who thinks they will. It seems to me that there are some fundamental things that the actuarial profession needs to get into, and that is to really start looking at the new techniques of artificial intelligence applications. I don't know enough about this to really talk about it, but I understand that there's quite an impetus being given to artificial intelligence by the use of parallel processing in computers, where you have several ports of input on an ongoing basis which can then be evaluated, interpreted and applied against the situation as you see it and against a kind of

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a scenario on a time frame basis. That permits the interpretation of results from several different aspects at the same time. I think Mr. Robertson is referring to the use of stochastic methods and Mr. Vanderhoof was also. However, I think I'm talking about a new dimension, not just stochastic but in terms of parallel information input and processing an application of those new figures, and new input to the single scenario that you were originally projecting. I would also like to have some comments on this. I have a term I developed while sitting here that may help. Instead of artificial intelligence, we ought to be able to make this actuarial intelligence, and make it something like parallel actuarial intelligence in scenario techniques. In other words, this is something that you can start talking to the investment people about in real terms, and how you would then adjust your scenarios to the changing circumstances. Comments please?

MR. VANDERHOOF: Artificial intelligence, that's a current buzzword. I think that artificial intelligence is a technique that will become important over the next decade. I think as with many other things, it's being sold to the public before it actually exists. Now, I've been through a lot of these things with computers, and I remember I worked on the Univac 30 years ago and then they were talking about executive programs. We had executive programs for 10 or 15 years after the terminology became common. I think that what you are saying is correct and I think it will be a necessary area for the actuary to get into. However, as far as I've seen, there's more publicity and more conversation than there is reality right now.