# 2004 Valuation Actuary Symposium*

Boston, MA
September 20-21, 2004

## Session 8 PD
## Minimum Guaranteed Benefits on Variable Annuities

**Moderator:** John O'Sullivan

**Panelists:** John O'Sullivan
James W. Lamson
J. Timothy Gaule

*Summary: There has been significant recent industry activity in the area of guaranteed minimum benefits on variable annuities. There is also growing appreciation of the tail risks associated with these benefits. This session focuses primarily on the Academy's development of nonformulaic statutory risk-based capital and reserve standards for death and living benefits. In addition to providing an overview of the calculations, we'll discuss the practical considerations and alternatives of implementing these standards.*

**MR. JOHN O'SULLIVAN:** I've been part of the Valuation Actuary Planning Committee for probably about four years now. In the last four meetings we've had something on this topic. I think it's getting close, but, in any case, let me give you a little background on each of us. I work as a consulting actuary with my own shop, Trinity Actuarial. I've worked with variable annuity (VA) products since 1987. In the beginning days, these things were truly incidental benefits. I am a member of the Variable Annuity Reserves Work Group of the Academy (VARWG) and the Analysis Subgroup, where we helped crank out some numbers for both the Variable Annuity Reserves Work Group and the C-3 Phase II Work Group. My role is to provide an overview of the framework that we're talking about to help you better understand the next two speakers.

Jim Lamson is the president of Actuarial Resources Corporation. He has been very active in the development of various actuarial guidelines that deal with annuities. Both Jim and I had served on the Quad M initiative, and I know Jim had been involved with actuarial guidelines before I ever came on the scene. He's our vice

chairman of the Variable Annuity Reserves Work Group. His role is to update you on the details, focusing in on what has changed over the last year.

Tim Gaule is a valuation actuary with Security Benefit Life. He has been involved with analyzing the impact of the proposals on his company's variable annuity book of business. He has been an active participant in many of the calls that we've had on VARWG and the C-3 Phase II Work Group. His role in our panel discussion is to provide useful insights in the process of implementing the proposal, based on the significant modeling that he has done for his company. His presentation provides a useful checklist for you.

The current situation, in my opinion, isn't highly desirable. We have a very popular product in variable annuities. We have a lot of different guarantees. It's rare to see a simple return-of-premium design as the only guarantee on a variable annuity these days. There's popular support for many of these benefits. They do provide good consumer value in most cases. However, we've been tending to think of things in terms of single scenarios, and that really doesn't work with these products and the nuances that are involved. Some claim that Actuarial Guideline (AG) 34 doesn't even handle things like a maximum anniversary value (MAV) or a roll-up adequately. It definitely doesn't handle things like a gained death benefit. One of the items that emerged out of the whole Quad M initiative was that it's almost impossible to come up with a single scenario, given the mix of left-tail and right-tail exposure and sometimes the combination of those two exposures.

What we got out of the Quad M initiative was a Band-Aid, Actuarial Guideline 39 for living benefits. Our current risk-based capital (RBC) requirements stem from a much simpler time. What we need is a better measure of the actual risk that's involved. This is recognized not only inside of the actuarial profession and the insurance industry, but also in the outside world. I came across an article in July in *The Wall Street Journal* that dealt with secondary guarantees, primarily variable annuity but there was some mention also of secondary guarantees on universal life. The VA guarantees were mentioned very prominently. A very succinct quote was, "Now regulators are wrestling with how much insurers must set aside to reserve for such guarantees." Everybody is wrestling with that.

If I had to come up with the goals for establishing a framework for a new reserve/RBC kind of requirement, the first thing I would start off with is an accurate measure of risk. You don't have inherent conservatism built into things but, rather, an explicit degree of conservatism. That would involve a large number of scenarios. It would recognize the actual experience of the company, because with these benefits it's not always clear what is conservative as far as an experience assumption. It would allow the natural offsets that happen in the business (the diversification across time, across plans, across investment options), and it would reflect risk mitigation activities, both the positive and the negative. The negative risk mitigation activity is the cost of them or the inefficiency of them. The positive is an encouragement to adopt some type of risk mitigation strategy so that the capital

needs and the reserve requirements are lessened. It would have flexibility so that we weren't faced with a new actuarial guideline whenever the "benefit du jour" arose on the scene. There would be coordination of the reserve in the RBC, and it would accommodate simpler benefits, involving much less pain rather than full-scale modeling.

I would like to give you an overview of what's happening on the reserve end. I like to think of it as we're turning the process upside down. Currently what we have is formula reserves as the starting point. We come up with a number, and then we test for the adequacy of it in some fashion. Under the new proposal, our starting point is the number that we get out of either a stochastic model or the alternative methodology. Then there is a standard scenario, which will be prescribed by regulators, that basically acts as a floor on both the reserve and the RBC. For a standard scenario, I think it's important to include things like tax basis reserves and some sort of standardization across the industry, so it helps the regulators monitor the process. However, it's also an extremely difficult thing to come up with, and, in fact, I believe that we've had versions of the standard scenario in June, July and August. So far in September we haven't done any more fine-tuning. It's a work-in-progress.

I want to give you a feeling for what's involved with this modeling in order to help you visualize the concept into which we're going. We start with the asset classes. A typical variable annuity will have something like 40 or 50 investment options that people can choose. That's far too many to model. The idea is to bring it down to a more manageable set of asset classes. For those asset classes, develop scenarios. The key item to remember is that the scenario is multidimensional. So, if you have 30 years' worth of returns for equity, inside of the same scenario you're going to have 30 years' worth of returns balanced for, let's say, international equity, for money market and for bonds. The idea is that for that one scenario, everything is inherently coherent—the correlation coefficients, the market price of risk, things of that nature. Once we have the scenarios, we have to go ahead and construct representative inforce cells that capture the risk to which we're exposed. That's tricky business. It takes a bit of time for that.

Then we have to develop our experience assumptions. The concept for that is prudent best estimate. That is your best estimate, but blend in a little conservatism (more conservatism if you have less experience on which you're basing your assumptions). Once we get all this, we're going to put them together. For any given scenario, for one cell, we want to come up with the accumulated deficit or surplus at each projection year-end, including time zero. If you start with zero surplus, and you bring it forward year for year, what does it look like at each year-end as far as whether or not you built up surplus, given the scenario? Are you in a deficit?

Then we're going to go ahead and do aggregation at some level. You could aggregate at the cell level, but I'm thinking that you do the aggregation at a much higher level. The way I visualize it is by thinking about an Excel spreadsheet. Each

row in the spreadsheet is a different inforce cell. Each column in the Excel spreadsheet is a projection year-end. We're going to sum down across the rows. For each column we're going to get a combined value for the accumulated deficiency or surplus at each projection year-end. Then we're going to find the greatest present value for that accumulated loss.

In other words, we want to come up with any money that we would need to prevent a loss at any of the future projected year-ends. That's going to be our answer for that particular scenario. We're going to do this, however, over many scenarios, say 1,000 or 10,000, and we're going to average over the worst 35 percent for the reserve and the worst 10 percent for the additional asset requirement (AAR), which is sort of like a superset of the reserve. The AAR is what you would need to meet a harsher standard. It's also on an after-tax basis, whereas the reserves were on a before-tax basis. Then when we get to determining what the reserve is and what the AAR is, we're going to basically wash out of the AAR number whatever we've already set aside in the reserve. That's going to become our RBC.

It's a principles-based framework that we're dealing with here. The September reports enumerate four principles. I'm probably not going to do them justice, but I'll try. The first one is that the goals quantify the amount of money that's needed to meet the contractual guarantees in light of the risk to which you're exposed. The second point talks about the method needed to analyze scenario cash flows: to use the greatest present value approach and to allow for aggregation so the natural offsets can take place. Then you would need to handle moderately adverse experience, not necessarily the worst case. The third one talks to the fact that the actual statutory requirements arise from the risks that we actually have, which may or may not be the same as the risks that we're modeling. The fourth principle succinctly is, "Thou shalt not game the system." You know ahead of time which scenarios you're going to go ahead and run. You probably know ahead of time which scenarios are going to be causing you the likely problems. So, wouldn't it be possible, at least theoretically, to go ahead and develop some sort of a risk mitigation hedging strategy that took care of that extreme tail only, but gave you more of a benefit in the modeling results than any actual results that you would go ahead and see in practice? That's the gist behind this idea of "thou shalt not game the system."

In conclusion, minimum guarantees have become a very vital part of variable annuities. I think variable annuities still have a very vibrant future. We need to find a better system to go ahead and handle this class of products. That involves reliance on professional judgment. It's a practical, long-term approach. We don't need to constantly worry about whether or not prescribed rules need to be updated or how to resolve conflicts between different sets of guidelines or integration. It accommodates evolving knowledge. There's a great deal of knowledge that's evolving in this whole area. It gives actuaries the responsibility, but also the accountability.

The last idea is that it's not a small job. It's not overwhelming, but it's not a small job. It's complex. There are a lot of details on it. However, it's like anything else complex—you just take it a bite at a time. You do need to leave yourself a lot of time for implementation. The implementation, in my mind, involves being able to explain the results that you're seeing out of your modeling and anticipating what can happen for various different starting points and/or different behaviors and sensitivity.

**MR. JAMES W. LAMSON:** I'm going to try to update you on the major changes that have taken place in these proposals over the last year. Those changes mainly revolve around the alternative methodology that was finalized earlier in 2004, the introduction of the standard scenarios, which, as John indicated, is an ongoing process, and then also some of the additions to the requirements relating to modeling of hedges. I'm only going to be providing an overview on these topics. It's important for you to realize that you need to look into the details of all these things. You've heard the expression that the devil is in the details, and there are a lot of details here for a lot of devils to come and get you on.

The alternative methodology was designed as an option for smaller companies or for companies with smaller blocks of business to be able to avoid the rigors of stochastic modeling on their business. It's designed so that it can only be used on products that either have no guarantees or else just guarantees of death benefits, not any guarantees of living benefits. If you start off using the alternative methodology and move to modeling, you can't move back unless you get permission to do so.

The factors are to be applied on a seriatim basis or using a grouping type of an approach. The reserve or total asset requirement (TAR) that you derive using the alternative methodology has a general form, that is, R times the sum of CA and FE, plus a GC component for the cost of the guarantee. It's worth noting that GC becomes zero for any contracts that don't have a guarantee currently or for contracts that never had guarantees. For RBC purposes you use the existing formulas. For the reserve, you just set that equal to the AG 33 reserve. The first component in that formula, CA, is the provision for the grade-off of the surrender charge. It's a misnomer. The CA comes from the Commissioners' Annuity Reserve Valuation Method (CARVM) allowance, but it's really the grade-off of surrender charges. Basically you just compute the present value of the surrender charge grade-offs that are going to occur in the future on each contract. The second component, FE, is for fixed expenses. It's a reserve that would be set up for the shortfall of any fixed charges in covering any fixed expenses. That just relates to the fixed elements of the contract.

The third part, the GC component, has a general form such that GC is equal to F times GV, less the product G times AV times R. F and G in the formula are actually derived by doing something called multipoint linear interpolation over 16 sets of factors. The R factor itself also involves a different set of 16 factors that you have

to interpolate for each contract. One thing that's important is to realize that this has the general form of a formula reserve. It's the present value of some costs minus the present value of some revenues or premiums. The difficulty in coming up with the alternative methodology and the reason why it's so complicated is that what they were trying to do is to take something that's a greatest-present-value-of-loss type of a calculation like John was outlining and then recast it in the form of present value of cost cash flows less the present value of revenue cash flows. It was, indeed, a difficult job. In doing that they actually had to introduce a scaling factor "R" that was just a factor to try to make everything work out.

As you can imagine then, translating something as complex as stochastic modeling to a set of factors was a very difficult and time-consuming exercise. It wasn't too bad for CA and FE because those are just the actuarial present value of the surrender charge grade-off (in the case of CA) and the present value of expenses less expense charges that you make (in the case of FE). That isn't too bad to do. It involves lapse rates that you set based on prudent best estimate assumptions. Other than that, most other assumptions are prescribed by the methodology. GC is the part then that took all the work in this development. What it involved was comparing model runs on 10,000 prepackaged scenarios with the present value of these cash flows to try to empirically develop something that was a pretty good approximation to modeling. The factors were developed for several combinations of business, different product types, different levels of in-the-moneyness, attained ages and so forth. They were also developed on the basis of 65 percent of the 1994 GMDB Mortality Table and 100 percent of that table. It is worth noting that the factors are all based on male mortality and that the requirements allow you to just use a five-year age setback for females.

An adjustment factor, indicated as "R," was needed to trim down the revenues, because the greatest present value in many of the bad scenarios occurred at shorter durations. As a result, when you looked at the present value of cash flows, there was too much revenue coming in, because the revenue was the present value over say 30 years, and maybe the greatest present value occurred in year four in the projections, let's say. They incorporated this R factor to kind of trim down the revenue. It was very much an empirical type of undertaking.

By design then, we made it so that the reserve alternative methodology followed the same approach as the one for RBC. At least you don't have to try to implement a completely different methodology for reserves than for RBC. All these combinations of issue age, product type, in-the-moneyness and so forth did work out to a large number of factors. There are over 80,000 factors for each set of reserves and RBC. It is well-documented. The report was produced before the September Academy report from the Life Capital Adequacy Subcommittee, and so actually the methodology is documented in Appendix 8 of that new report. For reserves, of course, it's included as Appendix 4 in the AG VACARVM draft.

The Academy tried to make this easier to deal with by developing some tools for

you, such as an Excel add-in that actually calls a C++ DLL. It will do a lot of the work for you. You can actually calculate the AAR for small blocks of business with the spreadsheet that's provided. However, you would have to expand it to handle multiple funds, because obviously all the policies are going to have more than one variable subaccount type, and then you'd also introduce another ratio (that is one of the devils in the details) relating to summing the account value and the guaranteed values over product categories. Even though this is applied, then, on a seriatim level, you'd have to determine 90 percent of the ratio of account guarantee value for a product. Do that first and have that information available at the time that you applied it to each policy.

When you look at the portfolio comparison spreadsheet (all the materials are downloadable from the American Academy Web site), you should look at the miscellaneous calculations tab to see how to calculate CA and FE, because it's quite straightforward and laid out for you. The Excel add-in that's provided actually pulls out all the correct factors and does the required 16-point linear interpolations for you.

There are five easy steps to calculate your alternative minimum reserves. The first one is to map all the variable subaccounts into one of the eight asset classes for GC. It's a different approach for GC than it is for CA and FE because in those cases, you use each one of the eight summarized asset class values with the growth rates that are specified—they're fifth percentile growth rates which actually makes them zero or negative—in case you need that for the determination of CA. In the case of GC, you have to map the entire exposure to one asset class. The way that you do that is to take a look at the volatility on each one of those fund classes, then combine them (using the correlations that are provided in the documentation for the alternative methodology) to calculate an overall volatility for that particular contract and then use that as guidance in selecting which of the eight funds, or asset classes, to assign the entire exposure. There are also some rules that have to be followed, and so it's not completely straightforward. I think there would have to be a little bit of artificial intelligence built into a program to be able to do that. It has got to be done on a contract-by-contract basis.

The second step is to compile all the proper characteristics that you need. There are basically seven characteristics that you need to go into that factor file to pull out the right factors. Then what you would do, after selecting the ones for F and G (that is the part to apply to the guaranteed amount and the part to apply to the account value for revenue, respectively), is get another 16 lines out of there for purposes of determining that R factor that trims down the revenue. You do 16-point multipoint linear interpolation over those 16 values, which is not a trivial process. Some people think it is, but believe me, it's not linear interpolation the way most of us think about it. Then you apply the factors to the policy values.

Let's take a look at some of those factors. I brought a few of those factors into an Excel spreadsheet. There's an actual key where the first digit is always one, and

then you code the characteristics for the other seven that you needed to look up the right factor. There are columns for the cost factor, the margin factor or the revenue, and the intercept and slope for a straight-line interpolation, which are used in determining R.

There are separate factors for each of the six products for which factors were developed: return of premium, a 3 percent roll-up, a 5 percent roll-up, maximum anniversary value, the higher of the maximum anniversary value and a 5 percent roll-up, and the enhanced death benefit. There are also then separate sets of factors for dollar-for-dollar and pro rata type of partial withdrawal adjustments to the guarantee. There are separate factors for the eight asset classes, the seven in-the-moneyness ratios, eight attained ages, five contract durations and then another item that relates to the delta, if you will, from your actual charges expressed as a percentage of account value compared to what was assumed in the factor development. Your factors may be exactly the same as what was used in the factor development or 100 basis points higher and 100 basis points lower so that there can be interpolation to get to the proper mortality and expense (M&E) charges. When you do the arithmetic, that turns out to 80,000 rows of tables.

What do you do if your products don't match one of these standard designs? The easiest thing to do is, of course, to use more conservative factors. In other words, just try to pull factors out of the factor grid or factor table that are more conservative. Otherwise, perhaps some minor tweaks could be made to the factors to accommodate some minor differences. If you have some major differences, then you need to be looking at doing stochastic modeling for purposes of generating your own set of factors that are unique to your company. If it were me, I'd just say to heck with it and do the stochastic modeling at that point. Adjusting for reinsurance could be a challenge. If you had to include some kind of quota share coinsurance, that could just require a pro rata adjustment, but non-proportional reinsurance is going to require an outside model and a manual adjustment to the results.

Let's turn to the standard scenario. That's something that has been developed by two NAIC groups, the Capital Adequacy Task Force and the Life and Health Actuarial Task Force (LHATF). It's not part of the American Academy proposals. It's important to understand that those are intended to serve two purposes. One of them is to serve as a minimum value, but the other one is to be used for tests of model fit. In other words, how good of a job did you do in building your model, and are you following the model approach? There are two similar but separate sets of requirements, one of them for reserves that has fixed growth rates and another one for RBC that has rates that change year by year, or are dynamic by calendar time. The assumptions are actually specified for the projection purposes.

Let's go through the two different purposes. You need to understand that there are two sets of calculations. The first is as a minimum value. That's done on a seriatim basis. It does include an aggregation effect for RBC but not for reserves, that is to

say, minuses offset pluses. For RBC purposes, you need to add in any Phase I effect. This is to be done as of the valuation date. You can't use an earlier inforce. That means you've got to gear up for this because this has got to be done in the first few days of January. If the reserve is based on a model or the work is done based on business that is in force at a date prior to the valuation date, then you need to run it another two times. It should be run once on a seriatim basis, as of that inforce date, and run again against the actual model cells in the model that you've created. This is for model validation purposes.

There's more latitude, I might add, for the model validation part. This helps if your modeling system doesn't do quite the same job that your seriatim valuation system does calculating AG 33 reserves, for example, which forms the basis for the standard scenarios. Then you could maybe back off to something else, let's say use cash value in both cases or something, and then that way you won't introduce an automatic error that makes your model not look like it fits the actual data as well as maybe it really does.

Some people think that the reserve standard scenario maybe isn't all bad because maybe it can help justify or can be justified for use as a tax reserve. To calculate the reserve, you start with the AG 33 reserve, ignoring the actual guarantees, and then add the standard scenario measure, which is the greatest present value of projected account values over projected assets, which is a positive value when an actual shortfall develops. You don't get any aggregation benefits for reserves, just for RBC.

The other thing that you've got to do is subtract the effect of any approved hedges that exist on the valuation date. Adjust for reinsurance as a last step. The standard scenario uses drops and returns, kind of like AG 34. I think it was modeled after that. You apply the drop to the assets and then start the projection. You grow the assets at specific returns less M&E charges plus a margin then. You could add back a margin. The margin is actually less during the surrender charge period than afterwards to account for the amortization of the surrender charge. The account values, though, of course, grow at gross returns less M&E charges.

I looked at a chart that showed the drops for the reserve standard scenario and the grow-backs, the assumed returns. It was taken directly out of the documentation for the standard scenario. The asset classes are different from what you use for anything else. You've got to be able to summarize your individual policy subaccounts differently for this than for other purposes. Roll-up designs get particularly hammered by the standard scenario. If you had a 5 percent roll-up benefit that was already in the money, then it just gets worse and worse as you go through the projection after you deduct M&E charges from the amounts, since the account value growth will undoubtedly be less than the roll-up rate.

The money situation just gets worse and worse and worse as you go along. I didn't

include the rates for RBC purposes, but they're based on a dynamic rate (DR) that equals the 10-year constant maturity Treasury rate plus 50 basis points but not less than 3 percent and not more than 9 percent. The rates in years two and later for RBC purposes are equal to the DR, but the initial drop in the first year is a negative 10 percent return for equities, zero for bonds, and a negative 6 percent for the balanced class.

Turning to the specified lapse rates, they are specified differently during the surrender charge amortization period, with different rates for in-the-money and out-of-the-money purposes. After the surrender charge period, the in-the-money rates vary by magnitude of the in-the-moneyness while the out-of-the-money contracts lapse at a 15 percent value. For any of you who have guaranteed minimum accumulation benefits (GMABs), the lapse rates for those, while they're in the money, is assumed to be zero.

The reserve standard scenario avoids explicit expense assumptions and rather assumes that an offset of expenses with a portion of charges will occur. That makes it a little more acceptable of the tax reserve because you can't really incorporate expenses into the calculation of tax reserves. The part of the M&Es that's assumed to cover the expenses varies by whether the contract is in the surrender charge period or not. All contract charges are assumed to be used to cover contract level expenses. For the reserve standard scenario, income taxes are ignored, but it's assumed equal to 35 percent of the gains in the RBC scenario.

If you look at the margins that are provided by the standard scenario, the margin for the insurer is assumed to be 20 basis points or the actual charges for the guarantees, if larger. You'd get the whole amount of the charges during the surrender charge period. After the surrender charge period, you'd add the maximum of 40 basis points or 30 percent of the excess of M&Es and other account value charges over the margin during the surrender charge period. This is kind of complicated. The adjustment that has been made in the August version of the standard scenario would increase the margin by 10 basis points during the surrender charge period, and the increase after the surrender charge period is changed in that the 40 basis points was changed to 65, and the 30 percent of excess went to 50 percent. That's done because the standard scenario reserves were considerably larger than modeled reserves. The extra margins have brought down the standard scenario reserves quite a bit. We've still got a ways to go, I think, on that. Fixed separate account funds and general account assets are projected with the very same margins, plus any charges that are assessed as a percentage of the benefit base.

Other aspects of the standard scenario involve projecting the account values, of course, at gross returns less M&E charges and subtracting off any charges that are assessed against a benefit base. There are no future premiums to be assumed unless they're contractually required. Profit is computed as the change in assets less change in account values less the excess of benefit costs over the account

values released, plus investment income on retained earnings and plus the gain or loss on proportional reinsurance.

For guaranteed living, benefits are 15 percent if they're in the money and at rates varying by age if you have guaranteed minimum withdrawal benefits. The greatest present values are computed using a dynamic rate that I alluded to earlier. This is true for both reserves and RBC, with the greatest present value for RBC, of course, reflecting the 35 percent tax adjustment as well. So it's just 65 percent of that rate. Retained earnings are assumed to earn the dynamic rate, and, as I noted earlier, DR is the assumed rate on the assets for RBC purposes in years two and later in that calculation.

Let’s leave the standard scenario and move into a new area. Let’s discuss the expansion of the requirements to reflect hedging strategies. First, product hedges are not recognized other than the natural risk offsets that you get from products that are included within the scope of the requirements. You can't use a product hedge of a block of equity-indexed annuities (EIAs), let's say, against your variable annuity guarantees. You don't get any hedging credit if you use the alternative methodology. That's another strike against using that approach. Hedge instruments held on the valuation date are reflected in both the standard scenario and in modeling. To gain benefits from future hedging positions in the modeling, which is not allowed in standard scenario, you have to have adopted a clearly defined hedging strategy and meet other requirements. The hedges are to be priced using risk-neutral scenarios and, as John indicated, the fourth principle says, "Thou shalt not game the system," which is one of those principles that have been set down for this and other purposes.

The clearly defined hedging strategy must be in place for at least three months before the valuation date. The company has, at the very least, to have evaluated the implementation of a strategy, if not actually implemented it. You must clearly articulate the hedging objectives in specific terms in order to be able to reflect this hedging strategy in your projections. The other requirement is that the costs and the benefits of the hedge positions can be directly reflected either in the model or outside the model. Wherever they're reflected, all the risks and the associated costs must be included. You need to adjust the effect of the hedging program for the amount of time the strategy has been in effect. There's a unique adjustment that has been developed. Basically it is saying that you compute the conditional tail expectation (CTE) on a best-efforts basis and you compute it on an adjusted basis, and then you boost the CTE you're actually reporting by a percentage of the difference between those two amounts. That's to reflect to some degree that maybe not all the risks were completely reduced and to reflect any other imperfections. The percentage factor is "E." That's based on the judgment of the actuary.

Turning to certification requirements, you need to certify that the reserve or total asset requirement was calculated in accordance with the principles and the requirements of the proposed methods. You need to report any material changes

since the last time. You also then have to provide a separate certification for hedges relating to the clearly defined hedging strategy and certify that the model used to evaluate the effect of the hedging program did not reflect foreknowledge of the scenarios used.

Regarding documentation, there are numerous requirements for documentation. They're similar to the ones for asset adequacy now. There are new ones relating to the scenarios and calibration ones for the standard scenario, the alternative method and hedging, as I noted earlier.

The draft guideline and the RBC requirements are all set to be effective at the end of 2005. If everything goes as planned, they should be adopted by year-end or, at the very latest, by the first quarter of 2005. Please note that there has been a group organized to develop a practice note for the C-3 Phase II requirements. If you were to get on that group, that would be an excellent way for you to understand all these requirements. I encourage you to contact Steve English at the American Academy to sign up.

**MR. J. TIMOTHY GAULE:** At my company, we have started the C-3 modeling, but by no means are we done. Based on the work we've done so far, it has identified the challenge we have ahead of us. It's definitely not something you're going to want to start in January, because it's a big undertaking.

To give you a little background, we've modeled our two primary products. One of those products is a product with about $3 billion of assets in force. It's a product we've marketed for probably about 20 years. It has a six-year step-up death benefit. That's a relatively tame death benefit. It's also primarily marketed in the tax-sheltered annuity (TSA) market, primarily to teachers. We tend to see recurring premiums. They tend to be small counts. One of the risks with the product is that it does have a dollar-for-dollar provision. A couple of years ago we did see some increased partial withdrawals, but when we looked at it and the policies that got into the money, the average net amount at risk was only $5,000. While we did see increased partial withdrawals, the one thing we noticed after they took those higher partial withdrawals is that in a lot of cases, they later surrendered the whole policy. I believe they probably weren't gaming us as much as they just needed the money. That's one of the products we modeled.

The other product we modeled is a newer design that's sold primarily in the nonqualified market. It's what we call an unbundled product. The base product has a death benefit, simply a return-of-premium benefit. It's a seven-year scale, and the surrender charges apply to each premium payment, but through riders you can enhance the death benefit. You can add guaranteed living benefits, such as a guaranteed minimum income benefit (GMIB) or a guaranteed minimum withdrawal benefit (GMWB). You also have the option to add benefits that will modify the surrender charge scale. In some cases, this product is actually managed by a registered investment advisor who's using an asset allocation model to determine in

what subaccounts to invest. There's actually a wider choice of subaccounts in this second product. The concern there is that there's more ability maybe to game us a little bit.

What's interesting, based on the preliminary work we've done so far, is that for the older product (the one with the $3 billion block of business), when we did the CTE 90 calculations for RBC, we actually came up with a total requirement less than our current reserve. Something else that is interesting and is maybe just a coincidence is that when we calculated the CTE 65 number for that particular product, it was very close to the current reserve, which surprised me. I should emphasize that in our modeling, we're also moving to a new modeling system. Normally we probably would have started with our cash-flow testing model. What we had to do here is build a new model. We don't have everything in it yet. There are definitely some dynamic assumptions I want to bring into that, but it was interesting seeing what happened on this older product.

The newer product has about $1 billion of assets in force. In many cases the policyholder is not taking elective benefits, but definitely in some cases the policyholders have. On that product, we were seeing a capital requirement that was greater than our current reserves. One of the things we realized when we aggregate the two together (it's something I'm going to talk about a little later) is that we didn't have a capital requirement. In other words, the older block, where the capital requirement was less than the reserves, offset the capital requirement for the newer block. Obviously that's something we're going to have to watch as we go forward, because that's the block we're selling today. Our pricing actuaries are very proud of that particular design. From a valuation standpoint, it's a nightmare because of all the different options.

The main thing I've learned based on our experience so far is that there are a lot of decisions that the actuary has to make. The first decision is probably whether to use a cash-flow testing type model or alternative methodology. As you saw from Jim's presentation, the alternative methodology is definitely not as easy as we might have thought originally. Most of us will probably choose to use the stochastic model. You definitely need to use the modeling if you have any type of guaranteed living benefit, such as a guaranteed minimum withdrawal benefit or a guaranteed minimum income benefit. Once you make that decision to model, it's permanent. You can't go back. It's possible to use modeling for certain blocks of business and the alternative method for the remainder. As I already stated, I think it's likely most companies will elect to model.

I recognize that there's probably no perfect model. We all do the best we can to assess all the risks that our companies face. We need to think about the impact of what happens to our products in high-impact, low-probability events. It's important to model assets and liabilities under stress. It's important to have a sufficient number of model points to adequately assess all the drivers of risk. The challenge there, though, is that although you'd want to have as many model points as you

can, if you're going to run a number of scenarios it's going to take a long time to run those models.

You've got to balance that need for accuracy with the number of cells you have. Those model points should factor in all sources of revenue, disbursements and expenses. With expenses, you don't want to forget overhead and investment expenses. You need to model asset behavior and policyholder behavior. That's definitely going to be a challenge. I am thinking of the product that I mentioned earlier, the unbundled product where we have the options to add all the different riders. Those are relatively new products where we don't have a lot of experience. We're definitely going to be learning as we go on that one to determine the appropriate assumption. You also need to factor in hedges and reinsurance. As I mentioned before, it's desirable to have a large number of model points, but again, you've got to balance accuracy against runtimes.

As I alluded to earlier, the modeling assumptions should be the actuary's prudent best estimate. What does that mean? It's basically the actuary's best estimate based on information available. It should include a margin for error. The margin should be based on the abundant and reliable datas available. It gets back to my example I was making about the unbundled products with the variable annuities with guaranteed living benefits (VAGLB). That's a relatively new benefit. We don't know for sure what's going to happen. I would guess that if those benefits get into the money, especially a guaranteed minimum withdrawal benefit, I would expect the person would take that benefit every year. It's important to consider dynamic behavior. As we've gotten into this and talked about the assumptions, we realized there's a need for additional industry and company experience studies.

I'm going to try to give you a laundry list of the various assumptions you need to make. Some of them are probably ones that you've made before for cash-flow testing or your deferred acquisition cost (DAC) amortization models. Obviously persistency is a key assumption. You obviously need to consider both full surrenders and partial surrenders. The one thing we should never forget is that, in most cases, these products are bought for retirement. Eventually they probably are going to lapse, but you want to be careful there because again, if the policy gets into the money, those lapses may well slow down. You need to assess the dynamic changes based on the degree of in-the-moneyness. In our model, we've grouped our model points into six degrees of in-the-moneyness, just based on where they are as of the valuation date.

Another important consideration is that policyholder dynamics may vary by type or guarantee. For example, if you have a dollar-for-dollar guaranteed death benefit, you would probably expect higher partial withdrawals than you'd get under a pro rata guaranteed death benefit. Mortality probably won't vary by investment performance. One of the challenges that we all face is making sure when we look at our experience data that it's not underreported, especially if the policy is out of the money at the time the policyholder passes away. Perhaps that didn't get reported

or captured in the administrative system.

You also need to make sure your model captures all the asset-based fees. That's a challenge for us with this unbundled design because they've added a number of riders. There are obviously a lot of fees we want to make sure we capture. It's important to make a provision for mutual fund revenue-sharing; make sure you captured expenses associated with that. We, like a lot of companies, have an added challenge that some of our funds are managed internally. There are higher fees there versus the ones that are managed externally. As far as expenses, as I mentioned before, you want to make sure you include administration expenses, overhead and marketing. For both C-3 Phase II and VA CARVM, the starting assets are equal to the approximate statutory reserves, and the working reserves are equal to the cash surrender value.

Future benefit utilization will vary by market performance and whether you are in the money. A good example might be a guaranteed minimum income benefit. You would expect that the more a policy gets in the money, the more likely a policyholder is to annuitize. Most of us have probably not experienced a lot of annuitization, but with a benefit like this we may see higher utilization levels. It's important also for your model to capture transfers between your fixed and your separate account. Those transfers should be dynamic based on market performance.

I mentioned the two products we modeled. With the older product that we've sold in the TSA market, what has been interesting to me is that we have not seen a lot of movement between the separate account and the fixed account. That is kind of surprising, especially considering the minimum guarantee in that product tends to be at least 3 percent and in some cases as high as 4 percent.

One thing you need to think about in your model is the potential that the policyholder may choose to lock in benefits. I'm talking about a scenario where—you're in the money, perhaps—that policyholder may decide to move more funds to the general account or maybe move it to a tamer fund. They may move into a separate account like a money market or a bond fund. It's important also for the model to capture fixed account flows. With that I'm thinking of products where you have a high minimum guaranteed interest rate. For example, we've got a product with a 4 percent guarantee. It wouldn't seem surprising to me in the current environment to see more flows going into that guarantee. There are a lot of decisions to be made here and no easy answers.

Fund mapping is important because you want to reduce the number of asset classes in your model. I know most companies today have various fund options available to the policyholder. When determining how to map those funds, it's important to review the prospectus and historical performance. This might be complicated by limited history or manager changes. It's important for your fund groupings to make sense. I don't think you want to group an aggressive technology with, say, a

diversified Standard & Poor's (S&P) category.

My next point is on the number of model points. I've talked about this a couple of times. It's important to balance accuracy with runtimes. I mentioned earlier you should try to have as many cells as possible, but you also need to look at how credible your assumptions are at that cell level. It's also important to accurately assess the tail risk. It is true of any model, whether it's cash-flow testing or DAC amortization, that it's important to validate your model. For example, one of the things we've looked at here is making sure that the net amount at risk of our model points, when we add that up, equals the total net amount at risk for the block.

When I talk about time step, I'm talking about whether you're running a model monthly, quarterly or annually. The pre-packaged scenarios are available on a monthly basis. That gives us the flexibility to run monthly, quarterly or annually. Obviously monthly runs are going to increase runtime. An annual run would be acceptable for benefits that are not sensitive to projection frequency. It's important for the actuary to use more frequent increments of product features that are sensitive to the frequency of the time step.

Let's talk about projection horizon. As probably is typical of most models, it's important that the projection horizon be long enough to model all material risk. In our DAC amortization model, we typically go out 20 years. That may not be long enough here when you have a VAGLB benefit. For a GMIB benefit, you may need to go out longer to make sure you've captured those risks. As a general rule, the projection horizon should be at least 20 years. If we have a model going out 30 years, there are going to be some challenges for us as to the appropriate assumptions. I'd like to get back to my comment about this newer product that we have with the VAGLB benefits. We've only had that product for about three years, so I don't feel comfortable right now that I know exactly what those policyholders are going to do.

The fact that I don't know if three years of experience gives you enough credibility to know what's going to happen in the next 30 years gets to my last point. You have some options with the interest rates that you use in your model for both discounting and general account earnings. You can use the implied forward rates as of the calculation date if you're not using an integrated model. If you're using an integrated model, you can use the rates generated from the model. What's important is that whatever approach you decide upon, it must be consistent from year to year. Another consideration is that the discount rates used to determine capital must be reduced for federal income tax, unlike the rates used for determining reserves. It's important, too, for the interest earnings on your fixed assets to reflect defaults.

As Jim mentioned, it's fine to model hedges, but you want to make sure it's a clearly defined strategy. You need to make sure that your hedging benefit is adjusted to reflect imperfections in the hedge strategy. Don't forget future premium

flows. Again, these could be dependent on quite a few parameters, including fund performance, the value of the options, economic conditions and tax qualification code.

I mentioned earlier that one of the things we need to model is policyholder behavior. That's definitely unpredictable at times. It would include lapses, transfers, deposits and utilization of elective benefits. Policyholder behavior can vary by product, market distribution and how much you're in the money. It may be different for elective versus non-elective benefits. It's also likely that anti-selection will increase as the value of the option increases. Again, that gets back to my example about a GMIB. The more it gets into the money, the greater the utilization rate may be. You would expect that ancillary options, such as a death benefit or simply a return of premium, would not be a significant driver of behavior. Elective options may be driven more by economic conditions. It's very important here to do sensitivity testing, because we may not have a lot of experience on which to base our assumptions. It will be important to do a lot of sensitivity testing to see how important each of these behavior assumptions might be.

We have a couple of choices on the scenarios that we use for our model. The first one is whether to use the Academy pre-packaged scenarios or ones that we've generated ourselves at our company. The Academy does provide the pre-packaged scenarios and a picking tool. There are 10,000 scenarios. Obviously you may want to create a model that's using fewer scenarios, and the picking tool will allow you to pick those scenarios. Whether you're using your own scenarios or the picking tool to use a subset of the Academy scenarios, you need to make sure they calibrate.

One question might be, how many scenarios should I use? I would think at least 1,000, but again I would emphasize that you need to make sure that calibrates. When we ran our model of our two products, we did do a run where we had all 10,000 scenarios. We have a modeling software package that allows us to distribute the calculation out to a number of machines, and based on that test, I believe it took us about 50 hours to run all 10,000 scenarios.

I might mention data processing. The machines we have on our desktops tend to be leading edge; we're fortunate at our company because when the IT department buys new machines, they tend to give those to investments and actuarial first. They always take those old machines and give them to someone else. This last time we asked if we could keep them. They're not necessarily state of the art, but we set up a bank of 12 machines. We take advantage of those machines. When we ran the distributed processing, we were running on those 12 machines plus some of the desktops. Those older machines are a little slower, but we still thought there was an advantage of having those machines there. You're probably not going to be doing these runs during the day. They'll probably be over the night or a weekend. I thought I'd share that because it may be possible to run all 10,000 scenarios. We don't know yet because we've got to get all our products in there. We don't have all the dynamic hooks into our model yet.

I might mention that the Academy provided monthly growth rates with the standard scenarios. That's important to consider as you're incorporating the scenarios into your model, because your modeling software may interpret those differently. You may want to be aware of that. The scenarios provided by the Academy are monthly rates for a number of years. This is probably not that significant a point, but you can't import them into Excel. Most modeling packages can probably bring them all in. We had no problem bringing the scenarios into our model. I believe the scenarios must be available in electronic format to facilitate review by the regulators.

I have a few other comments on the pre-packaged scenarios. I believe they were developed using 50 years of historical data. There were shorter periods for some asset classes. As I already mentioned, the standard scenarios satisfy the calibration requirements, but again, if you're going to use a small number, it's important to make sure to calibrate. As I previously mentioned, it's monthly rates. The Academy does provide a scenario picking tool. We found that helpful because it does give you some statistics on the scenarios that you've picked with that tool. The pre-packaged scenarios were developed for 12 asset classes. That includes nine separate account classes, plus three points on the yield curve. We have several choices on asset classes, including money market, corporate bonds, diversified U.S. equity and aggressive equity, among others.

As I already mentioned, I think there is a benefit of aggregation if you take the modeling approach. We definitely saw that, at least on a preliminary basis, with the work we've done. Aggregation allows for effects of diversification not only by product but also by age, issue year, benefit type and fund choices. It's more conservative to aggregate at a lower level. There are limited aggregation benefits for the alternative method.

You should be aware of the C-3 calculations for fixed. Exempt companies may now elect to be nonexempt. That gives you the choice of using modeling for the fixed portion of your variable business only or for all C-3 interest rate testing. If you decide to use modeling, you may not revert to the factor method without regulatory consent.

Again, I feel sensitivity testing is important if your data is limited. I believe it helps you identify drivers of risk. I feel we still need to do a lot more sensitivity testing. That's going to help me finally decide the appropriate assumptions I want to use in the model. The sensitivity testing is going to help me validate the base model and identify the level of conservatism we have in that model. It obviously will increase run time, but I think it's a necessary evil until we get comfortable with everything.

Regarding the CTE calculation, as most of us know, for capital it's a CTE 90 but for reserves we use the CTE 65. Unlike Phase I, the Academy does not have a tool for this calculation. We took our results and pulled them into an Excel spreadsheet to do the work. I would expect that most of the modeling software packages will

probably be modified to support that calculation.

I have some practical considerations. I already mentioned distributed processing. The modeling software has that capability. That's very important; we've seen a big benefit of it. I report to the CFO. I think he has some concerns about expenses if I start using more and more computers, but hopefully he'll like our results. Based on what we've done so far, this is probably something you'd want to try to validate before year-end to reduce the effort at year-end. The robustness of your model may depend on the modeling software capabilities. There may be some limitations on how many model points you can have or just how robust that model can be. Perhaps it makes sense to build off an existing model, such as your cash-flow testing model. We actually built off our embedded-value model. I don't know if I mentioned this earlier, but in the last couple of years we purchased a new modeling package, and our cash-flow testing model is not quite on there yet. It will be in a couple of weeks because we were going to do cash-flow testing as of September 30. Starting late last year we built an embedded-value model for our company. We engaged an outside consulting firm on that. We felt that was the place for us to start because we felt that model was a lot more credible. The benefit of bringing in an outside firm was that they helped us review our models and make sure that we were capturing the appropriate expenses, that our assumptions were consistent and that we were consistent with the industry.

There's definitely a need for experience data. It's going to be important to try to gather your own data. It's going to be important for the industry to try to pull data together. One thing I'd recommend is that if you haven't gotten started, I think you better, because time is running out on us. We can't keep hoping that the regulators will keep pushing the effective date back. One of these days it's going to happen.

Finally, as Jim mentioned, there are certification and documentation requirements. It's going to be important that your model comply with all applicable actuarial guidelines and standards. There is a practice note that's being developed. I would agree with Jim that if you're interested in participating, it would be great. The format that they're taking in the practice note is basically questions and answers. Right now the group is trying to pull together all the questions related to modeling, both for capital and reserves. It's also going to be important for the actuary in the documentation to disclose any material changes from the previous model.

**MR. O'SULLIVAN:** How many people are planning or think they'll be planning on going with the alternative methodology versus the modeling? (One or two hands were raised by attendees.) That is about where we had guessed that it would come out.

**MR. GREG MATEJA:** Would you care to comment on how the proposed actuarial guideline interplays with Statement of Standard Accounting Practice (SSAP) 61, because SSAP 61 lays out some criteria for non-proportional reinsurance?

**MR. O'SULLIVAN:** I'll briefly address your question. The whole credit for reinsurance stuff is primarily going to be governed by what emerges out of the standard scenario. The standard scenario has specified rules for obtaining credit for any reinsurance, be it proportional or non-proportional. It quotes two model regulations. There are two specific model regulation/laws that are specified in the standard scenario for you to go ahead and get credit on that thing.

**MR. LAMSON:** As I recall, the position that has been taken is that the specific models dealing with reinsurance will govern. In this case, I think SSAP 61 would govern over whatever is in the actuarial guideline.

**MR. MATEJA:** So to the extent that the two are potentially in conflict, how does that get resolved?

**MR. LAMSON:** In the favor of the specific reinsurance requirement.

**MR. MATEJA:** Under SSAP 61?

**MR. LAMSON:** Yes, that's the case.

**MR. O'SULLIVAN:** How many people are generating their own scenarios as opposed to using the 10,000 standard scenarios? (About six or eight attendees raised their hands.) My last question, out of curiosity, is, how many people are waiting until this thing finally gets adopted to get serious about it? I'm afraid that that laughter may be too prevalent an attitude. I would go ahead and re-emphasize that it does take a lot of time to go through this thing, and the more you look at it, the more complexity you see.

**MR. LAMSON:** We could ask the converse of that question, too. How many people in the room are like Tim and have done at least some preliminary work toward building this model and running things out on a CTE basis? Oh, quite a few. (There are 12 to 15 attendees that raised their hands.)

**MR. PHILIP J. BIELUCH:** I'm chairman of the Individual Annuity Experience Committee. I wanted to pass along, in reference to the fact that we need more statistics, that the Society has approved a mortality and lapse study to be run with Life Insurance Marketing and Research Association (LIMRA). The mortality component will cover features of the guaranteed minimum death benefit (GMDB). The concept is that the exposure is the same whether it's termination or lapse. Eric Sondergeld at LIMRA is the primary contact on that. There is a project oversight group. There are specifications for the study. If you need further information, you can contact either Eric or me. We can get you that information. You will be getting requests. I think there are 22 companies that have agreed to submit data so far on that.

**MR. O'SULLIVAN:** More companies is obviously better. Do you have any feel for

what the time frame would be?

**MR. BIELUCH:** I think the request is going to go out in the next couple months. You also should look at the appropriateness of the table in Actuarial Guideline 34 as a standard. We're looking for all experience we can on that.

**MR. O'SULLIVAN:** A footnote to what Phil had mentioned is that inside of the Academy meetings there was a fair amount of discussion about where the level of mortality was. Some companies argued that what they were seeing was closer to a 65 percent level of mortality. Others had a viewpoint that it's probably up around 80 percent to 85 percent of the table.