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ASSET/LIABILITY MANAGEMENT

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- o Investment products oriented toward asset/liability matching
- o Asset/liability management including the C-1 Risk
- o Current practices among life insurance companies
- o Future regulatory developments

MR. MICHAEL R. TUOHY: Just to update you on what has been happening around the world since we heard that the Dow is off 25% -- Tokyo was off 15% following a 3% fall yesterday, so that's less than here. Sydney was off 25% and London, at noon, was off 15%, falling at 12% for yesterday. But interestingly, if we were having this session in Sydney or in London, there would be a lot more worried faces than there are here because typically, in Australia and in our British life company we would have something like 40-50% of the assets in equities and they wouldn't be matching necessarily variable products. Here we don't have that sort of problem and we will center our discussion on the bond market.

MR. FRANK J. ALPERT: Before I start, I would like to give you a pictorial image of the risks we are trying to manage. Imagine a shallow inverted U-curve but declining to the right. This is the typical asset value curve -- as interest rates increase and you move to the right, the asset value decreases. Now in

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your mind's eye, overlay this with another, deeper inverted U-curve. This would be the typical liability value curve. Visualize that over the middle range the value of the liabilities is less than the value of the assets. We expect to make profits in the future, and the difference between the curves is the expected present value of these profits. However, because the liability curve is a deeper U, at the ends of the range the value of the liabilities is more than the value of assets. Whether interest rates get too high or get too low, there is an expected future loss. A good way to minimize that loss is to manage the assets in such a way that the asset value curve parallels the liability curve. There are some specialized assets which help you do this including zero-coupon bonds, coupon strips, futures on debt instruments, stock index futures, options, high-coupon bonds, and interest swaps. Each of these has its own use to help shape your asset portfolio to be closer to risks on the liability side, but all have disadvantages and can increase risk under some circumstances.

Zero-coupon bonds are very useful instruments. Either you can make them yourself, through internal stripping, or you can buy them in the marketplace. I will talk mainly about the publicly traded bonds because most companies are not diverse enough to do internal stripping. The publicly traded zero-coupon bonds have many advantages. The market is very active, the return is fixed at a known date, with no reinvestment risks, and there is no default or call risk because the market is exclusively in treasury instruments. In short, it is a known quantity at a known date, with maturities from six months to thirty years. I might also say that the spot rate curve (which shows the theoretical prices of zero-coupon bonds at various maturities) has theoretical value and is useful in a lot of asset studies.

How would one use these in asset/liability management? The most obvious use is to support insurance liabilities that may be very distant obligations, such as are sometimes seen in structured settlements. For example, a settlement may contain a provision to pay $100,000 in one sum in 25 years. It is difficult to find any instrument, other than a zero-coupon, which is suitable for funding this obligation. Another use is in fine-tuning the overall sensitivity of the portfolio to the changes in interest rates, because zero-coupon bonds have the highest degree of sensitivity to changes in interest rates. That is, of course, their principal disadvantage as well. If you have a lot of these, you will have a hypersensitive investment portfolio. The second disadvantage is that the publicly traded ones

are essentially privately produced and priced to make a profit for the producer. At times, therefore, you may be sacrificing yield. If you have a big enough portfolio, you may be able to achieve the same result at a lower cost by internally stripping assets into zero-coupons and coupon treasuries.

The other side of the coin of a zero-coupon is the coupon strip. Since the zero coupon is made by someone separating the payments of the coupons from the payments of the principal, the series of coupon payments can be sold as separate instruments, created in the same transaction. Zeroes and strips have complementary characteristics. Coupon strips are less sensitive to changes in interest rates than typical bonds. They match continuing rather than one-shot liabilities. They can be used to match the cash flow of certain products, particularly those that have a fairly steady, even stream of cash flow -- disability income on disabled lives, for example. They can be used for fine-tuning the sensitivity of the portfolio, and for those who understand this, I am told that in combination with other things, one can create "synthetic" assets with particular characteristics. The main disadvantage of coupon strips, if you must purchase them in the market, is that they can be a relatively expensive way of providing for an income stream.

While coupon strips from a Treasury instrument are a predictable, if possibly expensive investment, strips of other securities behave in strange and unexpected ways. There is a particular danger if you are dealing with strips from mortgage-backed securities, which can be exceptionally eccentric in their behavior.

Perhaps one of the most interesting and useful of the special kinds of assets are futures on debt securities. A future is a contract to deliver a security sometime in the future at a price that is agreed upon at the beginning. Most of the market is in U.S. Treasury instruments, and although the agreement covers a range of different specific issues and you deliver the "cheapest to deliver," it can be priced very accurately. The market is very active and liquid, and the transaction costs are low.

Futures are useful in a number of ways. You can hedge or insure the current value of a portfolio by selling futures against it. If interest rates go up and the value of your portfolio goes down, the value of the futures contract will go

up. You will make money on the future because you can buy the security to be delivered at a lower price than you will deliver it.

By selling futures, one can also create a series of short-term assets that are less sensitive to changes in interest rates. That is a direct corollary of the opportunity for increased yield. Sometimes the pricing of futures becomes slightly inconsistent with the underlying instrument. If one is alert to it, you can increase your yield by taking advantage of this price differential.

A third use of futures is to better control the timing of market moves. For example, if your portfolio manager has decided that it is now the time to move from long-term assets to short-term assets, but is unwilling to sell a large block because of timing considerations and the particular characteristics of the assets, he could sell futures now and deliver the instruments later. Thus, you can quickly alter the characteristics of the portfolio in anticipation of making permanent changes in it at a more appropriate time.

A fourth use of futures is to guarantee now an interest rate to be credited on money that will be coming in at some later date. This is a common situation on so-called window GICs, in which a rate is guaranteed for all money received over the next six months to a year. Today's rate can be locked in by buying a future that will be delivered to you when the money is to be received.

Futures are not a perfect solution, and do have their own disadvantages. The first is that if there is a change in the shape of the yield curve, you will not be that well hedged. You will not be quite as safe as you planned, even if you own and hedge the Treasury bonds. If you own other than Treasury securities, there is an additional risk. The market spread between the assets you own and Treasury bonds can also change. Then your municipal or corporate bonds will be closer to government bonds or further away from government bonds than when you started, and the hedge will be less exact. In the trade, this is called basis risk. It is another way in which the hedging operation may be less than perfect. Subjectively, I believe that less than perfect probably means that you might be 75-80% hedged, instead of the perfect 100%. Depending on how much you are doing, that slippage can be a substantial sum of money.

A different disadvantage is that operating in the futures market requires a different kind of expertise, a different set of knowledge and a different market orientation than the management of a traditional debt portfolio. It is not necessarily more difficult, but it is certainly different.

The biggest hindrance in the use of futures is that all of the states have regulations on their use and all the various regulations differ. Some states do not allow or flatly prohibit hedging operations. Where it is permitted, there may be restrictions on the proportions of assets which can be involved. In many states the company must file a statement identifying the assets to be hedged, how you are going to hedge them, and what the operational plan is. Of course, even if you are not required to file this statement, sound management dictates that you prepare it for internal purposes.

An extension of the concept of futures on bonds is futures on a stock index. Although it is possible to buy futures on specific stocks, it is less advisable because the market is smaller and more volatile, the price is frequently higher, and the risk is much greater. A stock index future would be used analogously to bond futures to hedge your stock portfolio. In terms of its use in an insurance company, you need even more expertise than for bond futures. The pricing analysis is considerably more complicated. State regulation is more restrictive, and if changes in the stock values go through the mandatory securities valuation reserve (MSVR), there may be less need for it.

The step beyond an agreement to buy or sell something at a future date is the use of options. An option is not a *contract* to perform, but a *right* to perform. It gives you a one-sided hedge against a future event. The main advantage of an option is that except for the cost of the option itself, you can only gain and not lose on it. There are a number of ways that options can be used in an insurance company's portfolio: one-way hedging (for example, against rise in interest rates); straddles -- two options combined to hedge on both sides; and even to increase income instead of hedging. For example, you can sell a call, and receive the income if you believe that the security will never be in the money. The principal limitations to the use of options are the transaction costs, which are considerably higher than for futures, the much tighter regulations -- Georgia, for example, will permit the use of futures but flatly prohibits the use of options -- and the expertise required to understand the pricing.

The next instrument is highly specialized, is useful only in a very narrow range of conditions, and is more risky. These instruments are high-quality bonds with high coupons and call provisions, probably issued years ago when general interest rates were much higher. If interest rates are below the coupon rate, and if (a) the issuer has the resources to buy back his debt and (b) the issuer is inclined to do so and (c) the debt issue can be retired early, then the bond is going to be called. But the pricing in the market usually provides a yield to call, somewhere between the short-term interest rate and the long-term interest rate. For example -- a 14% coupon bond in an 8% market when short-term rates are 6% will usually be priced to yield perhaps 6 1/2% to call. In the six months that you might own it, you will receive not the full 8% of the general long-term market, but certainly well more than the 6% of the short-term market. However, the big disadvantage and the big risk is that with a small rise in interest rates, this bond will not be called and you may be left with a long-term bond in a falling market, with a market value that will sink more rapidly than you had expected. If you want the additional short-term yield, you must be prepared to move very quickly out of these when interest rates start to rise.

The last instrument, sometimes called interest rate swaps, is an interesting concept with very specific and limited use for insurance companies. The instrument is a contract between two parties based on a notional amount, where one party pays to the other a variable interest rate and the second pays to the first a fixed interest rate. The variable interest rate will be pegged to some index such as London Inter Bank Offered Rate (LIBOR) or Treasury bills or the prime rate. The fixed rate payer is said to buy the swap. The exact terms including the fixed interest rate and the index to be used are negotiated between the two parties. One can use these to help shape the portfolio by changing the character of the interest stream; for example, to change long-term coupons to short-term interest. You could pay fixed interest to somebody who is willing to pay you floating rate interest in return. You can also use this to exchange taxable interest for tax-exempt interest; this might be advantageous to both parties if they were in different tax phases.

MR. DENNIS A. BLUME: I am going to amplify what Mike was saying on the stock market and what happened recently. I think it is important for you also to know where the money went because of the impact on asset liability management. It appears that there are some basic and massive reallocations of money

out of the stock market and into the bond market. In fact, yesterday morning, when I flew out of Fort Wayne, Indiana and got into Detroit, I called the office and found that 30-year Treasury bonds were around 10.45%, which would have been up from about 10.20% at the close on Friday. By five o'clock last night, they were down to about 9.72%. Talk about interest rate volatility! And it isn't just in the long sector of the market.

Two-year Treasury notes were down 80 basis points or .8 of one percent yesterday. Three-month T-bills were down about 65 basis points yesterday, so there is a lot of volatility in the marketplace. It seems like the money is being captured in the bond market, which is a little unusual. There has only been bad news in the bond market in the last 6 months or so. This is a pretty nice thing to be happening, unless you were sitting in cash.

I want to start out by giving you a brief overview of the Lincoln's approach to asset liability management and then touch upon what I consider to be the obstacles to proper immunization from an asset perspective. As Michael said, I manage the Lincoln's GIC portfolio so I approach the subject from the aspect of a fixed liability stream and manage the assets accordingly. We are duration matched on a call-adjusted basis at all times and are cash matched for the ensuing 24 months. Our GIC portfolios are made up of public bonds, private placements and commercial mortgages. We take an extensive look at all of our assets and liabilities every quarter or more often, if we are in volatile markets like we are right now. We do both asset and liability rebalancing depending on which is the cheapest rebalancing at any point in time. So, I want to talk to you about what I consider the obstacles to proper asset liability matching: mainly, default risk, investments with variable cash flows, and finally, call risk.

In the case of defaults, I think most of the statistics show you so far that defaults really have not hit the public bond market yet, whether we are talking about investment grade public bonds or junk bonds (or high-yield bonds). Really, the default experience in those areas hasn't been too great yet and one of the major reasons, of course, is we have had a very strong economy for the last five years and they haven't had to weather the storm, especially in the case of junk bonds, of any kind of an economic downturn.

But the case in mortgage loans is very different. Figures from March 1987 show that a few cities have very serious vacancy problems in office buildings. In Dallas, about 22% of downtown and 30% of suburban office space was empty. Denver faced a 31% downtown and a 24% suburban vacancy rate. In Houston, the figures were 22% downtown and 33% suburban. Miami had a 22% vacancy rate in both downtown and suburban properties. Equally important is that national averages are so high, hitting 16% for downtown office buldings and 24% in the suburbs. So you can see why most borrowers are having a very difficult time making their mortage payments.

Table 1 shows some statistics from the semiannual review of the ACLI on delinquent loans.

TABLE 1

Delinquent Loans*

	Total Nonfarm	Total Farm	Total Mortgages
December 1983	0.90%	8.27%	1.63%
December 1984	0.90	9.58	1.71
December 1985	1.16	15.06	2.27
December 1986	2.64	18.01	3.84
June 1987	2.96	18.01	3.84

*A delinquent loan is a nonfarm mortgage with interest payments in arrears at least 2 months (60 days if other than monthly payments) or a farm loan with interest in arrears more than 90 days. Delinquent loans include loans in process of foreclosure.

If you look at the far right hand column for total mortgages, you can see that from December of 1983 through June 1987 the trend is pretty disturbing in the mortgage area and from most of the people I talk to, they feel the trend will get worse rather than better.

You can see in Table 2 total nonfarm, total farm and total mortgages. Again, the trend is pretty disturbing. The number in June 1987 is 1.52%. I think the last time they were that bad was about June or so of 1976, so it has been over ten years since we have seen these kinds of numbers. Again, I think the disturbing part of these numbers is the fact that we have had a good economy for the last five years. What if we enter into a recession? Most of the experts are saying that we are going to get a recession within the next 24 months,

probably before that; but even in good economic times we are seeing pretty disturbing numbers here.

TABLE 2

Loans in Process of Foreclosure

	Total Nonfarm	Total Farm	Total Mortgages
December 1983	0.31%	2.60%	0.54%
December 1984	0.18	4.54	0.58
December 1985	0.31	7.11	0.85
December 1986	0.84	7.83	1.28
June 1987	1.11	7.98	1.52

The second obstacle I want to talk about is securities with variable cash flows -- Ginny Maes, or mortgage-backed securities in general. There is certainly a lot of risk in buying those types of securities for an asset liability matched portfolio. At the end of 1985 most major Wall Street firms were touting the purchase of premium Ginny Maes to write five-year GICs against, and by the summer of 1986, prepayments had picked up to the extent where the durations of those instruments had gone from about 5 years down to two years. So most of the GIC writers who wrote GICs based on Ginny Maes were faced with a very significant reinvestment risk. It doesn't mean that you never buy Ginny Maes. It just means that you have to be aware that there certainly are substantial risks in buying that type of security if you think you are going to be matched asset/liability-wise at any point in time.

Another security which a lot of life insurance companies have used recently, and something that troubles me a lot, is foreign currency denominated bonds. Again, you are at the whims of what the exchange rate is at the particular point in time that you get your payments and you may or may not have enough U.S. dollars to meet your liability payments. You just have to be aware of what risks are involved in doing this but certainly the risks are substantial.

Finally, there are perpetual floaters. Perpetual floaters are securities that adjust to short-term interest rates but have no stated maturity. That's why they are called perpetuals. A lot of insurance companies have recently purchased these and have entered into interest rate swaps in order to "fix" the payments. But since there is no stated maturity date you are going to have to

sell it in the marketplace and you are at the whims of the market when you sell. This is especially troubling because this particular security has been very volatile in the marketplace. In fact, almost overnight about six months ago, the demand for these things dried up and the price went from around par to about 85 cents on the dollar. So it is a highly volatile instrument and there are a lot of risks in writing fixed rate liabilities against those.

Call risk is a horrible problem. Billions of dollars of bonds have been called in the last couple of years. Mainly, I am talking about not only cash calls but bonds which have been refunded, meaning that a company issues lower interest cost debt and, in turn, is able to retire higher interest cost debt with the proceeds from that issue. So, there is a distinction there between cash calls and refunds. I think cash calls are a significant problem because most bonds can be cash called at any time, although there may be a period of five or ten years of nonrefundability. In fact, last year a number of 30-year bonds which were issued a couple of years ago were cash called. That was a significant problem in the marketplace because although there is a premium usually attached to the call, which might be 11 or 12%, it really doesn't make up for the fact that if interest rates are falling enough, you cannot duplicate the cash flows that you have lost from the cash call. What we saw happening last year, which is pretty troubling, is that bonds were cash called, and in order to duplicate the cash flows that were lost, a lot of insurance companies were buying bonds of a lower quality.

The only way to duplicate that kind of cash flow is to buy low-quality debt where the payments would be a lot higher. So, the end result of that is you are actually losing a bond through a cash call that is probably a very good credit because they had enough cash to call the bonds. You are replacing it with a mediocre credit, and you just hope that it works out in the long run.

Public utility bonds have special call features and special risks. There are three special redemption features that a substantial amount of utility bonds have. They are a maintenance and replacement fund, a funnel sinking fund, and a property release provision. Maintenance and replacement funds were set up mainly so that utilities would have a vehicle where they could set money aside for upkeep of utility plants. In turn, through this kind of a vehicle, first

mortgage holders would always know that the value of their security was good because any time that the value of the plant went down, they had to mandatorily put money aside for the upkeep of the plant. Well, what's really happened in here is that there is a fine nuance in utility company indentures, whereby a deficiency in the maintenance and replacement fund can be made up by retiring high-coupon debt.

Table 3 shows bonds that have been called within the last year or so at par. You can see some fairly high coupons, and this is just kind of a random sampling. There's been substantially more than this but I am just trying to give you a feel. For instance, let's look at Kansas City Power and Light bonds. They are 16.5%, and all of a sudden you lose your 16.5% bond at par, not at 110 or whatever the call premium would have been. So, that is a significant problem.

TABLE 3

Maintenance and Replacement Fund Redemptions

		Amt. (millions)
Appalachian Power	14 5/8% of 11/1/92	$ 78
Houston L&P	7 Issues	261
Indiana & Michigan	11 3/8% of 6/01/90	64
Kansas Cty P&L	16 1/2% of 12/15/11	50
Ohio Power	10% of 5/01/06	33
Puget Sound Power	16% of 12/01/91	48
	9 7/8% of 7/01/08	52

A funnel sinking fund basically is a way that a company can combine sinking fund payments from several different indentures and apply the entire amount to the highest coupon debt outstanding. You talk about adverse selection; that is about as adverse as you can get. It is something that really wasn't used a lot until recently, but because of the fact that you were able to retire substantially higher coupon debt than you could issue in the marketplace, you again see issues that have been lost at par in the marketplace through funnel sinking fund redemptions.

Most public utility indentures have a provision where the proceeds from the sale of the utility plant can be used to retire debt at par. Again, it is something that you just never saw a utility use. Utilities used to be scared to death that if they did something bad to bond holders, the bond holders would never come back and buy their debt again. So, if we sold a utility plant and used the

proceeds to pay off 16% debt, then what happens next week when we want to come to the marketplace? All the bondholders say, "Yeah, there's no way I am going to buy your debt. Look what you did to me last time. You are going to find a way to do the same thing to me again." But, what's really happened is that because of the impetus of public utility commissions, which love the retirement of high-coupon debt at par, we've really seen a lot more of this happen. A lot more utilities are saying, "OK, let's just go ahead and do it!" Now, almost to the point of being ridiculous, we've recently seen a number of sale-leasebacks for public utility bonds where all of a sudden the utility sells some utility plant and then leases it back, so they still have full control of the plants. It's not like they sold it to somebody else, but yet, they can use the proceeds to retire high-coupon debt, usually at par. Now, I guarantee you there will be several significant lawsuits on the part of bondholders, but again, because of the way the indentures are worded, it is going to be very difficult for bondholders to win those lawsuits.

Table 4 shows most of the major sale-leaseback transactions that have been done.

TABLE 4

Major Sale-Leaseback Transactions
by Electric Utilities

Seller	Date	Price (millions)
Tucson Electric	1985	$718
Montana Power	1985	232
PS New Mexico	1985	325
	1986	575
Arizona Public Service	1986	491
El Paso Electric	1986	700
Ohio Edison	1987	509
Kansas G&E	1987	392

There is a significant amount of high-coupon debt now at risk because although these sale-leasebacks have been done by these companies, not all of them have retired some of their high-coupon debt.

Table 5 is an abbreviated list of the proposed sale-leaseback transactions that are currently in the process of being done and should come to the market fairly soon.

TABLE 5

Proposed Sale-Leaseback Transactions

Seller	Date	Price (millions)
Centerior Energy (Cleveland Electric & Toledo Edison)	1987	$1, 350-1,500
Ohio Edison	1987	845
Duquesne Lighting	1987	690
El Paso Electric	1987	480
Consumers Power	1987	950-1,000

If you add the numbers here with the ones that have already been done, it is almost ten billion dollars and it is just the tip of the iceberg. There are going to be substantially more of these sale-leaseback transactions coming out. They are a significant problem.

I don't expect you to remember all the utilities involved and all the special redemption features that we've gone over here; just remember that utility debt has special problems. It is important also to remember that utilities can get away with this because public utility commissions fully endorse the retirement of high-coupon debt, as the end result is a more profitable utility and hopefully, lower rates. In fact, a year ago or so Florida Power and Light retired a number of high-coupon issues from their maintenance and replacement fund, actually at the request of their Public Utility Commission. So, this problem is very significant.

I think the most appropriate strategy is probably to minimize the number of high-coupon utility bonds that you own and to limit exposure to only those issues that give the utilities the fewest number of call options.

MR. JOSEPH J. BUFF: C-13 is supposed to be the combination of C-1 and C-3 risks in the same model and that is going to be the subject of my talk. That's our working title for the model until we come up with a better name for it. These are some quotes from recent days from the capsule section of the business section of the New York Times: "A Day of Wild Gyrations in the Credit Markets," "Stocks Took Another Sharp Plunge -- They Went Down Almost 58," and "Many Economists Do Not Expect a Recession until 1989."

However, the reason that I think the particular topic of leveraged buyouts is critical is that what I am really going to talk about is a familiar approach to C-3 risks that has been beefed up a little bit to address C-1 risks for fixed income securities at the same time. Others have commented that in a real sense, the market for high-yield or junk bonds is rather different than it was five or ten or fifty years ago. It used to be that an insurance company came to own junk bonds unintentionally because they were fallen angels. Fallen angels are investment grade instruments that deteriorate for one reason or another when the company that sold the bonds deteriorates.

There is a whole new class of securities that's become increasingly popular in the last few years which are issued initially with low credit ratings and are coming out for the first time as junk. Very often, they are backing leveraged buyouts. In Sunday's paper, there was an article about a particular leveraged buyout that did not work out. It had to do with a mushroom farm in California and apparently everything that could go wrong did go wrong with this mushroom farm. This article says: "For years, the stock and bond markets have acted like a huge silent partner in helping many misconceived or shaky deals muddle through. With the financial markets getting distinctly less accommodating, many other buyouts may start to falter, their flaws exposed by the adverse financial climate." And bear in mind that this was published Sunday.

I first learned about yesterday's sharp drop in the stock market when I was attending a meeting of the Special Advisory Group that's been working with John Montgomery's NAIC Actuarial Task Force on the subject of valuation laws and valuation methodologies. In fact, John Montgomery came in to tell us that yesterday the market had gone down about 25%, which was about twice the loss on infamous Black Thursday in 1929. I think it is going to be very interesting seeing what happens later this week in the stock market. I would echo what Mike has said. On this continent the exposure to equity investments for life insurers is not what it is in certain other important parts of the world.

Basically, what I will discuss is some work that is a combination of theoretical research and practical engineering which has been going on under the auspices of the Society's Committee on Valuation and Related Areas since fairly late last year. What it is is a way to look at the total investment risk picture integrating the C-1 and C-3 risks into one model. Just for some of you who are not aware,

I'll explain what C-1 and C-3 mean and where those terminologies come from. They go back to a 1979 report of the Trowbridge Committee which is when the Society first started to get its hands firmly on some questions about risk exposure. C-1 stands for the risk of bond defaults or other fixed income asset defaults. It also stands for the risk of market value fluctuations in equity investments. C-3 stands for interest rate risks, so I guess by definition it is mostly a fixed income security thing. It has been getting a lot of attention. I'm sure many of you have heard panel discussions on the C-3 subject before and many of you have seen a number of the models that are meant to address the C-3 risk and some other risks. The problem has been to get a feel for the overall integrated picture of investment risks and maybe put C-1 and C-3 back together. It might be good news that after seven or eight years of research, we're able to do that.

I also want to stress that in a sense, what I am going to discuss is really nothing new. It builds directly on earlier research done by a Committee on Valuation and Related Areas (COVARA) subcommittee. The Combination of Risks Task Force was chaired by Mike Mateja. A number of other people at the Aetna contributed to the work including Jim Geyer. I would encourage you to take a look at the *Valuation Actuaries' Handbook* to see some of their work.

I am going to present the model in a practical application, sort of tell a story, an imagined case study. This is an insurance company that is working with a single premium deferred annuity (SPDA) policy that is fairly run-of-the-mill and it has come up with some generic assumptions. This insurance company wants to ask some questions about investment strategy, but what we are going to do is introduce a dimension -- the dimension of C-1 risk as well as the dimension of C-3 risk -- and try to model how, in fact, they interact. Now, let me introduce three terms that are fairly simple and are commonly used, and explain exactly how I think they ought to be used. They are the words *methodology, scenarios,* and *assumptions.* If you have a problem and you want to do some calculations, you need all three. You need a methodology, you need scenarios and you need assumptions. And in fact, a lot of the option pricing models are doing a form of scenario cash flow projections along the way. By methodology, we could be talking about a model or an approach, computer programs, some series of formulas or calculational techniques. By scenarios, we might in fact be talking about some aspects of the external world outside the insurance company or

outside the insurance industry. In particular, I think we would be referring to the capital market, which means things like the stock market and the bond market. Finally, we might take assumptions as a class of predictions about behavior within the insurance company or in areas where the insurance company or the insurance industry retains primary control.

Our basic goal is going to be investment strategy analysis where we are going to focus on the question of how to allocate the assets within the portfolio by the dimension of asset quality. We are going to try to answer that question the way a lot of C-3 risk questions are answered. The C-3 risk question is often, How shall we allocate the wealth within our portfolio along the dimension of maturity? Would we like a ladder of 2, 4, 6, 8, and 10-year bonds or should we buy 5-year bonds or 10-year bonds or 20-year bonds, etc. Again, this is all going to be done within the context of asset liability management for life insurance companies, so we need to be looking at the liability side of the balance sheet along with the assets. We want to look at real life events that go on in an insurance company's operation over time, and we want to be able to work with a number of the different profit variables like accumulated surplus or annual cash flows and things that many of us have started to work with for interest rate risk.

Now the particular approach that we will take is only one of many within this class. In order to select between a couple of competing strategies (we made these strategies up largely for illustration purposes), we will do two things. We will look at the level of the surplus, which gives you some idea about the return, and also the dispersion of the surplus. That means how far apart you could get from good scenarios to bad scenarios. We'd look at that set of numbers for each of the strategies that we're testing and presumably decide that the further apart all the results get, the greater is the risk. So, it is a kind of risk return analysis. The methodology really is built all around the general approach of cash flow scenario projections, and I would emphasize that I am sure there are other approaches possible.

However, this general technique has the advantage that it has become well proven and fairly easily available (with some resources) to many of the particular problems in the area of interest rate risk already. So we have an advantage of building on something that sort of has a history and a good reputation for itself. The technique is going to be very much like a C-3 risk analysis. The

questions are going to be similar to a simulation study. We are looking at this risk return, and in particular, the working method is similar. We are going to run a series of scenarios and then get a range of results and try to make some decisions based on what that range of results seems to be telling us.

So, let's then take a look at this particular product. Then we will run through some of the assumptions. In fact, a lot of what I will do is going to be almost an instant replay of an asset liability management C-3 risk study. I think it is important to bear in mind that that tells you something about this approach, that it does have its familiar aspects.

The product is a single premium deferred annuity. We are looking at one sale of new business so it is kind of like pricing or a strategy example for a new product. We will imagine that there is a block of 5000 policies and we made up some assumptions and the average size is $20,000, commissions are 4% for the first year only. We ignored maintenance expenses just to keep things simple. We assumed that the FIT rate was going to be 34% and there was no surplus tax. Then we assumed that the reserve equals the full fund value and for this particular product, there is no market value adjustment, there is no bailout. The surrender charge is 5% of the funds during the first five years and there is a free withdrawal provision, a fairly common one of 10% per year.

Now, let's presume that this insurance company has already made a decision about the C-3 risk component of its investment strategy. It has come up with an answer that what it's going to do is purchase 10-year par bonds and these bonds have the basic call provisions along the lines that Dennis was just discussing. They are callable at par in 5 years. Just to define those terms for some of you, a par bond basically means a bond that is trading at a hundred, or a dollar to the dollar. When we say that a bond is callable at par, that means that the issuer can pay you the maturing face amount, which is again a dollar per dollar at the end of five years or any time between five years and ten years. The issuer does that at their option and typically, this creates some amount of reinvestment risk. Now, the reason we need to address call risk here is because, as you have already heard, it is very real and I think that in the real market, most bonds do have call provisions whether they are utilities or other kinds of bonds.

But, we need to ask another question. How are we going to allocate our wealth between the investment grade category and the high-yield category? (I'll call the high-yield category junk bonds for short.) Now, why is there a question that needs to be asked? The reason is fairly simple. First of all, junk bonds do have more promised yield. That means when you look at one and you consider buying it, you'll find that the promised yield to maturity tends to be higher than for investment grade bonds. If in fact the bond doesn't default, and it isn't called before maturity, and given a few other smaller ifs, then that yield is a yield that you'll earn. However, the downside to junk bonds is that, of course, we all expect that in the aggregate they are going to have higher default costs. In other words, the certainty of getting the money back at maturity or even getting coupons along the way is lower than for investment grade bonds. So, here's why we have a question. In the real world of operating the insurance company, there are opportunities and there are drawbacks to junk bonds compared to investment grade bonds. But we do have to make a decision as to how much of our wealth, in other words, policyholder premiums or whatever, we are going to allocate to these different categories.

Now, this model is not meant to address the question, "Should you or should you not buy junk bonds?" There is really nothing that's meant to say particularly whether you should or should not. I would like to redefine the question actuarially and say that depending on the company and depending on the time, there may be an answer of X percent, where X percent is how much of your wealth should be put in junk at that time, where X presumably could be any number from zero on up. But there are going to be a number of situations in which case the answer is zero and one advantage of this method is that it may help you get there quantitatively. But what we did was take a look at a couple of extremes.

We'll assume that the assets are all investment grade and that is certainly rather common if you go through insurance company MSVRs and look at the different reserve classes. There are a number of companies that are probably 99% or higher in investment grade but let's take a look at another alternative strategy, which is to invest 80% in investment grade and 20% in junk bonds. Now, I pick this one partly because this is, in a sense, the maximum exposure that is permitted by recent NY Regulation 130. Regulation 130 says that for a company as a whole, you can put up to 20% of your assets into junk, where junk includes

both private and public categories. I would point out, as I am sure some of you realize, that is a companywide limitation. So for particular product lines within a large company, the segment backing that product line may reach an exposure to junk by management's choice of significantly higher than 20%, in which case this question is by no means an academic one. But let's for now just compare these two strategies. The point again is to see that there is an approach that builds an answer to this question.

We all know we need to be getting the questions about C-3 risks at the same time. So, this is what the methodology is all about. For C-3 risks, we will use interest rate scenarios just as NY Regulation 126 strongly recommends. (Alternative methodologies could be justified.) For C-1 risks, we are going to take a similar tack. We are going to use default rate scenarios and because this is a combination of risk problem, what we are going to do is make cash flow projections that combine the two risks at the very beginning by redefining what a scenario is. A scenario is now something that specifies two risks at once. It is a track of interest rates *and* a track of default rates.

The idea of default rate scenarios was worth looking at because first of all, one thing that we could say about interest rates is that nobody knows where they are going to be a year from now or ten years from now. But one thing I think that just about everybody agrees is that it is very hard to predict them and they'll move up and down and change a lot. The answer of sorts that evolved to that problem was to look at a set of scenarios and then work with a range of results. Now, if you listen to those words, we could say virtually exactly the same thing about default rates. Nobody knows what they are going to be a year from now or ten years from now. But we can be pretty confident that they are going to move and change as time goes by. So why not, in fact, use a set of scenarios and then we'll get a range of results also for C-1 risks.

There has also been some feeling, I think probably justified up to maybe the last few months, that C-1 risk was a different sort of risk than C-3; that it was really all on the asset side; that it really didn't tie in with the liabilities; that it could not be hedged the way you can hedge C-3 risks. But some of the research that we did on COVARA, and some of the research that Frank helped participate in that was done by the MSVR Subcommittee of the Maxon/Ohman Advisory Committee suggested that in both of those respects after all, C-1 may

in fact be a lot more like C-3. One reason is that using option pricing theory, you can hedge C-1 risks the way you can hedge C-3 by duration matching. The way that you can hedge C-1 is, to get a little technical for a second if you don't mind, we can look at junk bonds as part equity rather than the fixed income investments because the junk bond is in a sense tied in with the real underlying perceived value of the company. If the company starts to become worthless, the junk bonds become worthless. So buying a junk bond is to a degree like buying the stock in the underlying issuer and the junkier the bond gets, the more that's true. Ultimately, when the company goes into default, owning the bond is almost exactly like owning the stock and if there is an exposure to owning the stock, then that can be hedged using put options on the stock. So, what we are really talking about is a hedging strategy that Wall Street is publicizing, which involves simulating through portfolio insurance a process of hedging the exposure to C-1 risk by artificially creating options on the stocks that your junk bonds are analogous to. Alternatively, you can directly purchase appropriate put options.

So that was a little digression. The point there was that C-1 and C-3 risks are more comparable than we might have thought and they both can be hedged through the avenue of option pricing theory or portfolio insurance.

Next, as to the question of how the asset and liability sides really tie in, let's think about a real live insurance product. You have recurring premiums, it may be an open block of business, with uncertain amounts of cash withdrawals in many product lines as time goes by. Default rates then really start to matter, not only as to their level, but as to their *timing*. So, if you look at a 20-year period (imagine an asset-side-only accumulation, then you could say that if you have a blip where there is a 10% default -- it doesn't matter in what year that happens -- and allowing for some slippage in rounding, it doesn't matter whether it is 10% a year or 2% for five years), you just take what your money is and what your yield is, then you compound the money for 20 years and lop off 10% and that is the answer. However, when you are looking at a real live insurance company, it is by no means that simple because the default rates are going to have a different effect on your ending surplus depending on when the defaults take place. The entire position of your balance sheet is going to be a function of your asset side and the liability side. So, suddenly we have been drawn directly into the liability side and we have also been drawn into the question of

C-3 risk. That is why we sort of need to look at them together. So, let's talk about the C-3 assumptions and then let's look at the C-1 assumptions.

The C-3 assumptions are familiar in a way. The C-1 assumptions are a bit new but you can see how one sort of draws on and starts to extend the other. We needed to make up a set of scenarios if we were going to do some calculations, so I decided just to pick as interest rate scenarios, some simple, easily explainable ones which came straight out of the recommendations of NY Regulation 126.

In the way in which this model was developed, it actually came straight out of a C-3 risk model. Consequently, just as we would want, things like portfolio yields, credited rates, competitor rates, and the lapse rates are all dynamic. They interact with each other period by period within the model. Then the cash flow assets and liabilities depend on this dynamic interaction of these profit and loss variables, and in fact, this part of the methodology is a typical C-3 risk scenario testing approach and it is, as I have sort of already hinted, just like NY Regulation 126. In fact, it comes out of a model that has been used to comply with Regulation 126.

Now, let's take a look at the C-1 risk part of the methodology. For each interest rate scenario we have a default rate scenario. What that means is that a scenario is going to be a string of yield curves and a string of default rates. For each period there is a default environment along with an interest rate environment. Because we are trying to treat the default events as realistically as possible, we need a way to reflect that if you own ten bonds and you are talking about a 2% default rate assumption, you have a question about how to handle this in your model. Very often what we do is we will just chop 2% off of the par across the portfolio on a uniform basis or lop 2% off of the investment return that year and say this is how we have reflected a 2% overall default rate in a portfolio which actually consists of ten bonds. In fact, if you take that approach, it doesn't really matter how many different bonds you've got or whether they are uniformly homogeneous in size or not.

However, when it comes to default rate exposure, we have a different sort of problem. We grabbed an analogy with the approach of applying risk theory to portfolios of insured lives where you may have a number of individual insured lives with different face amounts and you want to understand the gain and loss

tail. Going back to when I took Part 5, Risk Theory, there was a technique called Monte Carlo Sampling which was designed to address exactly that problem. Mathematically we are facing exactly the same problem here -- bonds dying or defaulting are the same as people dying. (Now, I understand that these days Monte Carlo Sampling is on Part 3 which I suppose says we are making progress somewhere.)

But what we are actually doing is each quarter within the model, with a given interest rate environment and a given default rate environment, we take a look with our computer at what the default rate environment is for each of the different asset quality classes. Then we take a look at what the portfolio is that we own. Each of the bonds one by one is subject to a sampling process so if there is a 2% default rate and you have ten junk bonds, each of them is subjected to the random process, whether it defaults or not that quarter, with a 2% probability that it will default.

Since we are doing this, we are really talking about a Monte Carlo sampling, and we need to run a number of samples before we can actually come up with a useful accumulated amount of information. So, we are working with a distribution of sorts. Indeed, it is almost a distribution within a distribution because we have to run a number of Monte Carlo samples through each of the scenarios if we want to go this far, but it is not necessary. But to address the key question about the real effects on risk of the diversification of the portfolio, this is one technique that you can take which statistically will reflect the results to your company or to your product line of risk exposure of the strategy that you decide to follow.

Now, what are we to do when a bond defaults? Well, to keep it fairly simple, we assume that when the bond defaults, it's sold. Defaulted bonds have a salvage value. Again, Irvin Vanderhoof's research and other research has shown that salvage value has been remarkably constant on average. Over long periods it is about 40% of par, so that is an assumption that one could use which, in fact, we did use.

Now that we have talked about the C-3 methodology and the C-1 methodology, we will go through the assumptions. Remember, I said we need assumptions, methodology and scenarios. We'll cover all three and then we will get to the results.

We used a 20-year projection period and we did quarterly cash flows for our interest sensitivity assumptions. This is an SPDA, so we need a policy credited rate assumption or strategy and what we used here was a hybrid. And what this hybrid is is a combination of crediting what you are earning on your portfolio but sticking to a corridor that follows the competition, so you are never more than 1% below the competition. We assume that the credited rate was reset quarterly. There was a minimum guarantee of 4% and continuing with other interest sensitivity assumptions, we have to define a competitor credited rate behavior. We assume that this was a 10-year Treasury rate minus 1%. The base lapse rates are 5% per year and we used a representative function that expressed interest lapses which was twice the competitive disadvantage squared, if there in fact was a positive competitive disadvantage. That means that the competitive rate as defined exceeds your policy rate as defined. Now, you will see that what our credited rate strategy does is keep you from ever having more than a 1% competitive disadvantage, so that in this example, we are never going to face a lot a disintermediation and that is going to have some effects on some of the results we will see at the very end. What we are basically doing is paying people to stay with us when interest rates spike even if it is expensive to buy their loyalty. That's not the only strategy one can follow.

Negative cash flows are going to be treated as negative investments. We needed to assume something about investment expenses so we used 10 basis points a year for investment grade and 20 basis points a year for the high-yield bonds. We also needed an assumption about the difference in yield between the investment grade bonds and the junk bonds and here we did something relatively simple. We assumed that at all times the promised yield on the junk bonds was going to be 2-1/2% higher than the yield on investment grade bonds. Now that is not bad as an average over the last 5 or 10 years. However, if you look at the detailed data, you will see that that spread is quite volatile. It varies between maybe 100 basis points and 400 basis points at times and I think if one were to go through this approach in more detail and vary the assumptions just like in the case of C-3 risk, the lapse rate assumption is critical. In the case of C-1 risk, I would suggest that this may be a very critical assumption because it affects, very strongly as time goes by, what the advantage is of going into junk versus the disadvantage. Another thing, speaking of the combination of risks, it's very likely and it is also intuitively appealing to expect that that spread would have something to do with the level of default rates. So it is

possible that the higher the current default rates are, then at the same time, the higher the spread is going to be. That being the case, we see just another way in which C-1 and C-3 risks really can't be separated in the real world.

We need to talk about the spread between the Treasury rates, which is our basic yield curve and the investment grade rates. They started at 20 basis points in 90 days and they went up to 110 basis points in 10 years. Again, because our bonds are callable, we need an assumption about bond call behavior and we used something representative there. Below is a review of what the seven interest rate scenarios are in New York State.

SEVEN INTEREST RATE SCENARIOS

1. Level.
2. Increase 5% over 10 years, then level.
3. Increase 5% over 5 years, decrease 5% over 5 years, then level.
4. Increase 3% immediately, then level.
5. Decrease 5% over 10 years, then level.
6. Decrease 5% over 5 years, increase 5% over 5 years, then level.
7. Decrease 4% immediately, then level.

Now, let's talk about the default assumptions. This will be comparatively new. As already hinted, we need to address the question of portfolio diversification. When you are talking about default risks, just like with mortality risks, the diversification, the pooling of the risk, has a major impact on the gain and loss tails, in other words, on the risk return position. So, we made up some simple rules that seem somewhat in line with what a lot of insurance companies do and we assume that this insurance company would put ten million dollars into any individual investment grade bond and two million dollars into any one high-yield bond. The reason for this difference is that given the perception that high-yield bonds are riskier, it was desired to have more diversification in the high-yield component and this again is consistent with practice in some companies.

We need a salvage value rule because we need to know what to do when a bond defaults and our rule was that the defaulted bonds would be sold for their salvage value. The salvage value would be based on this 40% average. Here we tried to get a little fancy and we said that the salvage value would actually be the lesser of 40% of par and also 40% adjusted for market value for a comparable bond in good standing for C-1 risk. The reason for that is if you have let's say a 5% bond that defaults in a 10% interest rate environment, the issuer, when they default in negotiating the terms of bankruptcy, is going to point out that

the debt is of a coupon that is significantly below current rates and here is another little place in which C-1 and C-3 risks really can't be separated. The salvage proceeds will be reinvested just like coupons and other sources of positive cash flow. Default rate assumptions are also needed.

We need the scenarios themselves and what I did was cook up a series of seven junk bond default rate scenarios. One is for each of the Reg 126 interest rate scenarios. Just to keep things simple, I assumed that for the investment grade bonds, the default rates in the environment were always a tenth of what they were for the junk bonds. Now again, this tenth is something like what we have seen in the last 15 or 20 years. To give you a feel for what a junk bond default rate scenario looks like, here are the seven.

SEVEN DEFAULT RATE SCENARIOS

Junk Bond Default Rates
(For Illustration Only)

1. Level 2%.
2. 2% declines to 1% in year 7, then level.
3. 2% declines to 0.5%, back to 2% in year 10, then level.
4. Cyclical 2%, 3%, 4%, 3%, 2%. 1%, 2%, etc.
5. 2%, 2%, 2%, 2.5%, 2.5%, 2.5%, 3%, 3%, 3%, then level.
6. 2% rise to 10%, back to 2% in year 10, then level.
7. Cyclical 2%, 3%, 4%, 3%, 2%, 1%, 2%, etc.

For the first one we assumed a level of 2%. The 2% is roughly average for the last 15 years. Then there was one that goes along with the second interest rate scenario where we assume, for instance, that the 2% declines to 1% in year 7 and then is level. In other words, it is a gradually improved environment and in fact, half the default rates of the current environment more or less become permanent. The 4th and 7th are the same. They are basically cyclical environments. In fact, what we did is we started off the 2%, that again is an average, and then we cycled it up to 4%, down to 1%, up and down, up and down until we ran through 20 years.

Some of the others can be linked together with the interest rate environments to define particular kinds of economic projections -- for instance, we have what you could call a stagflation -- high interest rates and high default rates, or a depression-low interest and low default rates. It may be a good way to come up with a whole series of these joint risk scenarios by in fact making economic projections and then letting things like yield curves and default rates drop out

of the economic projections. That is probably the way we would have to go if we want to come up with good random walk models instead of these handmade scenarios.

As to the Monte Carlo samples, I mentioned within each scenario we need to run a number of Monte Carlo samples to get a good feel for the behavior of the defaults. In fact the number you need to run to get good results is going to depend on how diversified the portfolio is. The more diversified the portfolio, the fewer Monte Carlo samples you need to run. If you have a portfolio with a thousand bonds, that is close enough to being in a sense like a uniformly distributed one, so you probably don't have to run Monte Carlo samples at all.

To quickly review, we discussed the problems of C-1 and C-3 risks and how they are interconnected in the real world and then mentioned why we would like to have a methodology that reflects the interconnections. We talked about a particular methodology. We have gone through the assumptions that are required and we have gone through the scenarios that are required in order to come out with answers from the methodology.

We will then see some results. I want to issue a caveat that these are some simple illustrative assumptions that were put together to demonstrate this approach, not to make any statement about investment strategies. The numbers are very much a function of all the assumptions that went in and do not necessarily reflect the set of assumptions that any company would come up with after sitting down and thinking seriously. Nor do these results reflect the sort of results that you would find if you were to go through this model in more detail and run some variations on the key assumptions.

Remember we were comparing two strategies. One of them was a 100% investment grade strategy and the other strategy put 20% into junk bonds. Because we are working with a whole range of numbers, 40 Monte Carlos for each of 7 scenarios, one approach that we can take is to merge all of those numbers together. We get 280 numbers. Then, look at things like the minimum, the maximum, the median, the 20th, and the 80th percentile. This is the approach to summarizing the results, which again is probably familiar from looking at asset liability management in the dimension of C-3 risks. The investment grade only distribution, and the junk and some investment grade distribution, seem to be somewhat

different. For instance, the minimum is lower for the portfolio that includes some junk and the maximum is higher. I guess neither of those results are particularly surprising. You would expect that if you go into junk, which does give you higher yield, and you have good default experience, then you are rewarded for having gone into junk so you outperform the strategy based on investment grade only. However, if you are exposed to these higher default rates, they are ten times as high, and you do get defaults, then you might expect that the added promised yield is not enough in the aggregate, and in fact, you get hurt and you can see that you do get hurt.

It is interesting to look at the 20th percentile median and the 80th percentile. They are comparatively close and I came up with some preliminary conclusions as to what this might all be about. Also we are comparing two blocks of identical sized inforce. In fact different investment strategies would give different credited rates at issue, which would result in different amounts of business issued.

First of all, it is very much dependent on the interplay between the scenarios and the yield premiums. It also is making a statement about diversification of the portfolio. The investment grade portfolio contains ten bonds. It starts with a hundred million dollars, it's ten million dollars per bond, so it starts with ten bonds. On the other hand, the junk bond portfolio has eight investment grade bonds and ten junk bonds. So, it has almost twice as many and some of our testing has shown that for small portfolios, doubling the size has a big effect on things like the exposure to risk and the variance around the median. The fact that the medians are almost the same seems to suggest that given all the assumptions that we came up with here, for C-1 and C-3 risks combined, when they are all put together, it says that in a sense, on average, the two strategies became almost identical. As I say, there is no reason to conclude that that would be true with any other set of assumptions.

Now, I would just like to go through some very broad conclusions. First of all, the combination of interest rate and default rate scenario testing does give you more information about investment strategies and exposure, but the results reflect a dynamic interplay of many different profit and loss factors. So, in order to get more information, you have to put more in to begin with and there is more work to understand what it is telling you when the results come out of the model. Also, the results for any model are very much dependent on the

particular assumptions and scenarios used and the possession of a model doesn't really solve the problem of coming up with the right assumption. In fact, it is also important to look at several points during the projection period and to look at more than one measure of profit or solvency. We were talking about 20-year accumulated surplus and you probably want to look at the 5th year and the 10th year, especially if you model a default disaster at the end of the 5th year. You probably care how you look then and not just at the end of the 20th year when you have given yourself 15 years to recover.

Where are we going to get some good default rate scenarios and how do we correlate them with interest rates? How do we get a better assumption as to the yield spread between different quality classes which certainly should be dynamic? Also, what are the implications if we start to apply this model to see things like reserve levels, risk charges and required surplus?

Finally, we are beginning to do some research in the modeling of equities. Part of the definition of C-1 risk is the fluctuation and market value of equity investments so hopefully, soon, there will be a panel discussion presenting that work.

MR. ROLAND A. DIETER: It was a fine presentation and I would like to make a comment first to Dennis. I think the bond market today will fall as margin calls are responded to by liquidation. Further, I think we have been in a recession for a couple of years because our tax base has effectively been spread worldwide by the sale of our debt securities. We should be taxed higher and effectively that tax money is coming from elsewhere. When that is recognized, some of our business will go under, though I hope not the life industry.

Joe, in your modeling, do you recognize migration of default risks -- in other words, a higher level default risk and lower default risk subgrades?

MR. BUFF: Do you mean regarding particular categories like triple A, double A, single A?

MR. DIETER: Yes, but within the default range. In other words, today it is barely defaultable in the junk grade but then it becomes more defaultable as the scenario evolves.

MR. BUFF: Yes, I guess there are a couple of ways in which we do that. First of all, you can define a rather large number of asset categories if you want to look at things like double B and triple B as separate classes and define default scenarios for each of them. That is one thing we can do. The other is that through the running of catastrophe scenarios you are modeling the effect of contagion. This means that the default assumptions are not really independent. We are not really assuming complete statistical independence of the default events. It's being reflected in the scenarios. Disaster scenarios reflect contagion at a global level.

MR. DIETER: I think it is also important in your qualifications on the liability side. As to the lapse assumption, I think there is a big difference between selling a bunch of small IRAs to a home service market versus selling nonqualified larger size SPDAs through a brokerage market. I think it is important to recognize which market one is in and/or the distribution within those markets in doing this type of testing.

MR. TUOHY: I think that is a very important comment. The withdrawal function is much more a function of the distribution system than anything else.