Session 118TS
Guaranteed Minimum Death Benefits (GMDB)—Reserving, Modeling, and Investment Implications

Track: Investment
Key words: Investments, Reserves, Variable Annuities

Moderator: DARIN G. ZIMMERMAN
Panel: MICHAEL W. PADO
             LILIA M. SHAM
Recorder: DARIN G. ZIMMERMAN

Summary: The growth in variable annuities has increased insurance industry exposure to mortality risk associated with GMDB. The focus of this session is on current practices in the areas of reserving for GMDB and modeling the GMDB risk (including stock market simulation.) Investment implications of GMDB are also discussed.

Mr. Darin G. Zimmerman: I work with Lilia in the Atlanta office of Tillinghast-, Towers Perrin. Lilia asked me to moderate because she thought I could add just a little bit since I worked on a variable annuity persistency study with our unit manager, John Fenton. In a nutshell, the earth-shattering revelation that we discovered was that you get a really high lapse rate after the surrender charges wear off.

I'm sure everybody has a particular interest because of the recent events in the stock market. That situation is obviously going to affect the GMDB. To help you with the issues involved with the GMDB pricing, we have two very distinguished panelists.

The first speaker is Mike Pado. He is a vice president with Swiss Re Life & Health Reinsurance. Mike comes to us with a long list of credentials. He is really one of the two experts in the field of reinsuring the GMDB risk and he was also on the task force that helped study the problem and eventually promulgated Guideline MMM on how to deal with the risk associated with GMDB.

Mr. Michael W. Pado: First I'd like to give credit to Tim Ruark from CIGNA. He presumably is one of the two experts Mr. Zimmerman is referring to. I was looking back to the literature as I was working up this presentation. I came across an article he had written a while ago. It starts off: "There are two kinds of actuaries. Those whose careers will end due to the variable annuity guaranteed minimum death benefit, and those who will move into their new offices." I don't know which group I'll be in when I get back to my office, but we'll see.

In the description of this session, they mention that the growth of variable annuities has increased insurance industry exposure to mortality risk associated with the GMDB. So, I thought before we got too far into GMDB, perhaps we could take a look at really what has happened to the variable annuity marketplace. Then we'll work our way through the risk characteristics of the GMDB benefit. We'll discuss some exposure analysis from Swiss Re's book of business for selected contracts and then we'll get into some modeling issues as well as some GAAP reporting issues that are quickly arising. Finally, I'll discuss some market trends that we foresee.

Let's discuss new annuity sales over the period 1985–96. In 1996, we have a 13% growth rate over 1995. What's more impressive than that is that over an 11-year period, it grew at 13%—a little bit more than that—per annum. So there is a very strong growth rate over a prolonged period of time. Actually, 1995 was really the only disappointing year. There are three reasons given for that. One was the potential change in the taxation of capital gains. The second was the flat yield curve, and third, in 1995, there were a great number of market conduct issues that potentially were depressing total annuity sales.

Let's look at the composition of these sales (Chart 1). Over this period, fixed annuity sales show growth in six of the eleven years, whereas, variable annuities show growth in nine of the years. Over the last five years, the sales growth rate tended to move in opposite directions for fixed annuities and variable annuities. So while the annuity market had good strength, sales of fixed versus variable annuity oppose each other. The big news here is that the variable annuity sales grew 47% in 1996, while the fixed annuity sales fell 21%. It's a strong, robust market and it continues to grow.

Let's look at the variable annuity (VA) market a bit more. The VA market grew in 9 of the 11 periods. We know that 1988 and 1995 were the only two years the market had downturns. The 11-year growth rate for variable annuities in and of themselves was approximately 27% per annum. That is tremendous. The Variable Annuity Reporting Data Service (VARDS) projects continued sales growth to $85 billion in 1997. I think we'll get there. We were already at about $41 billion at six months. This will increase steadily to $153 billion in the year 2000.

CHART 1
MARKET ANALYSIS—COMPOSITION OF NEW ANNUITY SALES
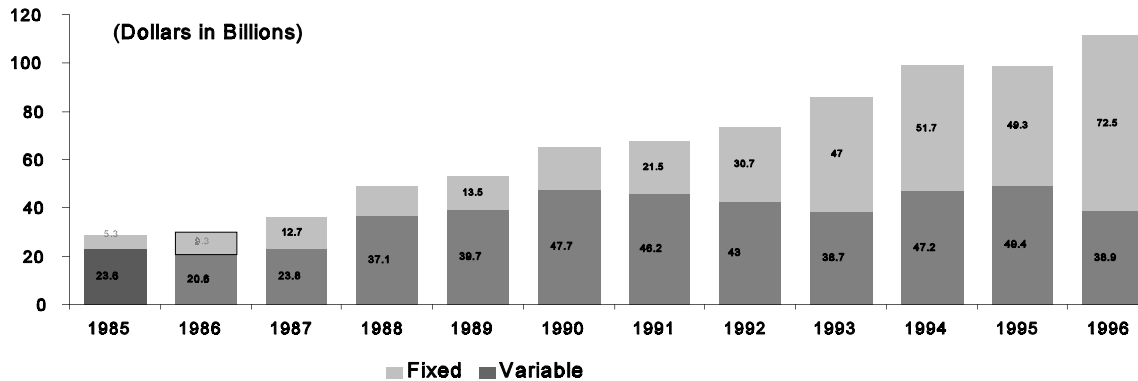
Source: LIMRA International

VARDS cited five reasons for this growth. It believes that 40–50% of top VA issuers will have stand-alone immediate variable annuities. I think that might be true. We see a lot of demand for that at the moment. There is a lot of product development. There is the distribution of low-cost private label VAs that will continue to become more common. Third, they expect continued competition from equity-indexed annuities. They also felt that capital gains taxation will be a non-event. I thought the fifth one was the most interesting. Notwithstanding market volatility, we are in an era of prosperity which will push the Dow upwards of 11,000 by the 2000. It's a strong prediction to have made in light of the recent developments, but one of the things that one needs to consider when modeling this type of business.

With the strong market growth, let's take a look at the total annuity assets in force. I would like to focus on variable annuities. At year-end 1995, there were about $388 million. In 1996, there were $488 million. That's a 26% increase against $72.5 billion of sales. It's really growing quite well. I looked up in *Morningstar* the asset rate of return for all VA assets over 1995, which was 12.4%. That implies a lapse rate of about five percent along with this growth.

As of mid-year, the variable annuity assets are projected at about $573 billion. It's up $100 billion after just six months compared to an increase of $100 billion for the whole prior year. It has a very strong growth rate with persisting assets as well (Chart 2).

The new sales by quarter correlates quite well with the Standard and Poor's (S&P) Index. I just mention this because in terms of the modeling that we're going to talk about a little bit later, you need to actually consider the growth drivers for the business. So given what has happened over the last couple of days, I would take

guesses from the audience as to what the third and fourth quarter might look like here.

CHART 2
GMDB RISK PROFILE
EXPECTED MORTALITY COSTS BY RISK RATIO
6-YEAR RATCHET
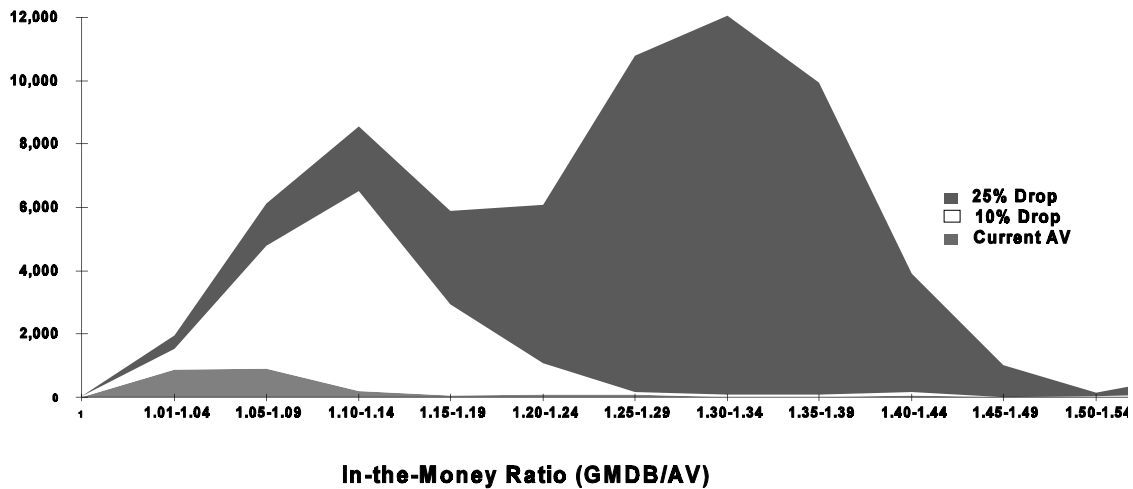
I was speaking to one of the major writers of variable annuities this morning. This person mentioned that on Monday, despite the downturn in the market, their company set an all-time high for daily sales. It seems that nothing is quite clear in this projection process.

Let's discuss what drove the market in 1996 and some of the characteristics of it. There were about 110 companies selling about 250 products. VA sales increased 47% to $72.5 billion. If you break that down further, the big news there is that sales of nonqualified contracts increased 62% to nearly $33 billion. The top 25 companies represented 81% of the market in 1996. This has fallen from earlier figures. I think it shows that the new companies introducing new products are having an effect on the market.

Distribution was strong. Every distribution system reported double-digit growth. There the big news was that sales had doubled through banks in 1996. Brokers and financial planners achieved a growth rate of 53%. So that channel did quite well. In 1997, companies are still rolling out new products, companies are trying to innovate on the GMDB design, and sales remain quite robust. As of mid-year, we had $40.8 billion and the momentum remains robust. The second quarter sales were up about 1.5% over the first quarter. Twenty-one of the top 25 companies had sales that exceeded 50% of their 1996 value. It's a very strong market and it

continues to build. Again, sales from banks and direct response were up, and the underlying assets came to $573 million, which was $100 billion more than year-end 1996. It's a very, very strong market.

With all this growth in variable annuity assets, did the guaranteed minimum death benefit risk exposure increase or decrease? Let's talk about the GMDB risk itself. In a stylized version, the GMDB is equal to the greater of three elements. First is the current account value, and second is the considerations with interest, and the interest may be compound or simple. We've seen it range anywhere from 0%, which is really a return of premium benefit, and more recently, we've seen numbers as high as 10%. On average, I'd say we've noticed the market tends to be in the 4–5% range. The last element is end-year reset or Ratchet value. I guess the hottest product seems to have the annual Ratchet out there, but there is a wide degree of variation, each with its effect on cost.

In terms of the GMDB risk amount, we define it as the GMDB less the account value. Alternatively, you can define it as the GMDB less the cash surrender value. If you view it that way, it puts the risk automatically in the money equal to the amount of the surrender charge. To develop the cost for it, we have to take the risk amount times the mortality rate. In a formula, that account value shows up in both elements so it can range from zero to a large number.

The team account value is rather simplistic, but the account value is really made up of initial and subsequent deposits reduced by withdrawals and surrender charges. It is also increased for investment returns and further reduced by investment charges and insurance charges. *Morningstar* data seems to suggest that the average investment charge for all subaccounts supporting VAs is about 82 basis points. The total charge for investment and insurance charges rates about 209. On our book of reinsured GMDB, our average charge is about 220, and I think that reflects the fact that, as a reinsurer, we tend to be involved with the more enhanced benefits that you might be seeing on average.

The other thing to note is that the higher the investment fees and insurance charges, the higher the drag on total returns. If you have a 5% roll-up, the fees automatically put some drag on that and put additional pressure on your being able to meet that strike rate. So, all else being equal, the GMDB for a company with higher fees will cost more than that for a company with lower fees.

Let's discuss a stylized version of the payoff profile. In essence, if you have good, cumulative investment performance, and you have good mortality, relative to what you were expecting, you will have a fairly low, if not zero, GMDB payoff. On the other hand, if you experience unfavorable mortality at a time when you have poor

cumulative investment performance, it will be, potentially, a very large cost. Obviously, somebody has to die when the cumulative return is beneath the GMDB bogie in order for there to be a cost. That's really how this works. The person must die "in-the-money." Poor chap. One needs to consider this type of thing. This type of payoff profile is very similar to an option payoff profile. Perhaps we can look at it from that perspective.

Let's discuss a stylized perspective. What you have is a situation where contract owners are giving over their considerations to the annuity writer, and they are allowed to invest their money or allocate their money across different funds of accounts. Normally, they range anywhere from a half dozen to two dozen sub-accounts. The annuity writer will subtract from that, its mortality and expense (M&E) charges, administrative charges, and contract fees. In return for these considerations, the annuity writer will provide benefits to the contract owner in the form of their account value, the cash surrender value, annuitization benefits, and GMDB, which is what we'd like to focus on (Chart 3).

CHART 3
GMDB RISK PROFILE
EXPECTED MORTALITY COSTS BY RISK RATIO
COMBINED

In-the-Money Ratio (GMDB/AV)
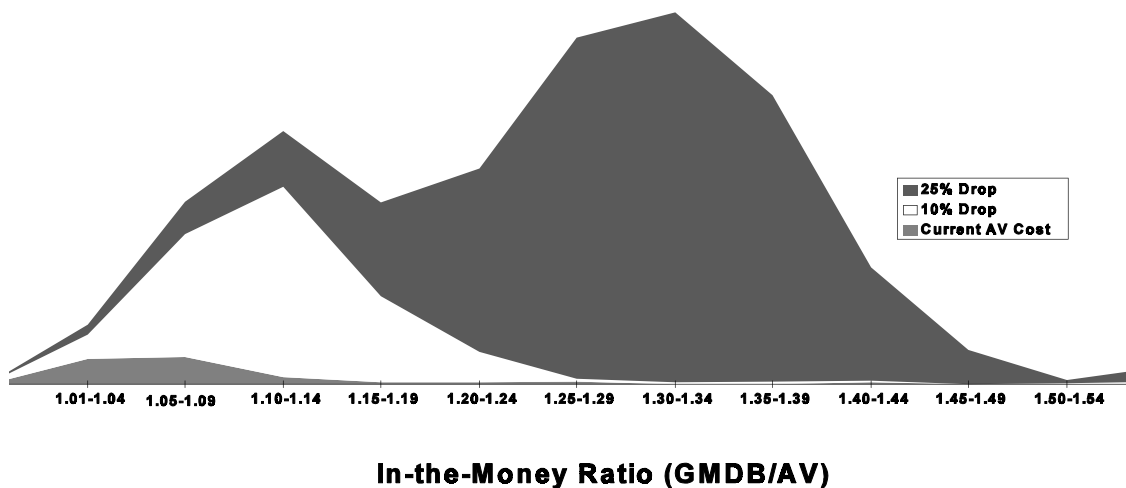
In focusing on the GMDB itself, the annuity writer in effect takes an option premium or mortality charge out of the contract, and in return agrees to pay off the contract owner (a GMBD) in the event of death at some later point. I maintain that this can be viewed as the contractholder paying an option premium in return for an option payoff. A little algebra helps to demonstrate the point here. The account value really comes from the separate account. The risk amount that needs to be

paid off here is the difference between the GMDB and the account value. This risk amount either needs to come from the annuity writer's general account or perhaps the reinsurer or some combination of bank-based hedging, but somebody has to fund this difference in the event that this option is in the money.

So you can look at it as a long-term option. The annuity writer is on the risk until the earlier of surrender, annuitization, or death. The first two are a function of, I believe, policyholder behavior and contract design. The latter is also a function of policyholder behavior. It's simply not as voluntary. It's also a European-styled option in that it's a cash settled option that pays the difference between the rate of an underlying compared with the predetermined strike level, but not being the GMDB. It is also path dependant as we saw a little bit earlier because the value of the option is a function of future market performance. If you had 1,000 contracts that began and looked at their account values 20 years hence, and if they were all at exactly the same point, I believe that you would have 1,000 different risk profiles along the way with differing costs associated with them. It really is a function of the occurrence of the risk amount and the level of the risk amount.

This option is also automatically exercising. Upon death, you're either in the money or out of the money. It's automatically exercising in that way. It's also a naked option in the sense that if you write the GMDB and simply retain it, then you have no offsetting position. There are ways to address that — one through bank-based hedging and another through reinsurance.

I also believe it's a basket option because most VAs offer a wide array of subaccounts and most contractholders take advantage of that and diversify their assets across those subaccounts. It's really the net comingled return of all those funds that determine whether this option is in or out of the money. They can go into either equity or fixed income and it might be either domestic or international in form.

Let's examine how one could possibly offset this through risk management. Reinsurers can step in and provide the offsetting through a reinsurance program in which they receive a premium from the annuity writer and payoff the realized mortality cost in the event of death. This would be a separate contract with the reinsurer and there would be no right of pass-through between the reinsurer and the contractholder. In some sense the annuity writer has traded the GMDB option risk for the credit risk of its reinsurer. You can also use a bank-based hedging program in a similar fashion to this type of design.

Let's move to some exposure analysis. We've taken a look at two blocks of business that we have from the same company, but they are different in terms of

their benefit design and their characteristics. We just want to see a little bit of what happens in several down market scenarios. In the first case, there is a one-year Ratchet benefit. The block is open for new business. There are currently about 1,800 contracts in force with an underlying asset value of about $75 million. We calculated expected mortality costs. We're looking at the actual risk amount as of August 31 and multiplying that amount by our expected mortality. We then plotted this by, what I'd call, in-the-money ratio which is the GMDB over the account value.

So in this particular case, we had 1,300 of the 1,800 contracts as of August 31, in which the ratio of the GMDB to the account value was one. They were not in the money as it were. So the expected mortality cost for those folks was zero. But we had 250 that were in the money at that 101–104 range and 125 were in the 105–109 range. So it's behaving like you might expect. You have a fair amount that are out of the money and fewer and fewer that are in. The total expected mortality cost for this particular block as of that time was about $6,300.

Now let's see what happens if we have a 10% market correction. I picked this number before Monday. It just happened to work out this way. If you have a 10% market correction, what happens is that instead of having 1,300 contracts that are out of the money, we now have only about 230 that remain out of the money. The rest move further into the range of "in the moneyness" and the mortality mountain is higher and wider. Our expected mortality cost under a 10% drop is now $50,000. So it's not a terribly significant amount, except it's eight times what it was under current conditions. This just goes to show you how potentially volatile this risk could be.

If we take it a step further and assume a 25% drop, we now have an expected mortality cost of $175,000 which is a mortality multiple of 28 times. So it really does move around quite a bit, and I think one needs to be aware of that type of behavior when trying to price and model these types of business. When the in-the-money ratio is one, you'll recall that the count was 1,300. When the account value dropped 10% we had about 230 contract out of the money. At the point where we drop it 25%, nobody is out of the money. Everybody is in the money.

We then looked at a six-year Ratchet. The characteristics of this are a little bit different. It's the same company, but it's a closed block. There are about 6,000 contracts with about $300 million of account value. With the current account value, we have an expected mortality cost of about $23,000 under the current account value and if you have a 10% market drop, it goes up to $152,000. The multiplier is six times. Just to complete the comparison, if the market dropped 25%, the mountain grows quite large and the expected mortality cost grows to

$496,000—nearly a half a million dollars. We started out, in this case, with 4,750 contracts out of the money. A 10% drop reduced that number to 2,500 out of the money and a 25% drop brought it to just about 1,000 out of the money. So it really has a gearing effect here in pushing the people in and out of the money, and trying to project this is a bit tricky.

Now I looked at changes in risk amounts over the course of time. In Chart 4, I compared, again, the one-year and six-year Ratchet, but from the point of view of the average GMDB risk amount. This was a summing of all of the contracts' GMDB risk amount, and I divided by the total number of contracts just to see how this could move about. You probably recall, if you're in the business, that March and April weren't all that attractive return-wise, and the average risk amount here shot up quite significantly over the months before and after it. Hence, when a person dies is quite significant here.

CHART 4
AVERAGE GMDB RISK AMOUNTS
COMPARISON OF ONE VERSUS SIX-YEAR RATCHET
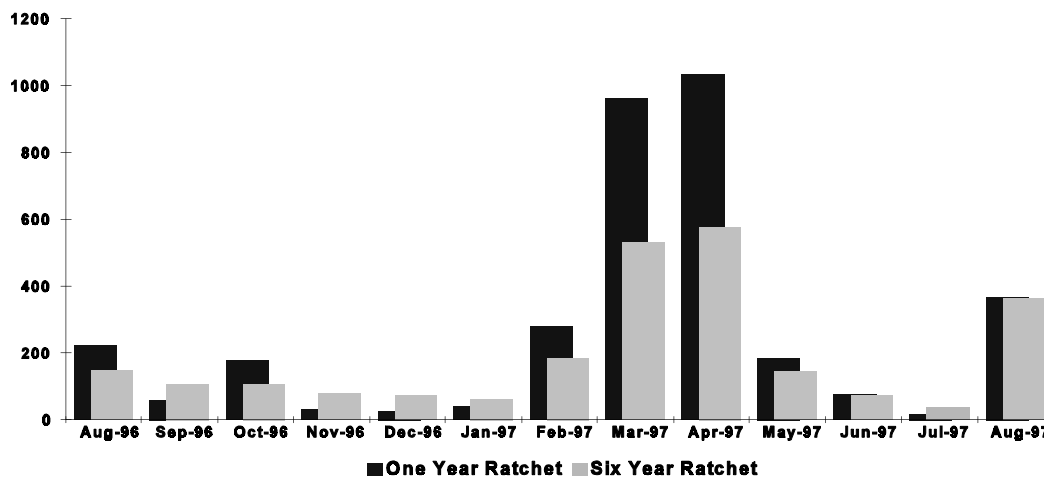
In terms of modeling the business, one can simply say that it's a five-step process. You need to project your account values and you need to calculate your GMDB which draws into that account value definition. Determine the risk amount which is the difference between the two, and multiply it by your expected mortality rate to get your expected mortality quote and you're done. For the revenue, since you've projected the account values, you just need to multiply by your M&E charge and you're done. No big deal, right? Getting there is a bit more difficult. You need to take a look at the premium flows—the timing and amount of which are both variable. We see quite a big difference in the dispersion of premiums by size. Premiums are coming in at different times and different amounts. Some

contractholders are withdrawing or surrendering either all or part of their contract. Again, that's variable by time and amount. The money that does stay, though, is invested across different options that they have within the contract. Your total return profile is a function of their initial allocation and to some degree, their transfer activity, thereafter. I find that not that many folks keep track of the transfer activity in the way that makes modeling, including that type of assumption in modeling, very unreliable.

Let's look at the profile of initial considerations in Chart 5. This is from an actual contract that we reinsured. The characteristics are that it is a brand new product and they are issuing about 1,000 contracts per month. We took a look at the average size in corridors. Most of them were quite small—in the $2,500 range. If you zip all the way out to the end for amounts above $250,000, there were 39 contracts of that size. So the average policy size is close to $400,000. Depending upon who dies and when they die, you have a different economic outcome. Given the same investment returns and the same GMDB bogie, obviously the one with the larger contract size will have the bigger bottom line affect should they die in the money.

I mentioned investment allocation. If you're projecting all of this business and you are using average return values, you need to be quite careful. If you go to *Morningstar* and look up the results for all variable annuity assets, you will see that most are invested in domestic equity. I believe the number was somewhere in the mid-70s, with a smattering of international equity fixed income and other investments. To see how much variation there is in this sort of initial allocation, we took a look at one contract that we reinsured. As a matter of fact, it links back to those one-year and six-year numbers I was talking about earlier. It's dramatically different. The contract is more influenced by international rather than domestic investments. In the return profile, here it would be very different than what it would be for the average. In terms of modeling and projecting this type of business, averaging is a dangerous game. The other thing is that over a course of time, this can possibly change and I think perhaps more work needs to be done to understand what drives those types of change.

Other factors in projecting the account value include lapse activity and surrender charge. One needs to try and set an assumption for the lapse rate, which we believe is a function of age, sex, duration, tax status, and, of course, the surrender charge pattern. There's also a difference between single premium and flexible premium products. There is also, the Life Insurance Marketing and Research Association (LIMRA) study that someone cited before.

CHART 5
GMDB MODELING ISSUES
PROJECT ACCOUNT VALUES
PROFILE OF INITIAL CONSIDERATIONS
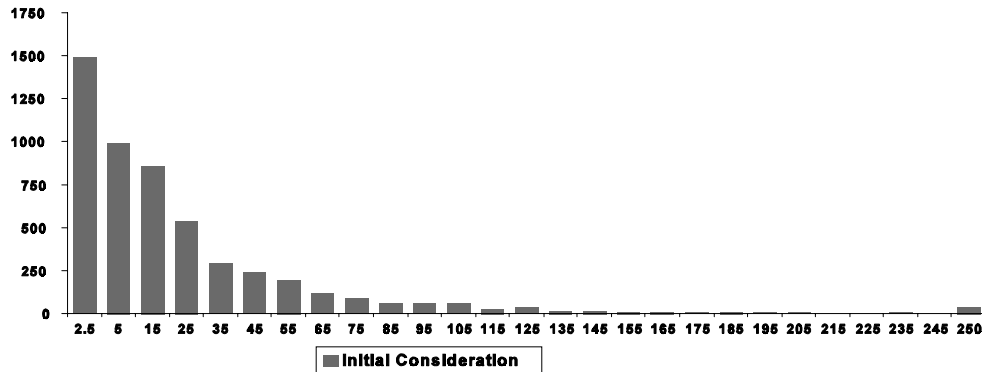
As with any insurable event, we also need to take a look at the mortality that one would assume in trying to come up with the GMDB cost. You need to select the table with adjustments for a variety of things. If the business is guaranteed issue, then the business is not underwritten so you need to find the appropriate table to use. There are a number of contracts that allow for joint owner status; so many pay off on a first-to-die basis, and so many pay off on a last-to-die basis. These are aggregate funded generally with one M&E charge applying for everyone. One needs to also take a guess at what the prevalence of that joint life status is and factor in the expected mortality of the status.

Last, we are seeing that more of the enhanced benefits are offered as an optional covered rather than a basic standard cover. So you have to try to project how many people will select this optional benefit. In doing so, you have to ask yourself, "Is there additional mortality associated with that?" If somebody is willing to pay 25 or 30 basis points more for an enhanced benefit will they have higher than expected mortality than the standard group.

We're still on step one, projecting the account values. We need to project the investment returns over a fairly long horizon to try to get our risk profile that we looked at before. One of those assumptions is trying to pick your return distributions. Do you use a normal distribution? A log normal distribution? We know some folks who use a triangular distribution. Whichever distribution you decide on, you also need to pick your parameters—the means, the standard deviation. In the case of the triangular, you need to pick out your minimum, maximum, and most likely. It's just another assumption one needs to make.

You also need to make a decision as to whether you project your business by fund, individually or by asset class. Again, there's some danger in doing it by asset class because you are averaging things out. When you average things out, you tend to take credit, if you will, for some diversification. That tends to lower your risk profile. You also need to reduce your investment returns for investment fees and mortality and expense charges. With respect to the investment fees, they tend to vary by fund. So by picking just the asset class, you'd be taking another distribution risk there. Furthermore, these expenses may or may not be guaranteed. If you're someone that's assuming the business from someone else, you have an issue to deal with in the event that the direct writer raises the fees and puts additional drag on the contract and alters your risk profile. Last, you need to make some reduction for the prevalence and cost of the optional benefits in terms of projecting the account values for those policyholders.

I think most people who are in the variable annuity business that are adding enhanced death benefits have chosen to go the stochastic route rather than the deterministic route. I highly recommend it. It shows you the range of potential outcomes that one can experience. I would also suggest that in the course of doing that, you not fix your mortality or lapse. It's possible to make each of those a function of other events that are going on in the contract or in the environment. And each of those should move around a bit as well to show you the full range of potential outcomes here.

You need to decide on the number of paths. Are you simply going to go with the low number? If you're concerned about run time and getting the jobs done in a hurry, you're going to pick a low number like 500. Or is 5,000 the right number? That's a critical decision to make. But I think it should be influenced by your sampling technique. If you're using Monte Carlo, perhaps a pretty high number is appropriate. If you're using more of a stratified technique like a Latin Hypercube type of sampling technique, you can get away with perhaps a lower number.

In terms of the pricing horizon, again, the risks behave differently over time. We believe that the pricing horizon of 25–30 years makes some sense. So that's it for the projection method.

Now, we've been looking at the GMDB as an option, and there is something that is developing in the market that I recently became aware of. I thought this would be a good opportunity to at least briefly mention it to everyone. It's the following. On August 29, 1996, Financial Accounting Standard Board (FASB) released a draft standard for exposure. It's entitled the "Accounting for Derivative Instruments and for Hedging Strategies." What it attempts to do is to standardize the accounting for derivatives and derivative parts of other contracts by requiring an entity to recognize

those instruments as either assets or liabilities in the statement of financial position. The big thing is to measure them at fair value. So if you view the GMBD as an option that's linked to a host contract, it may have some financial reporting effect for you.

The FASB had four fundamental decisions in coming up with this statement. Number one, derivatives are assets or liabilities and, as such, should be reported in financial statements. They determined that" fair value" is the most relevant measure and the only relevant measure for derivatives. Third, only items that are assets and liabilities should be reported as such in the financial statements. Finally, there is special accounting for qualifying hedged items, and one aspect of qualification should be an assessment of offsetting charges and fair value or cash flows.

They've gone on to define what a derivative is. It reads, "A financial derivative is a financial instrument or other contract with two distinguishing characteristics. It should have one or more underlyings such as an interest rate, a per share price or index of prices. It should have one or more notional amounts as in an amount of currency or a number of shares." They also said a derivative does not require the investment for receipt for the notional amount at inception of the contract. From my perspective, it seems like these types of guarantees can be viewed certainly as a derivative like an embedded derivative to your variable annuity contract.

In order for this FASB statement to apply, the contract must meet two qualifications. Value to the holder or writer changes by direct reference to changes in the underlying. I think when we looked at the risk amount before, it was the death benefit less the account value. If you look at the account value as the underlying, it meets definition there. It also can be settled "net" since it was automatically exercising upon death.

There are certain contracts for which the FASB statement is not applicable. There are certain insurance contracts written by insurance enterprises and held by insurers that are within the scope of either *Financial Accounting Standard (FAS) 60, 97* or *113* and, as such, are not subject to this draft statement. In these cases, it entitles the holder to be compensated only if, as a result of an insurable event, the holder incurs the liability. It has nothing to do with the change in the underlying. It is simply a result of an insurable event as in death.

They cited specifically in their papers certain nonqualifying insurance contracts. One of these was traditional life insurance. They say that the payment of the death benefit is a result of an identifiable insurable event instead of changes in the underlying. That was the same statement that they had given for traditional property and casualty type contracts such as fire or theft and financial guarantee

contracts. An example of which is where payments are made only if the debtor fails to pay when a payment is due. It has nothing to do with the change in the underlying. So those types of contracts are excluded from the statement. So, if you do have an embedded derivative in your contract, what this statement suggests is that you bifurcate the embedded derivative from the host contract. In this case, one could extend it to bifurcating the GMDB from the VA contract and perhaps you'd want to go a level further and bifurcate the death benefit by separating the insurable benefit from the investment element of the GMDB. If it is an embedded derivative, you account for the derivative instrument subject to the statement and mark to market the fair value of it. The host contract is accounted for based on the accounting principle applicable to it.

Now, in order to get the accounting treatment for changes in fair value, it depends on three items. You need to document the reason for holding the derivative. It needs to be designated as a hedge, and it needs to qualify as a hedge. There is a test in there for hedge effectiveness. I'm just becoming familiar with the document, and I can't claim to be an expert on it at this point, but I did think it was important to bring these types of issues up.

FASB then goes on to state that there are four types of hedge classifications. The most interesting one is the fair value hedge, where the gain or loss on a derivative that is designated and qualifying as a derivative, but was the fair value hedging treatment, shall be recognized in current earnings together with the offsetting position on the hedged item.

In order to be eligible for fair value hedge accounting, they require both formal documentation and an assessment of effectiveness. This seemed a bit onerous to me when I read it because the assessment effectiveness was required whenever an earning statement was produced at least every three months. It was quite a laborious task as it seems. If you want to find out more about this draft standard statement, you can contact the Financial Accounting Standards Board at www.fasb.word.

The ACLI has just produced a response to FASB. It is dated October 13, 1997 and they objected to virtually many parts of it. They objected to the bifurcation of various derivatives from the host contracts, citing that they were arbitrary and premature. They thought the issues were complex and substantial and, in essence, they thought we were racing ahead a little too quickly. So, I've not heard back from that response letter yet, but this is happening and you should be aware of that.

Last, market trends. I think the big thing here is guarantees. We're seeing a fair amount of product innovation within the GMDB. People are trying to enhance it in

many different ways. That type of thinking has extended into a couple of other areas I'd like to briefly touch upon.

There's the "guaranteed minimum value benefit," as I call it. I don't know if there's actually an accepted name for it yet. Some people call it a principal protection benefit. Then there is the guaranteed minimum immediate payout annuity. We'll briefly go through a few of those product designs.

On the guaranteed minimum income benefits (GMIB) there are a number of designs that are out in the marketplace; there are not a great number, but nonetheless, there are several. Here the GMIB is the maximum of two elements. The risk amount really is the discounted value of the difference of those two at the time of election. If you're trying to cost out this benefit, one of the things that one really needs to get a handle on in addition to the risk amount definition is just what the election rate might be. Different people come up with widely disparate assumptions for that type of number which translates into really different cost views of that type of benefit.

The guaranteed minimum value benefit, alternatively the principal protection benefit, is really the maximum of two amounts. One is the account value at some future point in time, perhaps 8–12 years out in the future or the net considerations through time t. Essentially, what happens there is that if you persist in the contract and your cumulative investment performance is sub-par, it is possible to design a guarantee where it's topped up to your initial considerations. The cost for this is really the risk amount, as defined above, times the number persisting. You have another set of interesting assumptions to make in order to get to that future point in time. I should mention that these things don't need to be stand alone; they can act in concert with the GMDB. In which case, you have a very interesting time trying to project all of these interrelated assumptions and costs.

Last, you have the variable immediate payout annuity that can have a guaranteed floor to it. The actual annuity payment would be calculated as the maximum of the calculated payment or the guaranteed minimum payment. The guaranteed minimum could be x% of the initial payment. You could pick 80% or 90%. If you follow that line of thinking, you can even guarantee the initial payment rolled up at some nominal interest rate or perhaps even the cost of inflation. You can design these in any different way that you would like with the associated cost differentials. They can get quite expensive, though. The risk is that, at the time of each payment, there is a shortfall between the guaranteed minimum payment and what the account value lets you pay. It can't be negative. The cost for that is the risk amount times the number persisting. This is sort of more similar to the GMDB in that it's a long-term option. In some sense, it's an omega minus x option depending upon when the policyholder buys the contract.

So those are three new areas where we see guarantees being applied. We're going beyond simply the deferral period in the variable annuity. We're going to some future point in time where the account value can get topped up and then we're extending into the immediate variable annuity phase and addressing really the retirement needs of the broader public. So I think there's a lot of opportunity. There's certainly a lot of activity.

Mr. Zimmerman: One issue that the experts on CNN keep droning on about is that there is a very significant percentage of people out there that have never been invested in the down market, and I think that applies to actuaries. There is a very large number of actuaries in their 30s, maybe even some in their 40s, that have never been invested in the down market, and they have a really hard time appreciating the risk associated with the resulting downturn. If nothing else, maybe even talking to a reinsurer about what an associated reinsurance premium would be might help you gain an appreciation for that risk.

Our next speaker is Lilia Sham. She's going to help us address some of the modeling issues and the reserving issues associated with that risk. As I may have mentioned earlier, Lilia is a consultant with me in the Atlanta office of Tillinghast-Towers Perrin. She has devoted a large portion of her career to addressing the asset side of product pricing issues. She has priced a lot of variable annuities and variable life products. She is also considered one of the premiere experts on equity-indexed products, which is another heavy asset product. Personally, I'd like to say I have a tremendous respect for her. She has been a great help to me in my career at Tillinghast.

Ms. Lilia M. Sham: Before I start with my prepared presentation, I would like to speak to Mike's comments on some of the investment applications or implications of the GMDB and also some of the modeling issues. I was supposed to talk about the reserving issues only. That's the Guideline MMM that has been adopted by the NAIC last month so now it has become Guideline 34. I think all of you that are working with GMDB have to be aware of that.

If you read the reports issued by the Academy work group that Mike is on, on GMDB, you know that there is a survey done by the work group asking companies how they deal with the risk in GMDB. Some companies said that they are not really doing anything. They were probably not too concerned until the last week or so and there are some companies that indicated that they use reinsurers like Mike or Tim. There are other groups of companies that say that they actually use a hedging strategy by using a series of put options. I just want to talk about the modeling issues. If you use a series of put options, what do you have to do when you model such a strategy?

We all know that mortality risk is not something that can be diversified away. Companies actually take on mortality risk, but you can use effective measures to reduce your exposure due to investment underperformance and volatilities. One such way is to structure a hedge and go to an investment bank and try to purchase that hedge. When you structure that hedge, what are the factors that you have to consider? First it would be the subaccount characteristics, meaning what kind of fund allocation do you have with respect to your variable annuities. The allocation would probably be in equities, bonds or in cash. The type of the hedge and the size of the hedge would also be determined by these factors. When you go to an investment bank, and they give you a price quote, what does that price quote mean? What does that depend on?

We talk about volatilities a lot. If you work on equity-indexed products, you probably hear about implied volatilities. So when they give you a price that's a factor of a number, it's dependent on a number of factors. Interest rates is one factor and implied volatilities is another. If you follow this market closely, then you realize that in the recent past, implied volatilities have gone up tremendously. So that means if you are going to go to an investment bank and buy such a hedge, you would have to pay a lot more now than what you would have paid a few months ago.

When you do modeling, you probably want to find out what the benefit is of buying such a hedge. We probably have to do a cost benefit analysis. When you do pricing on a variable annuity, as Mike as pointed out, you probably would want to do a stochastic model. If you don't have any hedges or if you are just naked, that means not hedging, you probably will see a lot of volatilities in your profitability in your stochastic model. But if you have these series of hedges, first you have to pay a bank the cost to buy a hedge. Then when your liability arises, then you would go to them and then they would give you a payoff. Theoretically, your volatilities and profitability would reduce because of your hedging. But are you paying too much to reduce that volatility? That depends on what you have to pay for it and what your profit objective is. When you do such a model, as Mike has mentioned, you probably have to make some assumptions about your gender mix, your distribution of issue ages, and the lapse activity and perhaps even some of the transferability if you can model such behaviors.

There is another consideration when you structure a hedge. Although you may choose a specific fund allocation, most people would choose to ignore the correlation between the funds. If you are familiar with stochastic modeling, and if you just do a model, for example, just based on equities and another model based on bond funds and another model based on cash, then you would see that the returns can be quite volatile as well. But if you are going to combine all three funds

and make it into a diversified fund, then you may realize that the annual returns on that diversified fund are actually less volatile than any of the three individual funds. So when people do modeling, they may choose to ignore that correlation component. They think that is probably on the conservative side.

As you all know, no investment or hedge strategy is without risk. I just want to mention two things that you have to consider when you buy hedges. The first one is probably tracking error. That's probably not too significant. The tracking error arises because the hedges that you purchase do not mirror the liability that you have to pay out. That can be dependant on the subaccount performance and also the relative sizes of all the subaccounts. That could be due to the transfer activity and something that you cannot model exactly. Or it can be something for which you don't have a perfect perception.

Of course, another risk would be the counterparty risk. If you are going to buy hedges from somebody, you pay them at the beginning hoping that when it comes time for them to give you the payoffs, that means when that benefit arises, then they are still around to pay you that benefit. You might want to have a provision for default in the modeling process. That's just my observation.

Now for my prepared presentation for reserving considerations. Mike might be more qualified to talk about this than I am because he has been involved in the Academy work group on developing Guideline MMM. As I said before, Guideline MMM was adopted by the NAIC last month. The proposed effective date is going to be December 31, 1998. So you still have a little bit over a year to think about what you are going to do with this.

What does Guideline 34 cover? It covers any GMDB on variable annuities that have the potential to exceed the account value. Mike already gave you the different examples of the GMDB design, so I'm not going to go into that further.

What doesn't it cover? It doesn't cover any of the group contracts not subject to the Commissioners Annuity Reserve Valuation Method (CARVM). In some cases, Guideline 34 may be inappropriate. I can give you one example. For instance, if your company is holding account value as reserves already, you may be able to demonstrate that no additional reserves are necessary for GMDB. The only question in that case would be how you are going to allocate the reserves between the subaccounts and the general accounts.

Within this Guideline, there are some definitions made. They may be somewhat different from the definitions that Mike gave in his presentation, but this is the definition that you have to follow if you're going to apply Guideline 34. First, the

work group defined the term *projected reduced account value*. That is the projected account value reflecting immediate drops and net assumed returns. Mike's examples included different immediate drop percentages—one being 10% and the other being 25%. In formulating the reserves, you would have to follow some specific guidelines and we're going to talk about those guidelines later on.

Another definition is the projected unreduced account value. That is the projected account value reflecting the valuation rate less asset charges, but not the immediate drop. Mike talked about the risk amount. The work group report mentioned the projected amount at risk and that is the projected death benefits, which include any of the GMDB components less the projected reduced account value. You might realize that's slightly conservative because you use the reduced account value rather than just the account value. That's somewhat different from what Mike had defined in his presentation as well.

It goes on to define the base benefit streams, which are streams of projected benefits based on the projected unreduced account values, but it ignores GMDB. Then there is the integrated benefit streams. I'm going to give you a formula later on to tell you what that is. It reflects the base benefits for all the survivors and the GMDB for all the expected deaths. The calculation period is any potential period that you would use to project the common reserves of the underlying annuity products.

What is the methodology behind this Guideline 34? What it says is that the reserve that you have to hold for GMDB is the integrated reserve less the separate account reserve. The separate account reserve would be the reserve held in absence of GMDB. The integrated reserve would be the reserve reflecting all benefits including GMDB. What I was referring to before was how do you allocate between the reserves in a separate account and the general account if you're holding the account value as your overall reserves? That's something that you would have to consider. Actually in this guideline it says that your integrated reserve less your separate account reserve would have to be held in the general accounts.

What is the integrated reserve? In a nutshell it's just the greatest present value of all the integrated benefit streams. The integrated benefit streams, as I said before, is the stream of projected net amount at risk for deaths during the period. It also includes the stream of projected unreduced account value for deaths during the period and the base benefit streams provided to survivors.

Now, when it comes to valuation mortality, the work group recommends the use of a group table which is the 1994 Group Annuity Mortality basic table increased 10% for margins. There is no projected mortality improvement allowed. This is recognized as the GMDB valuation table for the time being. There is a study

currently being undertaken by the Society of Actuaries on GMDB mortality. The SO
has sent out a second round of questionnaires to all the participating companies.
But it is going to be deferred until probably some time next year. If you read the
work group report dated June 1996, it says that this mortality study was going to
come out one year from that date. That means June 1997. But June 1997, has
already passed and it hasn't come out yet. I just talked to one of the staff members
of the Society, and he said that they are hoping to get it done before the end of
1998. So that means it will be out before any company would have to do the
GMDB reserving. You would have to follow the development of that.
The reason why the 1994 Group Annuity Mortality Table was chosen is because
the work group recognized that this table is probably the least likely to be affected
by any kind of selection.

In terms of valuation interest rates, what does Guideline 34 require you to do? You
have to be consistent with the Guideline 33 requirements. I understand that there
was a session on Guideline 33, so I'm not going to talk too much about it. But one
thing that you have to notice or you have to pay attention to is that the integrated
benefit streams have to be subdivided into different benefit portions. They would
be classified according to the withdrawal characteristics. Each of these benefit
options or portions would have to be discounted at the appropriate discount rate.

We talked about the immediate drops and the assumed return to calculate the
GMDB reserves, so the work group has identified two sources of data that you can
follow. First, you have to classify your assets into five basic classes. Those five
classes are: equity, bond, balance fund, money market, and specialty. The only
judgment components that a valuation actuary or an appointed actuary would have
is which class are you going to put your funds into? You don't really have any
judgment considerations in terms of saying what is going to be the immediate drop,
because it would have to follow two sources. One is the *Morningstar* variable
annuity data. The other one is the *MorningStar* data, but with weighted indices.
According to the work group that produced 3.33% adequacy, so they think that an
objective measure like this would be easy to audit, at least from the regulator's point
of view. It would be easy to do. If two companies have the same GMDB benefit
structure and everything is equal, they should produce the same reserves. There is
really no judgment involved other than the fact that you are going to put your funds
into those five different classes.

The work group also recommends that you look at those historical data and review
them periodically (perhaps once a year since you have to do your reserving once a
year or maybe quarterly if you are doing it for your company quarterly), and then
decide whether you want to upgrade or not. Again, the work group points out that
the correlation between funds is ignored. The reasons that they gave were that no

standard correlation tables exist between any of these funds. Also, correlations appeared to change over time. So, even if you have a standard table now, it may only apply for the time being. As time goes on, you may have to change anyway. Since they want to standardize the reserving methodology and all the components surrounding it, they recommend that you not look at the correlation between funds. But one thing that you can do is use the annual return from the historical data, and then deduct your company's own after charges from those returns to get the fund returns. It also recommends that the fixed account be treated as a separate fund so if you have any guarantees on the fixed account, they have to be treated the same way, except that the immediate drop percentage would be zero rather than based on any *MorningStar* data. I don't think the *MorningStar* data would give you any immediate drop on the fixed accounts.

As far as reinsurance goes, Mike would be more qualified to talk about that than I am. One thing you may want to pay attention to is, if you are thinking about reinsurance, you may have to think about the reserve credit that you are going to get when you are reserving for GMDB. The work group defines integrated reserves (net of reinsurance) as the integrated reserve plus the effect of reinsurance premiums and minus the reinsurance recoveries. Depending on what your reinsurance premiums are and what your expected recoveries are, it's possible that your integrated reserve net of reinsurance can be greater than your integrated reserve gross of reinsurance. In that case, your reserve credit can be negative. That's something that you would have to think about. I'm not advocating not getting reinsurance, but you have to think about this very carefully.

Reinsurance companies, like Mike's company, also has to hold GMDB reserves assumed. The methodology is basically the same as the methodology for the direct writers, but they would have to look at the reinsurance death benefits and subtract any of the reinsurance premiums. Then they would have to take the greatest present value of overall durations. If you have company A that's buying reinsurance from company B on a GMDB, then company A cannot have a ceded reserve that is greater than what company B is holding as a reserve assumed on a GMDB. I guess that's to be expected.

What do we have to pay attention to? As I said there is the SOA mortality study. So that's supposed to come out next year. The work group is also going to look at some asset adequacy testing, which might be in combination with other Academy task forces' efforts. Supposedly, some kind of revised guidelines are going to be recommended for actuarial opinion and random type situations. Then also, there is another task force that's looking at the risk-based capital (RBC) components for GMDB. That may impact part of your pricing because, currently, you may have risk-based capital (RBC) components for GMDB equal to zero, but if this task force

recommends that you have to hold something for RBC for GMDB that may affect your profitability. So those would be the things that you would have to look out for. Stay tuned for all the developments.

As a closing remark, I just want to mention one thing. The new guarantees that Mike talked about at the end of his presentation have generated some interest among regulators; they want to have some sort of specific regulations over that type of guarantee. They perceive these products to be more like fixed products than variable products. That's probably because of all the recent developments and all the recent attention that has been given to equity-indexed products. The Academy has a task force that's very active in looking at the various issues on equity-indexed products. In one of the most recent conference calls, one regulator (who has tremendous influence on other regulators) wants to regulate these types of products. We have to be careful about that.

Mike, as a reinsurer, what would you do to hedge yourself?

Mr. Pado: I guess the question was, as a reinsurer, what will we do to hedge ourselves? We mentioned bank-based hedging programs as a potential alternative and some of the risk that you get along with it. My belief is that if you reinsure, you achieve a perfect hedge that you can't quite do through a bank-based hedging program. With more hedge, there is potentially more cost. We recognize that. So, it depends upon the risk profile of your own company and which way you'd like to go.

In terms of a reinsurer, though, we take a look at our entire portfolio and we want to make sure that we achieve some degree or a high degree of diversification across benefits and across ceding companies. We take a look at what the composition of our portfolio is. We do recognize that all of the risks are somewhat independent in the sense they come from different places. They are different amounts at different times so there is some built-in diversification that is going on, and in some sense, is a hedge. On the other hand, you're accumulating market risk and systematic risk. You need to take care of that.

We use a combination of retrocession within our own family that does have a hedge-based backing to it. In order for it to be cost effective, you should be in a position to model out your entire book of business. It becomes quite a complex task with all of the innovation that we see in terms of the enhanced death benefits. Each one is a little bit different. Your risk profile is a little bit different. Over the course of time, our reinsurance structure has changed, so we have a bunch of moving parts. You need to project the whole book out and find out what your risk tolerance is for the entire portfolio of your GMDB, which constantly changes

according to market movements. Different companies write at different rates. That has influence on the composition of our books. You need to be very diligent in looking at the data all of the time. It's quite a complex process.

Mr. James M. Dallas: Being in the reinsurance business, I know there is a time lag between date of death and reported date of death. I'm just curious, who takes that market risk? How is that defined in the treaties?

Mr. Pado: That's a good point. Unlike traditional life reinsurance, the date of death is not quite as important as when the proof of death is received by the direct writing company. The money remains in the market fully invested until that time. That's when it gets marked to market. It is not marked to market on the date of death. It is the date of receipt of proof of death. On reinsurance agreements, we keep that risk, and we assume that risk. The offset there is that you are receiving reinsurance premiums the entire time that the contractholder may be expired. The contract has not been submitted for death benefit reimbursement.

From the Floor: I'd like to ask Mike and Lilia who is driving the process of adding all these complexities to variable annuities which started out as being kind of a plain vanilla thing. So many things are involved with all this high-level computation, calculation, and regulation that's going on. I mean, without regard to the need to do all this work, are the investors and the marketers and the retirees or eventual retirees of America really interested in having all of these features and paying whatever the traffic will bear to enable you to reserve them properly.

Ms. Sham: I will take that question first, and then Mike can add his thoughts. I would say that the driving force is probably many fold. The success of mutual funds has taken away annuity sales. To differentiate between variable annuity and mutual funds, insurance companies would have to make it more like an insurance product. First of all, you have the GMDB and now you have the GMIB and then because of GMIB, you have to use principal protection. I think part of the reason why you have principal protection is probably because of equity-indexed products because equity-indexed products attempt to be like a variable product. It has basic minimum guarantees.   I would say that the market is probably going to want product types that don't really have a clear distinction between fixed products and variable products. The other factors would be the distributing channel demands because if you work with different distributing channels, they would demand different characteristics on the contract. I'm not sure whether there's any consumer demand for this. They are probably not aware of the fact that they even have GMDB on their contracts.

Mr. Pado: From our perspective, I guess I view it as two driving forces. One is differentiation within the variable annuity industry itself. Any company generally wants to have a product that is unique and is of interest to its distribution system and to potential contractholders. So most try to innovate to be different rather than to try to design a product that is the same as someone else. Much of it is driven, I think, by distribution channel demands. From my point of view, there is no one product that satisfies everyone. It's possible that there are variable annuity contractholders that would like to pay a very low fee and try to get some of the benefits associated with it. To other contractholders, it's worth 20 basis points, or whatever the number might be for a particular enhanced benefit (whether it be a death benefit or an income benefit). It's just a different point along the curve. They may wish to buy that type of optional benefit and pay more for it. In situations where we reinsure agreements that have both standard and enhanced benefits, there are a fair number that buy the enhanced benefit so I think there is a demand for it. Anywhere between 15% and 30% are willing to pay the additional freight for an enhanced death benefit.