1998 VALUATION ACTUARY SYMPOSIUM PROCEEDINGS

SESSION 43TS

NAIC GUIDELINE ZZZ: EQUITY-INDEXED ANNUITIES

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MR. NOEL J. ABKEMEIER: I'm from Milliman & Robertson in Chicago. Our other presenter is Cherri Divin from KPMG, also in Chicago.

Equity-indexed annuities have been the rave product of 1996 and part of 1997. They're less popular now as the result of interest rate decreases, volatility increases, and market uncertainty. We're in a lull period, and there may not be many companies entering the market now as there were two years ago. However, in the coming years, as interest rates rise and volatility decreases, I think the product is going to get a second wind. If your company does not have one, another chance will come for your company to get into it.

We will go through the background and techniques of the NAIC's Guideline ZZZ. Cherri will go through the various requirements of what must be done—the rules of the game. After that, I will give some examples relating to one set of methods, the market-value-based methods. Then, Cherri will talk about the book-value method, and I'll have some additional comments on making the best overall choice among the methods. We invite you to ask questions at any time.

MS. CHERRI R. DIVIN: I'm going to provide for you the broad overview of the guideline up front. As of year-end last year, there wasn't any specific universal guidance for reserve methods on a statutory basis for equity-indexed annuities. People were handling them in many different ways, and about five or six states distributed information on how they wanted the reserve standards set. Among these was Illinois, which released guidelines that were very similar to the draft of Guideline ZZZ at the time. Although it specified the type of reserve methods, the Illinois draft was considered extraterritorial by Illinois at that time. Other than those guidelines, the only standards available were the general Commissioner's Annuity Reserve Valuation Method (CARVM) rules.

The guideline was approved by the Life and Health Actuarial Task Force (LHATF), in September. It's expected to be approved by the NAIC this year and be in effect for 1998 year-end valuations. The guideline can be found on the NAIC Web site at www.NAIC.org.

The scope of guideline ZZZ covers all equity-indexed annuities, deferred and immediate. However, the last statement concerning applicability to floor values on variable annuities is no longer correct. In September, when guideline ZZZ was approved by the LHATF, the application to variable annuities with floor values was eliminated. This has created a lot of concern because we used to have variable annuities and fixed annuities, and this is something in between. One concern was that variable annuities with floor guarantees, which have a mild similarity to equity-indexed annuities, would fall outside of regulations, so they were included in guideline ZZZ. But now they will be covered in a separate guideline that is being developed.

The guideline defines two different computational methods, and you can select either one for your own company based on qualifications. Type 1 is book-value accounting, the enhanced discounted intrinsic method (EDIM), and we'll be referring to that. Type 2 is market-value accounting, where the option piece is accounted for on a market-value basis. Two methods are acceptable: CARVM with updated market values (CARVM-UMV) and the market-value reserve method (MVRM). Under the MVRM is a specific variation called the Black-Scholes projection method, which was added in the last few months. So you actually have four different types of calculations within the book-value and market-value types.

Obviously, the balance sheets would be significantly different depending on the approach selected, and the guideline addresses assets, but it's not definitive at times. However, if you look to the NAIC codification for guidance on assets, it says that the derivative instruments must be accounted for in a method consistent with the item being hedged. So you know you should have some consistency. In other words, if you selected type 1, book-value accounting, for your liability, then the asset should be valued at book-value. The same is true for market-value.

A couple of terms are new to this guideline. One is the "hedged-as-required criteria." These are very strict criteria when compared with the GAAP standards we're used to. GAAP standards are typically more along the lines of closely correlated values. These are very tightly defined values, so we'll be going over the definition of hedged-as-required very carefully.

Another term you need to understand when we get to the calculations is the "policy term" that defines the computational method, and we'll go through that also. The policy term is a period for which you have guarantees, and that will be the length of the initial calculation period.

Your appointed actuary has responsibility for certifications on these different methods, and several different certifications must be performed at different times. Some of these different calculation methods use approximations, and some are more precise. One of the approximations being used for simplicity is on the interim values. Three of the methods—the EDIM, the MVRM, and the Black-Scholes projection method—use approximation methods to define the interim value. In other words, you know your beginning value and your end value when projecting your benefit stream, but you use the approximation to determine interim values; it's just an interpolation based on interest. However, because you are approximating the interim values, if you had had a very irregular benefit pattern during the interim period, it would not be appropriate to use this method. That is addressed in one of the certifications.

If you want to use one of these three methods, you must demonstrate compliance up front and file it with your state commissioner. It requires a one-time filing and certification by your appointed actuary.

Other certifications are filed with your domiciliary commissioners on a quarterly basis. For the EDIM, the hedged-as-required criteria are required. Because EDIM is a book-value accounting method, it's not going to show market-value realities on your balance sheet. If you're hedged gets somewhat out of sync, this would not be a good method to use, so you must certify on a quarterly basis that you meet the hedged-as-required criteria for this EDIM method. All methods require a certification of the reasonableness of their assumptions. The ones that are mark to market—the MVRM reserve method, Black-Scholes, and the CARVM-UMV—require another certification that says the assumptions used to determine the liabilities and assets are consistent.

I'm going to go over the hedged-as-required criteria because they are very definitive in deciding whether or not you could use the EDIM. It's a very popular method because it's very simple and works fairly well. Once you select your method, you can't change between different types at your own discretion. If you fail to meet the criteria in a quarter, you have a one-quarter grace period; then you must switch to type 2 and can't switch back without your domiciliary commissioner's approval. So it's very important to select the method that's appropriate for your business.

The hedged-as-required criteria on a statutory basis on guideline ZZZ is much stricter than we've seen on the GAAP side for hedge accounting. The first one is a required equivalent of characteristics between the option contracts and options embedded in the product, and the guideline is very specific. It's not "closely correlated," but "equivalent" as far as the index itself, the averaging, the term period, and the option or strike price. All the features must be identical. Therefore, you must be well matched as far as the type of option that you're buying or however you're hedging it. You don't have to be 100% hedged up front. The guideline does allow you to have a 3% elective decrement rate, and I assume that this is similar to a 3% lapse rate. In addition to this 3% decrement rate, you can have what I would consider a nonelective decrement and add mortality to that value too. So in determining how much hedge you must have, you can allow 3% for each year compounded from the end of the term period. That allows you to match what you expect to pay as opposed to being fully hedged up front.

The next three criteria are investment guidelines that you probably have in place if you have a hedge program. You must have (1) a very specific written plan for hedging risks, (2) a system to monitor the effectiveness of the hedge—in other words, each quarter you'll have to measure the effectiveness and see how far in or out the variance is—and, (3) a stated maximum tolerance between the expected performance of your hedge and the actual results. You must measure the latter on a quarterly basis.

An example of such a hedge would be if you had a seven-year point-to-point product and bought a similar over-the-counter option.

Some companies are using what we call option replication in their hedging. They might synthesize the derivative in house. One of the methods that I've seen is the delta hedge program. However, it would be difficult to meet the basic criteria because the wording isn't appropriate, so guideline ZZZ added another way to qualify for hedged-as-required criteria. There's a special guideline for option replication. The concepts are nearly identical to that of the basic hedge, but the wording is a little bit different.

The expected performance criterion is somewhat vague and awkward. It says the difference between the expected performance of the hedge and the actual results of the hedge should not exceed 10% of the amount up front. I think they're referring to the 10% of the movement. As such, you could just have 10% of the movement variability. Being overhedged would be all right, but the guideline specifically states that you must evaluate this weekly, which you probably would be doing anyway. And as in the basic method, if you don't meet the type 1 criterion, you get about a one-quarter leeway before you must switch to a type 2 method.

One of the terms we referred to earlier is a *single dominant benefit.* You use the single dominant benefit to establish a term period. You use a term period to establish the time frame of your calculations. So the single dominant benefit is important for most contracts. It's fairly easily defined for most contracts. However, if the variable annuity had slipped into the scope of this regulation, the single dominant benefit might have been difficult to determine.

To define your term period, first determine the single dominant benefit by looking at a variety of features: the entire product, the pattern of guaranteed participation rates, the surrender charges, vesting rates, spread deductions, and the sales literature. It's the most likely benefit to be paid under the contract that would define the term period for your calculations.

Let's go over plan type briefly. Most of us think that our fixed annuities are on a plan type C, but might prefer to have them valued as a plan type A because it gives you a lower reserve. When we first started talking about equity-indexed annuities, we knew our deferred annuities were generally type C, but because the indexed annuity moved in relationship to your assets, we presumed for a while that, even on a cash surrender value benefits, you might be able to get a type B or a type A valuation rate. And the guideline specifically states that the phrase "change in asset values" does not include changes in policy value due to changes in the equity-index, which surprised me. If you have market-value adjustments, you might be able to get to a type B valuation rate. However, if you're looking at elective benefit streams such as cash surrenders, then you're typically on a type C, and I don't think this would affect your other nonelective benefit streams.

Noel is going to give you some sample calculations on each one, starting with the market-value adjustments.

MR. ABKEMEIER: The reason we're starting with the market-value adjusted methods is because you will invariably use one of these methods as the starting point for the type 1 EDIM method. I will start with the type 2 methods, and Cherri will explain the type 1 method.

Initially, for the CARVM-UMV and the MVRM, we're assuming a four-year product. It's not a real common product, but four years is short enough to make the demonstration simpler. It's a guaranteed compound ratchet meaning that every year your benefits can go up by a certain percentage, but they will never go down if the index falls. The compound ratchet is guaranteed throughout the period for the CARVM-UMV and the MVRM. The participation rate is assumed to be 50%; the minimum guarantee, which is derived from the standard nonforfeiture law, is 90% accumulating at 3%. I put in surrender charges of 4%, 3%, 2% and 0%. When I talk later about the subset of the MVRM using Black-Scholes, there will be a mild change in the assumptions. The participation rate will be reset annually, which is the reason you would be using that method. And in the renewal years, the minimum participation rate will be 25%.

As we use the CARVM-UMV, keep in mind that it's the benchmark method of calculation in a sense. It is the most precise and gives the fairest value of what your liabilities are. The other methods tend to be simplifications of the CARVM-UMV because great complexities exist under certain designs. But this one is the benchmark. Under this method, you must look at each of the benefits under the product—the death benefit, the surrender benefit, the annuitization benefit—and calculate for each the index-based option cost for that benefit for each anniversary down the road so that you can fill your CARVM buckets.

For each benefit, you will have several years worth of calculation times the number of benefits. Therefore, you might have quite a few options to calculate.

Once the option cost has been calculated, the cost of that option is carried forward to the point at which the benefit is available by accumulating it at the valuation rate.

Next, that projected option value is added to the guaranteed benefit to determine the total projected benefit at that point. That then gives you one of the building blocks for doing a CARVM calculation using Actuarial Guideline 33 procedures. For each year, you do the same type of calculation, starting with the account value as it exists at that valuation date.

In Table 1, we're starting off with an account value of $1,000. I'm assuming that the only meaningful benefits are the surrender benefit and the death benefit. If you had some specially defined annuitization benefit, it would be a third calculation for you to prepare.

As we go through the calculation of the surrender benefit, we first look at what is flat-out guaranteed in the absence of any index-based growth. In the first column, that is the greater of the cash value with no growth, which would be the $1,000 minus the surrender charges of 4%, 3%, or 2%, versus the minimum guarantee, which is the 90% growing at 3%. In the second-to-the-last year, the guarantee is $983, because the minimum guarantee of 90% growing at 3% is $983, which is more than the account value less surrender charge.

TABLE 1
CARVM-UMV Benefit Determination
At Issue: AV = $1,000

Policy Year	Surrender Benefit				Death Benefit			
	Guaranteed Value	Option Cost	Projected Option	Projected Benefit	Guaranteed Value	Option Cost	Projected Option	Projected Option
0	$ 960	—	—	$ 960	$1,000	—	—	$ 0
1	960	$ 44	$ 46	1,006	1,000	$ 46	$ 49	1,049
2	970	87	97	1,067	1,000	90	100	1,100
3	983	125	147	1,130	1,000	130	153	1,153
4	1,013	158	196	1,209	1,013	158	196	1,209

The point is that developing the absolute guaranteed value is one of the first building blocks toward developing the surrender benefit. Second, the option cost is the cost of the index-based benefits that you could get in excess of this fixed guarantee. If you go down to the second line where you have a $44 option cost, that is reflecting an indexed value that starts at $1,000 and has a strike price of $1,000 because that is the minimum account value one year down the road. We then calculate that option cost, multiply it by 96% because there is a 4% surrender charge, and that generates your $44 cost. In the next line down, $87 is an analogous calculation except it's a two-year ratcheted option cost, with a strike price of $1,000. Once you have calculated that cost, it's then multiplied by the 97%.

For the third year, it's somewhat different. The guaranteed value is $983. There is a 2% surrender charge, so you divide the $983 by 0.98 for the surrender charge and find out that indexed benefits don't kick in until your account value has reached at least $1,003. As a result, the option that you're pricing is one with a starting index of $1,000, and a strike price of $1,003. That gets multiplied by 98%, which gives you $125.

Once you have the option costs, the next step is to project them forward one, two, three or four years to the point in time where the benefit is applicable. The projection is done at the valuation discount rate. Your investment people or somebody on Wall Street would categorically say you should be projecting at the risk-free rate such as the swap rate. However, the convention adopted in ZZZ is that you do the projection at the valuation rate. You're ultimately going to discount at the valuation rate and you want the cost of this liability to be the option cost, so you should be projecting out at the valuation rate. That's what creates your projected option value.

Projected benefit is the sum of the guaranteed value and the projected option. You now have the surrender benefits to pour into your Guideline 33 type calculation. Analogous to that, the death benefit is the greater of your account value or the initial premium, so you see the stream of $1,000 jumping up to the $1,103, your final guarantee, which was 90% growing at 3%. The option cost is calculated in the same fashion as I mentioned before. It would use a starting index of 41,000, and an ending index of whatever you're seeing in the guaranteed value column. Project forward, come up with your projected benefits, and now you have the death benefit buckets ready for Guideline 33.

In Table 2, we reel this forward one year. We assume that the stock market has done reasonably well. There's a 50% participation rate and the account value is up to $1,100, a 10% growth rate. Implicitly, the stock market went up 20% to lead to this result.

TABLE 2
CARVM-UMV Benefit Determination
After 1 Year: AV = $1,100

Policy Year	Surrender Benefit				Death Benefit			
	Guaranteed Value	Option Cost	Projected Option	Projected Benefit	Guaranteed Value	Option Cost	Projected Option	Projected Option
1	$1,067	—	—	$1,067	$1,100	—	—	$1,100
2	1,067	$ 49	$ 52	1,119	1,100	$ 50	$ 53	1,153
3	1,078	97	108	1,186	1,100	98	109	1,209
4	1,100	143	168	1,268	1,100	143	168	1,268

At this point, we want to view the valuation. The guaranteed value immediately after the end of the policy year is the $1,100 minus the 3% surrender charge. The guaranteed value as you go forward cannot go down because this is a ratcheted benefit. It would be the $1,100 minus a surrender charge and in no case less than the guarantee that we had in the first place in the fourth year, which was $1,013. This is the stream of guaranteed values.

The option costs are derived by using a starting index value of $1,100, and the strike price is also $1,100, with the result multiplied by one minus the surrender charge. This cost is projected forward as before, and you have your benefits. Analogous calculations are done for the death benefit.

This is a very efficient simplification of the CARVM-UMV. In Table 1, we evaluated eight different options for the first year. If you had a seven-year product, you would have had 14 options, or if you had a little more complex benefits, maybe 21. So you have a multiplicity of calculations that you must do. Additionally, the method of calculating the option costs isn't always easy. If you have some simple benefits, such as the point-to-point benefit, you could use Black-Scholes to price the option and everything would be fine. This particular product has a ratchet benefit and is not solvable with Black-Scholes. You need some method such as a Monte Carlo method and begin to get overwhelmed with calculation costs under those circumstances.

As a result, the MVRM simplifies the process very much, and comes up with answers with close enough tolerance that the mild difference in reserves is not a problem for using the method for tax reserve purposes. With the MVRM, the first step is to determine the cost of the option to hedge the benefit at the end of the term. It's looking at one option from the point in time where you're valuing it to the end of the term.

We'll start off going four years down the road. The cost then gets projected over that entire period to the end of the term, again using the valuation rate as before. From that, we go through a step asking, "What hat change in the index would have been needed to bring us to this point?" We determine that growth in the index and solve it to find the compound annual growth rate that would have taken you from your starting index to the final index. After that, use that growth rate to generate your account values year-by-year. From that, you can determine your surrender values. You then have your building blocks to do a Guideline 33 reserve calculation. As years go by, you'll repeat the same kind of calculation.

Table 3 shows the same design with the guarantee at the end of the term being $1,013. The option cost of $158 is the same as we saw under the CARVM-UMV for the benefit through the end of the fourth year.

TABLE 3
MVRM Benefit Determination
At Issue: AV = $1,000

End of Term Guarantee: $1,013

Option Cost: $158

Annual Index Growth: $$\left(\frac{\$1{,}013 + 158 \times 1.055^4}{\$1{,}000}\right)^{1/4} = 1 + .5 \times \text{Growth}$$

Growth = 9.72%

Policy Year	Projected Index	Account Value	Surrender Value
0	100	$1,000	$ 960
1	110	1,049	1,007
2	120	1,100	1,067
3	132	1,153	1,130
4	145	1,209	1,209

The annual index growth is calculated as what is guaranteed at the end, the $1,013, plus the projected cost of the option, $158 times $1,055 to the fourth power. This was calculated before June 30 when the valuation rate was reduced to 5.25%, but the concept is the same. Divide that by the starting index value, take it to the one-fourth power, and you have one plus the participation rate times the growth. That shows a growth of 9.72% per year. Using that 9.72%, the index itself is projected year-by-year going from 100 to 145. The account values using that index growth and the 50% participation rate run from $1,000 to $1,209. The first surrender value coming out of that is $960, but it gives you a string of surrender values that you'll see are essentially the same, although not identical, to those of the CARVM-UMV.

We did go through this process of figuring out what the growth in the index was, the 9.72%, and translating that into account value growth. Considering the design of this particular product, we could have asked, What is the account value growth each year? Rather than saying in the equation that it is one plus 0.5 times growth, it could say it was one plus the increase in the account value each year. For this particular design, which was rather straightforward, you could have functionally bypassed the step of projecting the index and gone straight to account value projections. The reason for including the index growth step is to generalize the method. In this way, if there is some other complex way of determining some benefits that aren't specifically a function of account value, you will have the index value as a tool for doing that kind of calculation.

As we go forward one year, in Table 4 we see that the account value has grown to $1,100 as in the prior example. The guarantee is viewed as $1,100 because we have superseded the initial guarantee, which was $1,013. The option cost of $143 is the same one that you saw for CARVM-UMV at this point. The growth over the three-year period comes out to 9.70%. It came out very close to what I had in the first year because I did not change the assumptions in the option cost.

If, in reality, volatility has risen a lot, your option costs could have gone up immensely, perhaps even 50%. Past years have shown that this is very possible. If the option cost was in the neighborhood of $210 instead of $143, the growth rate comes out to about 13%. The point is that you can find that the growth rate, because it's independently calculated each year, can bounce around quite a bit. Don't be surprised if you see that.

TABLE 4
MVRM Benefit Determination
At 1 Year: AV = $1,100

End of Term Guarantee: $1,100

Option Cost: $143

Annual Index Growth: $$\left(\frac{\$1{,}100 + 143 \times 1.055^3}{\$1{,}100}\right)^{1/3} = 1 + .5 \times \text{Growth}$$

Growth = 9.70%

Policy Year	Projected Index	Account Value	Surrender Value
1	120	$1,100	$1,067
2	132	1,153	1,118
3	144	1,209	1,185
4	158	1,268	1,268

Once you have the growth rate, in this case 9.70%, you can project the index. The account values spew out of that through the application of the 50% participation rate, and, ultimately, the surrender values are the account values minus the surrender charges. If you compare these surrender values with those in the CARVM-UMV, again you'll find them to be very close. A reason that they're coming this close is that this is a very short-term benefit, so there isn't much time for things to stray off course. However, even if you have a longer-term benefit, the values should be quite close.

The third market-value-based method is the MVRM with the Black-Scholes projection. Recently it's being called the BSPM method as opposed to MVRM-BS. This method is designed specifically to simplify the calculations for products that have annually reset participation rates or spreads, if that's the design of the product. It is capable of handling each year's cost as a separate step along the way. With the MVRM-BS method, the first step is to determine the cost of the options purchased to hedge the benefits. In the initial year, you have a 50% participation rate. What is the cost for a one-year option with this 50% participation? The result is then projected to the end of the current year using the valuation rate, as in the other methods. After that, for that year, you determine the index growth, which would produce the benefit equal to the projected option value. This is parallel to the MVRM, and it often is an unnecessary step, but it's written into the guideline so I included it here. As a practical matter, project it only if it has some relevance to your benefit; otherwise go straight to an account value projection.

Each year throughout your term, you would be taking another one-year jump with your option. So take the cost of an option for that subsequent year, project it at one plus the valuation rate, multiply one plus that times the account value that had been previously projected, and you will leap forward to the next account value. One year at a time you're going to be using the value of the option to project the growth over that period.

Finally, after you've projected all of the index values, you develop the year-by-year account values, and you're ready to pour it through a Guideline 33 calculation. In subsequent years, you follow the same steps.

In Table 5, we start off with our $1,000 account value. The participation rate, as in the others, is 50%. The minimum participation rate for subsequent years is 25%. It is possible that, with other products, you might have a zero participation rate guaranteed as your minimum for future years; however, in our example, we've chosen 25%.

The initial option cost was calculated as 4.52%, again this could be calculated either by Black-Scholes or by a Monte Carlo method, but it's an outside calculation. The projected option value is the cost at the beginning projected at the valuation rate to 4.77%, which suggests an index growth of 9.54%. From that, you see the stream of projected indices as shown. The account values, using first the 50% participation rate for one year, and 25% for the subsequent years, gives you the account value multiplied through by one minus the surrender charges, which yields the surrender values.

FROM THE FLOOR: When you're getting an option cost of 4.52%, what is your striking? Are you using at-the-money striking?

TABLE 5
MVRM-BS Benefit Determination
At Issue: AV = $1,000

Initial Participation Rate:		50%	
Participation Rate Rest Annually Minimum Participation Rate:		25%	
Initial Option Cost:		4.52%	
Projected Option Value:		4.52% x 1.055 = 4.77%	
Index Growth:		9.54%	
Policy Year	**Projected Index**	**Account Value**	**Surrender Value**
0	100.0	$1,000	$ 960
1	109.5	1,048	1,006
2	120.0	1,073	1,041
3	131.4	1,098	1,076
4	144.0	1,124	1,124

MR. ABKEMEIER: That is an at-the-money strike, and we're using that each year.

After one year, again we're at $1,100 dollars. I've assumed that because of market conditions, you're able to afford a higher participation rate of 55%. This could result from volatility going down, which you might hope would happen from this year to next year. Also, in subsequent years, the 25% participation-related renewal option cost is calculated separately. Here, you're seeing 4.55%; the previous year was 4.52%.

You should expect to see option costs remain roughly the same because underlying the product is the fact that you invested for the term, in this case, four years. You locked in your portfolio yield and therefore, virtually locked in your budget for buying the option. The amount you have to spend is somewhat constant. You end up solving for the kind of participation you can purchase with this constant budget. The projected option value is 4.80% and the index growth is 8.73%, which is 4.80% divided by 0.55. From this, you project the indices year-by-year. The account value shows the 55% participation rate followed by two years of 25%. Surrender values are recognizing the surrender charges. The surrender values in this projection are different from those in the previous two methods, but that should not be a surprise because the participation rate drops down in this case whereas it was held constant in the others.

In doing the market-value method calculations, where do you get your market-value of the options? If you're dealing with a method such as the MVRM, where you need just one value of the option to do your valuation each year, it is possible to go to the dealer who sold you the option in the first place and get a quote on the current value of that option. Generally, dealers should be cooperative about that because, for their own internal purposes, they are pricing their liabilities so the price they come up with can serve as the starting point for you in your MVRM calculation.

If you're using the CARVM-UMV and need a multiplicity of options, it's virtually if not totally impossible to find a dealer willing to give you a lot of prices for something that he can't sell you. Dealers are happy to give you quotes when they think you're ready to buy, but they're not eager to help you out in your valuation process beyond what they're normally carrying on their books. So you do need some kind of internal option pricing tool. If you're dealing with point-to-point products, your internal pricing tool can be as simple as a Black-Scholes calculator, which is easy to use and most of you probably have one already. However, if you have path-dependent benefits, such as ratchets or high-water or low-water benefits, you need a more complex method, such as a Monte Carlo method, to do the calculations. In theory, this could support a CARVM-UMV calculation for a complex benefit; however, in practice, it could be a heavy burden for you to go through all of that.

Your pricing of the options must be consistent. You must do the same thing on both sides of your balance sheet. You have some choices in pricing an option. The mid-market price is what you might get out of your own Black-Scholes or Monte Carlo calculation as the theoretical price of the option, but there also are the asked price and the bid price with which the dealers operate. When you're buying the option, you're buying it at the asked price. If you're using mid-market-values on the asset side, then use mid-market on the liability side as well. In that way, you won't create any false profits, losses, or imbalances on your balance sheet.

With that, I'll turn it back over to Cherri, who is going to handle the EDIM method based on the same assumptions that we've been looking at.

MS. DIVIN: Considering all those calculations, you'll like the EDIM method because it's a lot simpler than that. With the other methods, you were defining benefit streams in your typical Guideline 33 calculation. On this one, you're going to define the reserves and then go back and calculate the total reserve later on.

The EDIM method is broken into two parts. That is, it's bifurcated into the fixed component, the underlying guarantee, which, for most people, is 90% of your premium accumulated at 3%, and the equity-based component. The EDIM method is a book-value method, so there are no market-values on the balance sheet per se as far as the calculations of options. The fixed component is very easily determined. To determine the initial value for your fixed component, you must use a reserve that is least as large as either the MVRM or the CARVM-UM. So your starting point on the fixed piece is very easy. You pick a certain point that is at least as large as those values, and the value at the end of the term is your guaranteed floor value, which is 3% on 90% of your money. The interim values are interpolated similarly to the other methods. In other words, you define an interest rate that gets you from one point to the other point, or from the beginning to the end, and use that interest rate to define all your interim values.

The equity component is based on the intrinsic value. This is not the value of your option. The value of your option is the intrinsic value plus the time value of your money. Here we are using just the intrinsic value. It's somewhat parallel to GAAP, but on this one, assume the intrinsic value will be paid at the end of the term. You'll discount back the intrinsic value at the valuation rate. And your reserve at each point in time is the sum of the two pieces.

So you can see that this is a much easier calculation. It doesn't have all the embedded calculations. If you were using the Black-Scholes method, you need to know the volatility in all the different term periods. Here, you assume you have an elective and a nonelective benefit stream and use the calculation shown for the elective benefit stream. Then calculate for the nonelective benefit stream. Then weight by the appropriate factors, say 90% of your business is on the elective stream and 10% is on the nonelective, and add those in total.

This method is very easy. It has been very popular for that reason, too. The disadvantage is that you must be hedged-as-required at all times and certify this on a quarterly basis. Also, this method does not reflect market-value realities on your balance sheet. Your assets and liabilities must be in sync, since any mismatch will not show up on the balance sheet.

It's not appropriate for certain product designs. Any time you use an interpolation method from the beginning of your term period to the end of your term period and have some unusual value in the interim, it would not be appropriate. But it works for the common forms of the equity-indexed products. It's not applicable to the payout annuities, either, so you can see the pros and cons. However, the major disadvantages for some companies is the hedged-as-required limitation.

Let's move to the calculations. We started with a calculation similar to that of the other products and picked a point at the beginning, the $965. That's at least as large as the other two methods, so that's the starting point. The end of the term is the $1,013 that you've seen before. And you derive an interest rate (1.22%) that gets you from one point to the other. So the fixed guarantee reserve starts with $965 and ends up with the $1,013, your end point (Table 6).

The interim values grade smoothly at the interest rate of 1.22%, and your reserve is the sum of the two pieces: the guaranteed plus the discounted intrinsic value.

Your intrinsic value is the in-the-money amount you have today, but you discount it back from the end of the term period to today's valuation date at the valuation rate. Then you assemble those two pieces, and that's your total reserve. Be sure that your assets and liabilities are in sync by showing the intrinsic value on your asset side too.

TABLE 6
EDIM Reserve Calculation

Initial Reserve From CARVM-UMV or MVRM:	\$965 (example)
End of Term Guarantee:	\$1,013
Annual Fixed Guaranteed Growth:	$\left(\dfrac{\$1{,}013}{\$965}\right)^{1/4} - 1 = 1.22\%$

Year	Fixed Guarantee Reserve	
0	\$ 965	+ Discounted Intrinsic Value = Reserve
1	977	+ Discounted Intrinsic Value = Reserve
2	989	+ Discounted Intrinsic Value = Reserve
3	1,001	+ Discounted Intrinsic Value = Reserve
4	1,013	+ Discounted Intrinsic Value = Reserve

FROM THE FLOOR: Is the intrinsic value the market-value of the option?

MS. DIVIN: No. The market-value of an option includes two pieces. One is the in-the-money piece, the money where the value of your index is greater than your strike price. That's called the intrinsic value. The other part is the time value, a recognition of the beneficial effects that might happen later on. In this method, you're not going to be recognizing the time element of the derivative itself, you'll just recognize the intrinsic value.

FROM THE FLOOR: With this method, I assume that when someone takes a partial surrender you must recalculate the 1.22% interest rate.

MS. DIVIN: That's a good question. It's not addressed in the guideline itself, but you'd have to do something reasonable. There are several different ways to tackle this problem. You can take the partial surrenders and reduce this interpolated value by that amount as times goes on, or you could derive the different interest rates. You should use something that's suitable in your mind.

FROM THE FLOOR: If, by suitable, you mean reducing the values by the amount of the withdrawals and using the method you show here, you could end up with a negative interest rate.

MS. DIVIN: It's important to recognize that, once you have a partial withdrawal, the end point drops down, too, so they drop down in parallel.

FROM THE FLOOR: The $965 includes the option cost plus the present value of the guaranteed minimum at the end of the term. When you have a partial surrender, the guaranteed value comes down faster than the reduced option value and that can give you a negative interest rate. If all of these methods are supposed to generate similar types of reserves, I would like to fall back on the adjusted option cost method, which was eliminated at some point. It would eliminate the negative interest rate.

MS. DIVIN: If you can generate a negative interest rate, it's probably not the appropriate method to use I agree with you there. Maybe making an adjustment up front would take the interest rate down. Do you have an idea, Noel?

MR. ABKEMEIER: With a proportional scaling down, if you took a partial withdrawal of 10%, you would take everything down 10%.

FROM THE FLOOR: It might work if your product has a proportional reduction in the contract, but ours does not, and, for that reason, you get a negative interest rate.

MR. ABKEMEIER: I don't have a quick answer, but it does point out a problem with the multiplicity of designs in the market. There aren't one-size-fits-all solutions. In applying all of these methods, you do have to consider the special characteristics of a design to see what works for this particular product.

MS. DIVIN: If it's any help, this question came up earlier in other discussions, and it was a difficult one for everybody else to handle too. I don't think there's any one obvious solution. You just have to adapt it to your product to make sure you calculate something reasonable.

FROM THE FLOOR: I have another question about the initial pricing of your options. You mentioned the need for consistency with the bid/asked price on the asset side and on the liability side. A company's model will not be as precise as a dealer's option cost model. If a company uses the dealer's price, the reserve will not be the same as when a company uses its own model.

MR. ABKEMEIER: If you're using the dealer cost on the asset side and then carry that same cost into the liability side, you'll come up with a certain balance. As long as you use the same approach on both sides, you should not come up with a significantly different balance sheet result. It's only when you've used the dealer cost on the asset side and then you try to duplicate something on the liability side using your own calculation that you can run into trouble. If, for some reason, you have to calculate the liability side using your own internal approach, adjust for the distortion by trying to replicate the dealer's result internally. Note the difference between your calculation and the dealer's on the asset side and apply a similar difference on to the liability side.

MS. DIVIN: Some people get an over-the-counter price on the asset side and use a model on the liability side, but they calibrate their model to match the option price. That might be just a matter of determining implied volatility, but they will always make sure they're consistent up front.

FROM THE FLOOR: If you are using the MVRM method and have a nine-year point-to-point product, you could have hundreds of option prices to use in your valuation. How do you handle this logistically with your information systems (IS) people in a reasonable period of time?

MR. ABKEMEIER: Are you assuming the prices are generated internally or externally? Either way, they'll be in some kind of data set. It seems to me that the IS people could slap that in without great difficulty. As long as you've organized and put it into a neat file, they should not have any difficulty fitting it in.

FROM THE FLOOR: Administratively, something could go wrong and values could be calculated in error. This means you will have to do a lot of checking.

MS. DIVIN: I can see your concern. I would think a lot of companies would have the same problem. We started off with about one bucket a month and ended up with what seemed like an infinite number of buckets. Are other companies experiencing a problem with having too many buckets to track? I think there might be an issue of materiality too.

FROM THE FLOOR: Many companies are issuing weekly, so there are not as many buckets.

MS. DIVIN: I guess it depends on how many products you're offering, too.

MR. ABKEMEIER: Just one more comment on the problem of getting a mismatch. If it is, in fact, a point-to-point product, and you're internally calculating the option value, you could, and probably would, embed that in the reserve calculation machinery so that you're not handing over the whole series of option values to the IS people. Instead, you're handing over some basic assumptions about volatility, interest, and dividends to plug into the Black-Scholes calculation embedded in the program that IS is handling.

FROM THE FLOOR: If you are using hedged-as-required, do you also have to demonstrate adequate coverage on the fixed assets? Similarly, if you are using a market-value method, do you have to report your fixed assets on a market-value basis?

MS. DIVIN: The hedged-as-required does not address the underlying fixed guarantee; it just addresses your equity portion.

MR. ABKEMEIER: Concerning the second part of the question, with the market-value methods, the fixed assets are on a book-value basis and the options are on a market-value basis, which is consistent with the way the liabilities are being handled.

I would like to compare the methods and address how you select which method to use. CARVM-UVM gives you the most theoretically correct calculation, but not much more advantage. The MVRM gives you simplicity and hedging flexibility to the extent that you don't have to satisfy hedged-as-required criteria. You put one value in and get a decent result out of it.

MVRM with Black-Scholes should be selected if you have an annual reset index-based guarantee. You could use other methods for that kind of design if you wish, but the option calculation is path-dependent and more complicated than it's worth.

EDIM offers simplicity of calculation, and it is easy to get the values you need. The intrinsic value can come directly from your account value file because the intrinsic value is the amount of money that the option would pay to you at maturity if nothing else changed. Then that has to get discounted back to the valuation date. So it's a simple matter of looking at the account value and the guarantee at maturity, subtracting those two, and discounting it.

Here are the requirements. CARVM-UMV requires market-values of many options. When you're pricing the options, you need interest, volatility, and dividend calculations. Keep in mind that interest rates have a forward yield curve. The volatility has a term surface. It's not just a term curve but a surface where volatility varies with the length of time that you're covering. And it has its skew—the more you're out of the money, the more your volatility goes down. So you have a complex array of volatilities. If you're dealing with many options, you need to have a very good grasp of these values for your pricing.

MVRM needs the market-value of a single option. Get it internally or get it externally, but get it right. For MVRM with Black-Scholes pricing capability, it is very easy to do. And with EDIM, you need one market-value at issue so you can set your kick-off reserve. After that, just use intrinsic value.

How do the reserves differ? There's no significant balance sheet advantage and, again, that is critical. If you're going to use a particular method, let's call it the ZZZ method, for reserving, the tax reserves require that you use a CARVM method, you cannot cherry pick and have all different choices. As a result, it is imperative that the values under ZZZ all be similar to satisfy the IRS. When you look at reserves for EDIM, they differ from those of CARVM-UMV and MVRM because they're based on different approximations. But whatever variances you have in reserves on the liability side is compensated for by variances on the asset side, so you haven't gained an advantage. Finally, the MVRM-BS reserves are generally lower, but that is simply due to the lower guarantees that you have in renewal years, particularly if you have a zero guarantee.

The practical implications of the guideline are apparent when you're reserving for long-term equity-indexed annuities. It shows the same kind of characteristics that any kind of long-term interest guarantee has. In traditional fixed annuities, you find that reserve requirements, if you have, say, a five-year guarantee, are a lot higher than if you have a one-year guarantee. The equity-indexed annuities follow the same pattern. If you have an annual reset ratchet, it's going to look an awful lot like a one-year guaranteed single premium deferred annuity (SPDA). If you have a long guarantee, it looks like a long-term SPDA. All the methods are projecting indexed-based benefits with hedging costs reflecting the current environment. What that says is that, when volatility is high, as it is now (if you have the one-year ratchet product, volatility is an astronomical 32–34%), that cost carries through the whole valuation picture. When in future years volatility falls, you'll see that softening your reserves. But again, it will soften both the reserves and the asset side of the balance sheet, and not have a significant net impact.

FROM THE FLOOR: Do I have to use volatility figures from the street on the date of valuation or can I use internal equilibrium volatility that I use in my hedging comparisons?

MR. ABKEMEIER: Use a street volatility on a snapshot basis.

FROM THE FLOOR: That will have a big impact on the balance sheet. Companies that are delta or delta-gamma matching are not necessarily vega matching. Your vega might be $500,000 and, if street volatility is 32% and you are using 21% internally, you could have a swing of $6 million in your asset/liability situation.

It seems that you should be able to use some sort of equilibrium volatility. We are not using a Wall Street arbitrage-free interest rate and should not have our reserves jump because of a December 31 movement in the market.

MR. ABKEMEIER: Is your term equilibrium volatility historic volatility or implied volatility?

FROM THE FLOOR: There is a difference between historic and implied volatility, around 250 to 300 basis points, and it jumps a lot. If you bought an option today, the equilibrium volatility is 21–22%, but the market cost is much higher.

MR. ABKEMEIER: As ZZZ was being developed, we didn't anticipate what you're saying, and I'm not sure what the right answer is. Within your application, the equivalence of treatment between the two sides of the balance sheet should be king, and it may well be that your argument of using equilibrium volatility on both sides gives you the balance. It sounds commonsensical, but ZZZ doesn't consider that possibility.

FROM THE FLOOR: Is there any allowance in ZZZ to use account value or vested account value for the reserve?

MR. ABKEMEIER: No, not directly. Because you're flowing through Guideline 33, you have the floor of the current cash value, but that is as close as it gets to what you're saying.

FROM THE FLOOR: I can see the value of a lot of calculations for product management, but are there simplified methods for coming up with a value for the annual statement? For example, for UL, there is the California method and the option of using approximations. Is there anything equivalent for these products?

MR. ABKEMEIER: There's nothing overtly equivalent. Would the approximation you're talking about be greater than or less than the formula calculation?

FROM THE FLOOR: Greater than.

MR. ABKEMEIER: The reserves that we talk about are the minimum requirements. So if you want to put more reserves up, I see no problem with that.

FROM THE FLOOR: Unlike traditional products, the index might be $1,000 on the anniversary and $1,200 at valuation, but only $1,000 vested. If the reserve is set there, it could be inadequate. The value could go to $1,400 or to $600. There is so much unpredictability. Has there been any discussion of this?

MR. ABKEMEIER: No, and you may have now put it on the table.

FROM THE FLOOR: When will this guideline be in place, and what does this imply for IRS recognition?

MR. ABKEMEIER: The guideline is expected to be adopted by the NAIC in December 1998 and be in place on December 31. If a guideline is accepted by the NAIC, the IRS does recognize it.

FROM THE FLOOR: Is NAIC recognition sufficient for the IRS, even without recognition by the states?

MR. ABKEMEIER: Yes. It's the NAIC recognition that drives the IRS recognition.

FROM THE FLOOR: Is it necessary to use forward interest rates and forward volatility with the Black-Scholes projection method?

MR. ABKEMEIER: Yes. As you calculate this year's part of the Black-Scholes method, you're using the current interest rate and the current volatility. As you go forward one year, find the one-year forward rate on the Treasury curve and take the one-year forward rate on the volatility surface.