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Session 25 PD
Minimum Guaranteed Benefits on Variable Annuities

Moderator: John O'Sullivan

Panelists: J. Timothy Gaule
                        Larry Gorski
                        James Lamson

Summary: Over the past year, the Academy and NAIC have refined the proposed regulations for calculating risk-based capital (C-3 Phase II) and statutory reserves (VACARVM) on death and living benefit guarantees provided by variable annuities. This session provides an overview of the proposed regulations and their status. It also discusses the conceptual and practical considerations involved with mapping investment options to modeled funds; setting assumptions for revenue sharing, mortality and other prudent best estimates; selecting model points and major design decisions; coordinating the required calculations; and handling the workload at year end along with documentation requirements.

MR. JOHN O'SULLIVAN: We've assembled a good panel of experts dealing with the concept of C-3 Phase II and also VACARVM, but that's less important than what's facing you at year end, hopefully. Our first speaker is Larry Gorski. Larry is a 30-year veteran of the regulatory community and is currently a consultant with Claire Thinking. Larry is chair of the Academy group that leads the effort on C-3 Phase II.

Jim Lamson is the founder and president of Actuarial Resources Corporation. He's the vice chairman of the Academy group that's working on VACARVM. Jim has been active in a multitude of Academy initiatives, including Actuarial Guideline (AG) 33, Quad M and AG 39.

Tim Gaule is an actuary who has been active on a lot of calls that the industry has had on the subject. He's a valuation actuary and vice president at Security Benefit

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Life. He has been implementing the C-3 Phase II for his company over the past two-year initiative. He brings a wealth of practical information.

We're hoping that we can give you some practical guideposts to help you with your task for this year end.

MR. LARRY GORSKI: I want to correct one statement that John made. I'm the *former* chair of the Life Capital Adequacy Subcommittee (LCAS). About a month or so ago, there was a change in reins, and Nancy Bennett is now leading that effort.

Here's a summary of what I plan to say this morning. I'll give you background information; talk about C-3 Phase II from a big-picture perspective; and hone in on a couple of specific topics, including contract grouping, mapping investment subaccounts to modeled indices and representative scenarios. My comments are my comments only, and they do not represent the views of my employer (Claire Thinking), any insurance department or any regulator.

As background, the C-3 Phase II risk-based capital (RBC) requirements should take effect with the December 31, 2005 RBC submission. I have to be careful here. Even though the recommendations have made their way through the Life RBC Working Group and the NAIC Capital Adequacy Task Force, because of Hurricane Katrina there was no September NAIC meeting, so it was not adopted by the Executive and Plenary Committees of the NAIC. They plan to meet via conference call and deal with the issues that should have been adopted at the September meeting, but because of many different things, they still haven't had the opportunity. I believe it will be in effect for year-end 2005, but it's not a done deal yet.

There are a couple of things that you should note about this possible issue. Maybe the biggest thing is that credit for hedging. For those who are not completely familiar with C-3 Phase II requirements, this is the first time that an insurer can take credit for an effective hedging strategy within the RBC requirements. But there is a whole slew of conditions that have to be met to take credit. Two conditions are that an insurer has adopted a clearly defined hedging strategy and has tested that strategy for 90 days. If you're thinking about December 31, 2005, the 90 days are close to being over, if they're not already over. If you plan to take credit for hedging, you better have everything in place already.

Another point is that regulators have had many years of reviewing asset adequacy analysis, but the requirements of asset adequacy analysis are not the same as C-3 Phase II. Because of that, I would think that you'll be getting a lot of questions, assuming that this is in place for year-end 2005.

There is a gradual phase-in of the requirements. In the first year, it's 20 percent new and 80 percent current requirements. Even though you may not have everything ready yet, maybe taking a conservative approach just to have something done for year-end 2005, but remembering the phase-in requirements,

will smooth things out a bit for you.

There's another point that I should make. The actual RBC instructions, assuming they're adopted for year-end 2005, are a composite of input from three different sources. Maybe the biggest source is the C-3 Phase II recommendations from the Academy. Also part of the instructions is reference to the so-called standard scenario, which becomes the floor of the LCAS requirements. There's also the so-called smoothing and transition rule, which is essentially an ACLI recommendation. So the instructions are the composite of three pieces. The reason I'm bringing that up is that over the past six or seven weeks, I've been getting a lot of e-mail questions, concerns and issues with one or more components of the instructions, and sometimes I have to say that I know there's an issue there, but that issue was not something that was under the control of the Academy. It came from the ACLI or the standard scenario.

One major issue that applies to C-3 Phase II and, more generally, principle-based reserving and RBC, is the question of regulatory oversight. The regulators have been trying to build a framework to deal with oversight questions. Possible alternatives include some self-regulation; independent, required peer review; and a centralized regulatory review process. Those are the three main components.

One thing that is taking place right now is that regulators are trying to get their feet wet in reviewing this kind of work before the submissions are made sometime in March or April of 2006. Right now they're working on the process of reviewing some of the early components of the C-3 Phase II exercise. There's a working group under the Capital Adequacy Task Force called the Results Working Group. Again because of the hurricane and the cancellation of the September meeting, things are a little behind schedule. What they're trying to do is identify a core set of companies that have agreed to have their C-3 Phase II work reviewed, maybe in advance of year end and next March's submission. You may be getting a letter from your state of domicile, asking whether you're interested in participating in this review process.

Here's C-3 Phase II from 30,000 feet, just to make sure that everyone is on the same page. We all know that C-3 Phase II deals with RBC requirements. There's a comparable initiative on the reserving side. We'll be speaking strictly from the RBC side. There are two approaches that are recognized, either a modeling approach or a factor-based approach. Again, there's a third, that being the standard scenario, but that's a regulatory requirement and is not going to be part of our discussion.

Then we get into the model-building step, developing of scenarios; setting assumptions; running the scenarios; determining the additional asset requirement for each scenario; determining the total asset requirement (TAR), defined to be the additional asset requirement plus starting assets for each scenario; recognizing the effect of hedging; determining the TAR at a 90 conditional tail expectation (CTE) level and subject to the standard scenario; and finally, the actual RBC, which is the

TAR minus reported reserves. in a nutshell, that's what we're going to be talking about.

I'll only be talking about model building and scenario generation. Why would I pick those two topics? Unless these first two tasks are done well, everything that follows is somewhat meaningless. That's garbage in, garbage out. I want to focus on the foundation of everything that's going to follow from that. In addition, based on my experience over the years, I suspect that most regulators right now are thinking about the assumption-setting process. We're dealing with benefits where there isn't a lot of information dealing with the assumptions, whether it be the utilization of medical information bureaus (MIBs) or even the death benefits—the mortality assumption for guaranteed minimum death benefits (GMDB) is under dispute. Most of the regulatory attention is on assumption-setting, and, based on my experience, I tend to gravitate to things that are being overlooked. So I'm going to be talking about building a model and developing scenarios. My starting point, obviously, is the report from the Academy.

When I think about the model-building stage, first I try to think about what the actuary is being asked to do. The actuary is being asked to build a model such that that model, when the scenarios are applied to it, will develop a TAR at a 90 CTE level, under the assumption that you're doing a seriatim run. I'm not saying that you have to do a seriatim run, but that is your ideal. That's what you're going to compare your results against. You should be comparing your results against the results that would come out of a seriatim valuation. When I speak of the "ideal" for this part of the project, I'm talking about modeling in force on a seriatim basis.

Of course, probably no one is going to do a seriatim valuation. In fact, the report says that grouping is permitted. Then it gives you some guidance as to how to do a grouping of contracts. A grouping of contracts must retain the characteristics needed to model all material risks and options embedded in the liabilities. I view that statement as a necessary condition, but not a sufficient condition. Any type of contract grouping exercise, you'd want to do in this fashion, but simply doing it in that fashion may not be enough to ensure that you're utilizing a grouping process that achieves the ideal.

Typically, if each "cell," e.g. attained age, in-the-moneyness, is assumed to have parameters equal to its mean or midpoint, the capital requirements are understated. It is important that adequate testing be done to validate models on both a static and dynamic basis. The model used must fit the purpose. These points are comments straight out of the report. Of course, you have to document the process. When I say that, I'm talking about documenting how you got from the ideal, the seriatim-based results, to the final rules for contract grouping. You need to document the effectiveness of the contract grouping process against the ideal.

What I've said so far is a condensation of Attachment A . Attachment A is on the SOA Web site in the handout for this session. We're not going to go through it,

because it's a wordy document. I think people probably would get tired of looking at it, but you should take a look at it. (There's an Attachment A and Attachment B; we'll get to Attachment B in a few moments.) Attachment A was developed last April, for an entirely different purpose. Last April, the LCAS and the Variable Annuity Reserve Work Group (VARWG) embarked on an educational session for regulators, trying to get them up to speed to understand what the recommendations meant, because at that time, many regulators thought that a principle-based recommendation would be a lot of words without any substance.

So I took the Academy recommendation and restructured it so that it illustrated the strong points, which were the requirements of what an actuary had to do to accomplish certain tasks within C-3 Phase II. Attachment A deals with the contract-grouping task. You'll see a quote straight out of the Academy recommendation, with some interpretive language surrounding it (what that really means and how one accomplishes that portion of the task). The quotes were arranged in a more logical order, from talking about the ideal, to grouping is permitted and right down the line. It was done to help regulators understand and appreciate the strength of the Academy recommendation. It was not just a bunch of words on 104 pieces of paper, but a strong requirement for calculating capital or reserves. When you have a chance, take a look at Attachment A.

I talked about the Results Working Group. There's another activity within the NAIC, and that is to develop a checklist for regulatory review. If you remember, I made a statement that regulators are quite familiar, through experience, with reviewing asset adequacy analysis, but they have had no opportunity yet to try to apply C-3 Phase II. The first time that I looked at the Academy recommendation—remember, this started when I was still a regulator—I thought to myself, How in the world am I going to apply this in a real-life situation? Where do I start? I started working on a checklist approach for each different task within the project. I developed a checklist for reviewing the contract grouping process: Did the actuary test the appropriateness of the contract grouping process? What does appropriateness mean in this context? In other words, results of contract groupings should not understate results from results of a model applied on a seriatim basis (the ideal). Don't be persuaded by hand-waving arguments; appropriateness should only be demonstrated by empirical testing, so request cell compression rules and data by cell (number of policies, account value, AG 34 reserves) and ask if outlier policies are grouped or modeled on a seriatim basis.

The checklist does get into one test that I've applied in real life now. I was reviewing a company that had a significant amount of variable annuities with guarantees, so it would be impossible to do a seriatim approach. When I looked at its contract grouping rules, basing them against some of the statements made in the Academy report, they seemed to be doing a good job. But I wanted to be a little more certain of the results. First I asked the company to produce a report that had (on a cell basis that it defined) account value, AG 34 reserves and a few other values. Based on that report, I chose four cells. I asked the company to do a

seriatim valuation of reserves for these four cells. I was going to compare the seriatim results to the cell-based results. For each of the four cells, the seriatim results were greater; in one case, they were 45 percent greater. There's a significant difference between cell results and seriatim results. The idea that I'm trying to get across to regulators is that that's an approach they may want to use to test the cell-grouping mechanism.

Here are some of my ideas as to how conduct that test of cell grouping. For a sample of cells, request modeling results on a grouped basis versus seriatim basis; select cells based on the change of the ratio of AG 34 reserves to account value for adjacent cells. Is the contract grouping methodology comparable to the contract grouping methodology used by the company for other purposes, i.e., internal capital models, implementing actual hedging program? If there are differences, obtain an explanation as to why there are differences. Cell compression rules should be periodically tested for appropriateness.

Fund mapping is the other part of my presentation. I talked about cell grouping and scenarios, and part of the scenarios is the fund mapping. When I get to fund mapping, I don't have a natural ideal to talk about like I did with contract grouping. Here, I think the most important thing to remember is to not blindly use the AG 34 fund classes. One thing that concerns me about the LCAS report is that when it talks about different ways of mapping of funds, it specifically talks about the AG 34 fund classes as one thing to consider. My concern is that that may become a default for some companies who maybe want to take an easy way out this first year. I've been strongly suggesting that the fund class in AG 34 in and of itself isn't acceptable. It may be in certain cases, but those cases are determined only after doing quite a bit of testing. The other point is that there are no safe harbors, which is what I'm trying to get across in this AG 34.

The Academy report goes into some detail as to what may be considered a reasonable or typical way of doing the fund mapping process. You determine a proxy for each variable account to develop the investment return paths. Proxy funds are generally a linear combination of market indices. This next point quotes straight out of the report. The proxy construction process should include an analysis that establishes a firm relationship between the investment return proxy and the specific variable funds. I focus in on that phrase "firm relationship," and I've been suggesting to regulators that they too focus in on that when they start reviewing C-3 Phase II work. This gets back to that notion that there are no safe harbors, and you can't blindly use AG 34 fund classes. They may work, but, again, they may not work. You have to determine whether there's a firm relationship.

What does that mean? If you're dealing with a situation where you have data, you can do some backtesting of the mapping function. You'd probably construct a mapping function to a multiple linear regression, if you do some backtesting of that also. If you don't have data, the report then discusses a process for trying to develop a fund mapping exercise; The proxy should be constructed by combining

asset classes and/or employing allocation rules that most closely reflect the expected long-term composition of the specific fund, given the investment objectives and management strategy.

One should always look at the fund mapping function as setting an assumption. Like any other assumption, you are setting an assumption. You believe that this set of funds is going to behave like this linear combination of market indices. You're setting an assumption. When you set an assumption in the future, you're going to do actual-to-expected testing, so you should have a mechanism in place for testing the appropriateness of your mapping function. Again, from some practical experience I gained this past year, I was reviewing a company's mapping function (it was the same company whose contract grouping I reviewed), and on paper it looked great. Then I started asking some questions on what kind of backtesting or actual-to-expected analysis it performed, and it did point out some weaknesses with the mapping function. Again, I'm suggesting to regulators that they view this function as any other assumption.

Following are comments straight out of the report. It would be imprudent to ignore the concept of market efficiency in establishing the proxy funds and the associated model parameters used to generate the investment return scenarios. Basically, you have to look at risk-return characteristics of your funds and your proxies; you don't get something for nothing. Also, give some thought to the correlations in the simulations. Again, document the process.

Just as I had an Attachment A, there's also Attachment B, which deals with fund mapping. It takes the same approach. It takes comments straight out of the report, puts them in a logical order to illustrate the strength of the Academy recommendations and then includes some commentary as to what the recommendations are really trying to say, at least from my perspective. The key points that I get out of the Academy recommendations are that you have to establish that firm relationship between your fund returns and your proxy returns, and you have to document and test that relationship.

I have some recommended reading for regulators who may not be familiar with fund mapping. I would suggest anyone who is involved in this function and this task to take a look at the document, "Modeling Specific Funds—A Case Study," by Christian-Marc Panneton, from the CIA 2001 Segregated Fund Symposium. It's an excellent document that gets into the nuts and bolts of fund mapping. The Academy's handouts and slides from the C-3 Phase II seminars (2004 and 2005) are also recommended reading.

Again, I have a checklist from the perspective of a regulator who's being asked to review fund mapping work, maybe for the first time. What methods/data were used to map funds to fund proxies? Is the appropriateness of the mapping process monitored? How is correlation (co-movement) of fund returns incorporated into the modeling process? Are the fund mapping and grouping methodology and

assumptions comparable to the fund methodology and assumptions used by the company for other purposes, i.e., internal capital models, implementing actual hedging program?

Let's talk about representive scenarios. Running 10,000 scenarios (even running 1,000 scenarios) after having a granular approach to contract grouping is a daunting task. I'm sure you're going to hear comments from people saying that it's an impossible task, but that's what you have to do. One idea that I've seen people discuss and use for some work in asset adequacy analysis is choosing representative scenarios. Rather than using 1,000 scenarios, develop some kind of algorithm that's going to take the 1,000 scenarios and try to compress that down to maybe 100 scenarios, where those 100 scenarios, in some sense, represent the 1,000 scenarios, relative to the task of asset adequacy analysis or C-3 Phase II RBC.

Again, I had some practical experience this year with a company that was using an algorithm for choosing representative scenarios. The first thing I would say is that if you're going to use that approach, make sure your methodology is described well. That was one of the problems I had with the company, initially. There wasn't an understandable description of the methodology. The description should get to the distance metric; What does it mean for one scenario to be "close" to another scenario? Describe the algorithm for selecting scenarios and the process for assigning probabilities to representative scenarios. Then, when you're all done, test and document the results of that methodology for treating representative scenarios versus the universe of scenarios.

When I finally got the proper documentation from the company as to its representative scenarios, it seemed a little flawed. It seemed to be biased. It seemed to be always pushing scenarios to a mean, as opposed to picking up the tails of the distribution. In fact, after running some tests, that's exactly what it was doing. The company agreed that there was a problem there, and so, while it intends to use a representative-scenario approach, it's going to have to rethink how it chooses those scenarios.

If you want some background reading, there's a good paper from the CIA 2003 Stochastic Modeling Symposium by Alastair Longley-Cook, "Efficient Stochastic Modeling Utilizing Representative Scenarios: Application to Equity Risks."

I have two observations that I'll go through quickly. Cash-flow models used for asset adequacy (reserve testing) purposes may not be acceptable for C-3 Phase II purposes. I suspect that many people are going to go into year-end 2005 saying, "We did something like this for asset adequacy analysis purposes, so we'll use the same approach with C-3 Phase II." From my experience, that's probably not going to cut it, unless you develop your asset adequacy analysis model with C-3 Phase II in mind.

My second observation is a quote from a regulator: "There should be discussion of the consistency of the models between reserve calculations and company decision-making models. I believe this is one of the most important aspects of the project. If we wind up at the end of this process with companies setting up a separate model that is only used for valuations, then principle-based valuations will never be fully accepted (without conditions like the standard scenario)." I left the person unnamed, but he gave me the okay to make the statement. It deals with the issue of viewing compliance with C-3 Phase II as "just another regulatory requirement." He's suggesting that that would be a mistake. When one is doing C-3 Phase II work, I think that one has to be mindful of how everything that has been done in that process matches up with similar tasks being done for other purposes.

When I go to a company to review that company that's doing C-3 Phase II work and it's a contract grouping, for example, I'll ask it how it's grouping contracts for purposes of internal management reports for hedging purposes—similarly of its fund mapping rules. If it's doing something different for regulatory purposes from what it's doing for internal management of business, for hedging purposes or for other purposes, it makes me a little nervous that all it's doing is viewing C-3 Phase II as a regulatory exercise and not giving it the proper weight that was intended.

MR. J. TIMOTHY GAULE: I'm one of the many out there trying to get our hands around C-3, and hopefully we'll have a good model by year end. As John mentioned, we've been doing work with C-3 for about a year and a half. I was a speaker last year and presented results based on a preliminary model of a couple of our products. At this point we now have all of our products in the model, but I don't feel by any means that I'm ready to sign off; we've got a lot more work to do.

So far at this point, we don't have a capital requirement with the model that we've run. I think what drives that is that we have a large block of older business with a conservative guarantee. Aggregating everything together seems to drive our results at this point. As a valuation actuary, I've been concerned about that product for a couple of years because it has more aggressive benefits. That one by itself would generate a significant amount of capital.

One of the things that I want to focus on in the next few months is some additional sensitivity testing to make sure that I'm comfortable with the assumptions that we're using. We've got some more work to do on fund mapping. We're fortunate in that area because my company has been hedging its fee income for a while (not the guarantees, but the fee income). I've been working closely with the person who does that. He has some good information on our funds, and I think he's going to be able to help me a lot. Probably like a lot of you, one of our challenges is that we have a lot of funds. There are almost too many; I'm not sure how the consumer chooses one .

There are a couple of other things that we're going to do in the near future. We have a meeting next week with our external auditor, and I want to get him up to

speed on what we're doing and get his input. More important, in a couple of weeks we're going to meet with the actuary in our state insurance department. He's been active in the C-3 implementation. We want to show him what we're doing and get his input because that will be helpful. We all need to work together here. This is a challenging process and one that we're going to learn more about as time goes on.

I'm going to focus basically on C-3 Phase II models rather than VACARVM models, because I'm assuming that C-3 Phase II is going to be effective this year end. What's important in either one of these models is the model assets and liabilities under stress.

It's important to have a sufficient number of model points to accurately assess all major drivers of risk. I agree with Larry that ideally it should be a seriatim model. The challenge right now is that I don't have enough computers and efficient-enough modeling software to do that. But I do think it's going to be important to have a sufficient number of model points. Right now we have approximately 20,000 model points. One of the things we'll be sensitivity testing is looking at the impact of increasing those model points. There are a couple of ways that we can do that. We have two products that are our key drivers. It's on those products that we could potentially make a seriatim run and then compare that to our results based on the model points. Based on that, we may decide to increase the model points or tweak them in some way to get the results that we think are appropriate. It's going to be important for your model points to assess all major drivers of risk: revenues, guaranteed benefits, disbursements and expenses, asset behavior, contract holder behavior and hedges and reinsurance. That list is by no means comprehensive, but I tried to include the major drivers of risk.

Regarding revenue, I'm talking about mortality-and-expense (M&E) fees and revenue sharing. There's some guidance on revenue sharing in the Academy report. You need to take a close look at that area. You need to review all your revenue-sharing agreements. If you do that, you're going to find that the agreements have limitations, and the guidance says that you need to reflect that and have a margin for that. If you have an agreement that's giving you 25 basis points but the agreement has a limited lifetime, you can't assume in your model that you're going to get 25 basis points the whole time.

You need to capture guaranteed benefits in your model points. Like a lot of companies, we have some newer products that are an unbundled design, where the policyholder has an option of different guaranteed benefits. That gives you a challenge because you could have one product where one policyholder has a death benefit, but someone else has that same product with the death benefit and the living benefit; you need to separate those out in your model.

Obviously it's important to model disbursements and expenses. Asset behavior gets back to what Larry talked about on fund mapping. I do agree that that's going to be a significant challenge and that you shouldn't just fall back to the AG 34. That's the

easy way to do it, but I don't think that would give you the right results.

There's a lot of guidance in the report on contract holder behavior. It's probably not reasonable to assume that everyone reacts rationally. There are going to be some people who, even though they're in-the-money, will have other reasons for taking those benefits. Also, your model points should include any hedges or reinsurance.

It's important to balance accuracy and run times. That's the struggle, because ideally you want to do a seriatim model, but right now our model takes almost 53 hours to run.

What I'm trying to do is emphasize that, again, you need the model assets and liabilities under stress, but I also want to point out that there's a lot to do. It's one thing to create the model, but then you have the work of making sure that those assumptions are right and reviewing the fund mapping. I don't know whether you've looked at the standard scenario yet. Earlier this year, I thought that the standard scenario was just one more scenario. It's not; it's a separate model. If you look at the documentation and the Academy report, there are a lot of pages there. Mike mentioned that there's a practice note that just got put on the Web site. That in itself is 100 pages. There's a lot of work to do, and if you haven't gotten started, you better.

There's also guidance on modeling assumptions. Most of my talk is going to be on the assumptions. The report requires that the assumptions be the actuary's prudent best estimate for C-3 Phase II and VACARVM. "Best estimate" is defined as the actuary's most reasonable estimate based on available information. "Prudent best estimate" would include a margin for estimation error. That margin should be larger the more uncertain the assumptions, and the margin should serve to increase the amount of capital held.

I might mention that the report gives you some methodology notes toward the back of the report. Methodology Note C3-03 deals with policyholder behavior. Methodology Note C3-04 deals with prudent best estimate on mortality. Margins should be smaller as abundant and reliable data are available.

Again, it's important to consider dynamic policyholder behavior because there are definitely assumptions, for example, partial withdrawals, that are going to vary by scenario. I think it would be inappropriate to assume that those assumptions are the same. You need to focus on the tail scenarios. We'll be doing that in our sensitivity testing. In fact, I mentioned earlier how long our run times are; I don't think it's practical in the sensitivity testing to always run the entire model. We may try some things like focusing just on the tail scenarios and looking at the assumptions that we're kicking out for lapses, benefit election rates and reset rates and making sure that we're comfortable with those. That's a challenge because in our case, like a lot of cases, those benefits are relatively new benefits, and we don't have much experience information.

We're starting with the pricing assumptions. I think that those are good assumptions because our pricing group worked with one of the leading consulting firms in coming up with those numbers, but I still want to look at what kind of results those are generating in those tail scenarios.

I want to stress, too, that it's important to make sure that you're gathering company information. We've tried to expand our experience studies to capture things like election rates going forward. There's also a need for additional industry experience studies, and that there's some work going on in that area.

I'd like to mention the practice note. As I said earlier, it's pretty detailed, but there are a couple of sections that are probably pertinent to my part of the presentation. Section 7 deals with modeling assumptions, and Section 9 is on the standard scenario.

Contract holder behavior has already been mentioned. It's an important consideration in your model. It encompasses such policyholder actions as lapses, withdrawals, transfers, recurring deposits, benefit utilization and option elections. Again, I recommend sensitivity testing. It's important to not assume that all policyholders react in a financially rational manner. I feel, too, that a lot of these assumptions can be dependent on the agent, so you might want to look the kind of trail commission you offer on your product because perhaps if it's not that rich, that would be an incentive for someone to lapse and move elsewhere.

It's important to exercise care in using a static assumption when it's reasonable to use dynamic or scenario-dependent assumptions. Again, that would be particularly true of partial withdrawal. It's important to make sure that your assumptions are consistent with the tail scenarios. That's why in our sensitivity testing we want to focus on those scenarios. I notice that this is redundant, but I do think that it's going to be important for companies to track experience.

I have an assumption checklist that I thought I'd run through. What I'm trying to do is talk about the assumptions that you might want to consider in the model, but I also am going to give you some input on the assumptions in the standard scenario. Those are defined in the document on the standard scenario.

First of all, on persistency, obviously you want to have assumptions in there for full surrenders. They should vary by product and market segment. Regarding partial surrenders, you want to make sure that you're capturing both systematic and elective withdrawals. We've enhanced that area on our lapse study in the past few years. We're trying to gather information not only on full withdrawals but also on the partial withdrawals and split them between free, nonfree and systematic, because those all come into play. Dynamic changes should be based on the degree of in-the-moneyness. In other words, the more you're in the money to have a living benefit, the more you would expect those lapses to slow down, and then they go all

the way to zero. Contract holder dynamics can also vary by type of guarantee. We have an older product that has a dollar-for-dollar option in it. That may have an impact on our lapses relative to newer products that have a pro rata GMDB.

The persistency assumptions for the standard scenario can include partial withdrawals only for living benefits or contractually required withdrawals. No other partial withdrawals are to be included. Lapse rates are to be created as full contract withdrawals, and they vary. If you have only a death benefit, you assume a 5 percent lapse rate during the surrender charge (SC) period and 10 percent thereafter. If you have any guaranteed-account-balance-type of guarantee that's in the money, you're required to assume no lapses. For the other guaranteed living benefits, you can assume a 3 percent lapse rate during the surrender charge period, and then after that, it varies from 7 percent to 2 percent, depending how much you're in the money. Also, you must "look ahead" to determine the in-the-moneyness on the guaranteed living benefit; that's one more little twist in the standard scenario. Jim is going to spend a little more time with the standard scenario in his presentation.

I already mentioned that there's a methodology note dealing with prudent-best-estimate mortality. That requires you to develop an expected curve based on available data. One of the challenges may be that your deaths may be underreported. We're looking at that. It's traditional in variable annuity contracts that often when the policyholder dies, the spouse may take over that contract. One thing that I'm a little concerned about is if they're not in the money, how is that tracked in our system? Is that tracked as a death benefit? It looks like it is, based on some work that we've been doing. That was a nice surprise, because I was worried about that. You must apply a margin to reflect data uncertainty. There are two types of margins. The mortality must be increased for uncertainty in the business segments and is referred to as a "plus segment." If it must be decreased, it's referred to as a "minus segment." Finally, your expected curves have to be adjusted for the credibility of your data. There's guidance in the methodology note.

On the standard scenario, it's required that mortality be 80 percent of the 94 MGDB Table through age 95, and then it increases by 1 percent a year until 100 percent at age 115.

Another important assumption is asset-based fees. One of our challenges is our unbundled newer products. Our fees are going to vary, depending on the types of guaranteed benefit riders that have been attached to that policy, so that's one more nuance in putting the model points together. We also have banded M&E fees. I assume that we're not unique there, so that's just one more model point.

With regard to mutual fund revenue sharing, again I want to stress that there's some guidance there. This is, I think, a big challenge. To include mutual fund revenue sharing, it has to be received and controlled by the company, there should be signed agreements in place (that includes internal funds), and you can include it

if it's not already accounted for as a company asset. We didn't have signed agreements on internal funds, but I lucked out there because the company was putting those in place this year for another reason. You might be lucky once in a while. Again, I want to stress that that's going to be a big job because, like a lot of you, we have several funds. The number is in the hundreds, and so there are a lot of revenue-sharing agreements. You need to go through those and make sure that you understand them. Typically there's some type of limitation, so you need to think about what you're going to assume long run because if the agreement is in place for five years, your model is probably going out 30 or more years.

Another assumption is expenses. It's important to include all your expenses: administration, overhead and marketing. We've been doing quite a bit of work in that area because a couple of years ago, we started on a project to calculate embedded value, and that has helped us here with our model because we have better expense units than we had a few years ago.

Your starting assets should equal your approximate statutory reserves. The working reserve in the projection (this is the same for both the C-3 Phase II model and the standard scenario) is the cash surrender value, or, if you have payout annuities without a cash surrender value, it's the present value of the payments.

Then there's benefit election. That's an important assumption on the living benefits. You need to think about how that's going to vary by market performance and the degree of in-the-moneyness. Our assumption is that the more you're in the money, the more likely you are to take advantage of those benefits. There are also going to be reasons why policyholders are not always going to take advantage of those benefits; they may need the money for another purpose.

Another assumption is benefit resets. A living benefit may have a provision such that every so many years, you compare the guarantee to the current account value, and if that account value is higher, you reset that guarantee. You need to make sure that you have that reflected in your model.

Let me summarize the benefit election assumptions for the standard scenario. It's 15 percent for an elective in-the-money benefit, except for a guaranteed minimum withdrawal benefit (GMWB), but only to the extent such election does not terminate a more valuable benefit. You have to assume 100 percent election at the last opportunity to elect that benefit. A GMDB is not an elective benefit. There are different election rates for the GMWBs that vary by attained age and whether or not the other guaranteed living benefits are reduced.

The Academy report states that transfers between fixed and separate accounts "might be ignored unless required by contract terms." What it's talking about would be dollar-cost averaging or some type of asset allocation program. The C-3 Phase II standard scenarios states that "no transfer shall be assumed unless required by contract terms." Again, it's talking about dollar-cost averaging or some type of

asset rebalancing. It's going to be important that you capture those. The standard scenario requires that transfers be in proportion to current allocation. We do have one product on which I do want to spend a little time as we further develop our model. It's a contract actively managed by a registered investment advisor, so I do know that there are changes going on in allocation. Unfortunately, it's a relatively new product, and we don't have a lot of experience, but we may want to try to capture that in our model in the long run.

I won't spend much time on fund mapping because Larry did a good job of covering it. You do need to do some fund mapping to reduce the number of asset classes in the model. It's important to review prospectus and historical information where you have it, but it's going to be complicated by limited history and manager changes. Our company, like a number of companies, has added a number of funds in recent years, so there are not a lot of historical data. You want to map the proxy funds. I'm going to try to take advantage of the expertise we have in our investment area because they know a lot more about this than I do. The standard scenario requires four fund classes: equity, bond (which would include money market), balanced and fixed.

I have just a few points on number of model points. It's important to balance accuracy with run time. Again, that gets back to, ideally, you probably want to do seriatim. I don't know if that's practical today with the computers we have, but hopefully one day it will be. It's important to retain the characteristics needed to model all material risk. That's another reason why we'll get back and look at the sensitivity testing. You want to make sure that you have credible assumptions at the cell level. As I mentioned earlier, the real focus is to accurately assess the tail risk.

Potential model point parameters can probably vary by company. The first one is product. That's needed to capture such things as surrender charges and M&E fees. Also, you want to have a breakdown by duration. We have one product where the surrender charge ends after eight years, and we've lumped some of those durations together after that point. However, you have to be careful there; that works depending on the type of guarantee you have. With the unbundled products, again, you're going to have multiple points for the various combinations of guaranteed benefits. You want to have model points that break down by degree of in-the-moneyness. It would probably be prudent to have more model points for the cells in the money versus the cells out of the money.

Issue age is another parameter. We have a number of age groupings into which we lump ourselves, but let's say that we have a grouping for ages 30 through 50. We wouldn't necessarily assume that all those people are age 40. For any cell that falls into that category, we look at the distribution in that cell. We hopefully get a little more accurate estimation of our ages that way.

Gender, obviously, is another model point parameter. Distribution channel is

another one because our company, like yours, has lapses that vary by type of market and distribution. As far as investment allocation, you could have a group of policyholders who are in the same funds, but we've broken those groups into cells based on the riskiness of their allocation. So even though someone may have the same funds as one other policyholder, if that person is primarily in the fixed account or a bond account, we're going to put him or her in a separate cell from someone primarily in equity funds.

Guaranteed interest rate is typically another model point. We do have an older product with a number of guarantees, and in some cases where those guarantees are close together, we're using an average guarantee for that cell. Then obviously there's reinsurance. Whether you have it or not would be another reason to have a model point breakdown.

The projection horizon should be long enough to model all material risks. It's important to recognize that some benefits may not be elected for several years. We basically started with our cash-flow-testing model, but the model we're using is a lot different from that. The cash-flow-testing model, if I remember correctly, went out 20 years, but I don't feel that that's long enough with C-3 with some of these living benefits. Another thing is that the further out I go, the more uneasy I feel about those assumptions because I'm making assumptions for a number of years into the future. That's another reason to have some margin. Obviously, the longer periods are going to slow your run times.

Another important assumption is future premium flows. That's going to be dependent on fund performance, value of options and also tax-qualification status because if you have money in the IRA or maybe a nonqualified market, those products tend not to have any premium flow. We have a lot of tax-sheltered annuity (TSA) business, and we do have historical experience there that we use for our model.

You have some options for discounting. The Academy report says that you can use implied forward rates from the swap curve as of the calculation date if you're not using an integrated model, or you can use rates generated from the model or swap curve if you are using an integrated model. It's important to be consistent from year to year. For C-3 Phase II, that discount rate needs to be reduced for federal income tax. If you're modeling assets, you need to make sure that you reflect defaults.

I have a formula for what's required in the standard scenario. Basically, the discount rate is based on the 10-year Constant Maturity Treasury (CMT) plus 50 basis points, but there's a floor of 3 percent and a cap of 9 percent, and then it's adjusted for the tax rate.

Larry mentioned that you can include hedges in your model. The costs and benefits of hedge positions currently held should be included. The strategy should be in

place for at least three months, or you have evaluated the implementation for at least three months. If you don't have one in place at this point in time, you can't put it in your model this year. Under the standard scenario, you include only actual hedges held as of the valuation date, and there's no credit for dynamic hedging beyond hedges held on the valuation date.

You have some options on the scenarios. The Academy provides the prepackaged scenarios and a picking tool. You can either use those or your own. How many of you are using the Academy scenarios? I assume that the rest of you are using your own scenarios then. It looks like the majority is using its own. As a general rule, you should process as many as possible. If there are fewer than 1,000, the actuary is strongly advised to check sampling error. If you're using your own, an important point is that it must be available in electronic format to facilitate regulatory review. The C-3 Phase II standard scenario defines an initial drop and return assumption (I think that was covered in some of the other sessions).

The full set of scenarios provided by the Academy satisfy the calibration requirement. As far as their monthly rates, you may want to look at the input for your modeling software because you may need to tweak them. There is a scenario-picking tool that you can use to pick the scenarios. The chart (see Gaule, slide 19) summarizes those prepackaged scenarios provided for nine separate account asset classes and 10 points on the yield curve.

Aggregation is important. High capital requirements of aggressive benefits can be offset by the requirements of less aggressive benefits. As I mentioned earlier, right now we're seeing no capital requirements because of this large block of business we have that has a very conservative guarantee. Aggregation allows for the effect of diversification by age, issue year, benefit type and fund choices. It's important to have more model points because obviously if you have too few model points, you may be getting the wrong result, as far as aggregation.

I won't spend a lot of time on sensitivity testing because I've talked about it a lot, but sensitivity testing is important for many reasons. If your experience data are limited, it helps you get your arms around what might be inappropriate assumptions. It also helps you better understand your business and what drives it. We've already given a preliminary report on our results to our senior management team, and we're learning a lot from this model. It's going to be helpful to us as we manage our business going forward.

There are some practical considerations. Distributed processing is important if your software will handle that. That's what we've been doing. We have a bank of 10 machines that we use only for our modeling. We can distribute our runs off to those machines.

For valuation date, you can use an earlier in-force date if that reduces year-end load. Jim is going to talk in his presentation about a couple of methods, the

interpolation method and the informed projection method, to project to valuation date. If you use an estimate at yearend, your electronic filing that's due in June should be based on your year-end results. If that result is 5 percent higher than what you had at year end, you're going to have to refile, so it's going to be important to try to have a good estimate of your year-end results.

I mentioned earlier that we built our model off our cash-flow-testing model. But it's a lot different, and it's a lot more robust. In fact, when we do cash-flow testing this year, it will be based on our C-3 model. Based on Larry's comments, I'm glad that we have beefed up our model. You may need to beef up your hardware. It's important for your modeling assumptions to be consistent with past experience and future expectations.

An important part of the whole process is that your model should comply with all applicable guidelines and standards of practice. The practice notes will provide some additional guidance. I already mentioned that those are out there. There is an actuarial memorandum required. You want to document your methodology, assumptions and sensitivity results. It's important not just to say what are those assumptions but how you got at them, how you validated them, and why you're comfortable with them. That's going to be a big challenge here. It's a big process for all of us.

MR. JAMES LAMSON: I'm going to be talking about the standard scenario for RBC. I have a couple of comments regarding the standard scenario for reserves, and then I'll talk about some practical aspects as well. I think that a lot of people are overlooking the standard scenario. Rather than just running one more scenario in your model, it's more like implementing AG 34 all over again, except on a more complicated basis. Because the stochastic scenarios tend to get everyone's attention, the standard scenario is turning out to be a real sleeper in effecting compliance with the new C-3 Phase II requirements.

As adopted, the standard scenario amount (SSA) is the amount to be compared against the portion of the TAR related to market risk, and that excludes any provision for interest rate risk in that TAR. The formula is: $SSA = \Sigma$ Working Reserves + ANR − (H + R). A last-minute change to the RBC instructions was made to change this from the AG 33 reserve to the working reserve. That provided significant relief, since the working reserve is equal to the cash value for deferred business and the present value of income for in-benefit annuities. "ANR" is the lowest present value of accumulated net revenue. "H" is the value of existing approved hedges, taken as the present value of after-tax cash flows less the value carried in the annual statement, which trims way back on the value ascribed to a clearly defined hedging strategy within stochastic simulations. Finally, "R" is the aggregate reinsurance, which is the net value of reinsurance that contains benefit caps or premium floors.

The ANR (see Lamson, slide 4) is equal to the projected margins less guaranteed

benefits in excess of the account value less reinsurance premiums net of benefits and all accumulated and then discounted at an after-tax rate (AR). That's derived from the 10-year Constant Maturity Treasurer rate plus 50 basis points and is not less than 3 percent or more than 9 percent.

It's important to realize that margins that are accumulated in the ANR do not take into account an insurer's actual expenses and are based on stated rates applied to the account values, which are projected independently of the ANR (see Lamson, slide 5). By the way, while I indicate at the bottom that the add-on for the fixed account margin could be zero, it's important to note that the New York Department corrected this oversight in its most recent draft of the reserve standard scenario, in which it allows an additional 40 basis points for the fixed account after the surrender charge period.

The account values then are projected using the stated gross rates stated less all applicable charges (see Lamson, slide 6). The fixed fund is to be projected at the larger of the guaranteed rate or 3.5 percent, whenever greater than the rate currently credited. A new feature is that these rates are stated as fixed rates rather than being tied to the 10-year Constant Maturity Treasury rate as in earlier drafts of the standard scenario. Equities are projected by effecting an immediate drop of 10 percent, followed by a first-year gross return of -10 percent and 3 percent thereafter. The bonds have no drop or first-year return and a gross return of 4.85 percent thereafter. The balanced funds have a 60/40 blend of equities and bonds. The fixed funds are projected using the rates stated earlier.

It's worthwhile to note that, with regard to standard scenario assumptions for GMWBs, these rates vary by attained age and by whether or not withdrawals, or GMWBs, affect other in-the-money benefits (see Lamson, slide 7).

What do you have to calculate under the standard scenario? It's important to understand that the standard scenario requires several different values to be calculated. The first and most important of these is quantity "A," which is determined by aggregating the accumulated net revenue across all contracts before determining the lowest present value, which allows positive ANRs to offset negative ANRs. After you adjust A for hedge instruments and aggregate reinsurance, the results are compared to the market-risk portion of the TAR, as I indicated earlier. Aggregation is not allowed for the current proposed reserve standard scenario; that has a huge impact on the results and is controversial.

Quantity "B" is also required by the standard scenario. It's determined by first calculating the lowest present value of the accumulated net revenue for each contract and then aggregating. Regulators intend to compare the quantities A and B to gauge the extent of the benefits of aggregation.

Quantity "C" is yet another value to be computed under the standard scenario. It's computed if you have run stochastic simulations on a model population as opposed

to seriatim. As with quantity A, it should ignore hedges and aggregate reinsurance, but it should also be done with the benefits of aggregation. You're to calculate, then, the ratio of A to C as a test of model fit. That's to be used by the regulators just to evaluate the quality of your model population. The ratio should theoretically be close to 1 for a "good" model population and projection.

Quantity "E" is just like C, except that it applies when your model population is derived from business in force prior to the valuation date. Quantity "D" is just like E, except that it applies when you've done your stochastic projections on a seriatim basis, such as may be able to be down to, let's say, 50,000 or fewer contracts under certain circumstances.

I've constructed a table (see Lamson, slide 11) to make it easier to understand which quantities you have to compute to satisfy the standard scenario. As you can see, what you need to report depends on two aspects of the stochastic projections. First, what is the date of the business in force used for the stochastic projections? Is it the valuation date, or is it a date preceding the valuation date? Second, are you running your stochastic projections on a seriatim basis or by grouping the business into model cells?

If you use the business in force on the valuation date to construct a model, you need to calculate A, B and C and compare the ratio of A/C to 1. But if you base your model on business in force prior to the valuation date, you compute A and B using the in-force as of the valuation date and compute E based on your model. You then compare the quantity A/E less S/PM to zero, where PM is the result of pain using the in force prior to the valuation date, and S is that result projected to the valuation date. Some of this will make more sense when you consider the methods that are available for trying to do some of the stochastic work prior to yearend.

If you do the seriatim projections using valuation-date data, you are rewarded by only having to calculate A and B, and you don't have anything else to do. Finally, if you do seriatim projections based on the in force prior to the valuation date, you do need to compute A and B as of the valuation date and D as of the in-force date, and then, again, you have to evaluate the ratio A/D minus S/PS (seriatim projection) and compare that to zero. All these required comparisons are tests of model fit. That was one of the original purposes for the standard scenario.

Let's talk about the total number of calculated SSAs once the reserve standard scenario becomes effective, assuming that you're building a model (see Lamson, slide 12). There will be three values to calculate for A: one for TAR and two for reserves, as they're done with different discount rates. Calculating B for TAR adds one more. Then for the annual statement purposes, for reserves, there would be two more calculations because you have to derive these values on a direct basis, ignoring the reinsurance. Then you have the illustrative values used for validating the model; there's one for TAR and one for reserves, so that gives us two more. The total ends up to be eight. You can see that there are a lot of different values to

calculate under the standard scenario.

I want to quickly go through some practical aspects. I'm not going to go through this "Do List" (see Lamson, slides 14 and 15). I had included this list in our May seminar that the Academy had on C-3 Phase II, and some people found the "Do List" to be valuable, so I thought that I'd put that in your hands.

Let's move to a suggested sequence for getting all these runs done that you'll make at year end (see Lamson, slide 16). First, you should probably run the standard scenario and then use its data—or at least tie back to those data—for helping construct a model that you'll use for the stochastic scenarios. Then run the standard scenario on the model population. In that way, you can verify that your model validates according to the regulators' measure before you launch the stochastic runs. When those are finally done, check the results. Finally, as a last step, compare the CTE-derived value with that from the standard scenario.

It is easy to develop a potential model population size that goes well over 50,000 cells, depending upon your business and the number of characteristics that you use for grouping. Also, the number of values for each characteristic may be different from what I have shown (see Lamson, slide 17).

I'd like to set the stage for discussing some of the trade-offs in processing by considering two different processing options for the stochastic model. The first one is a projection of one cell that can be done largely independently of the others (see Lamson, slide 18). Each model cell can be projected to the end of the projection period, such as 30 years. The results of that projection are retained in memory, and it goes on to process the other cells. Since that process uses little memory, a model population of 50,000 or more cells can be easily accommodated by the software. That doesn't mean that it will run fast, but at least the software will work.

However, if dynamic aggregate-level decisions or calculations have to be made periodically, such as setting credited rates for the fixed account, based on projected general account returns, each model point can be projected only to the end of that period, with all necessary projection information for that cell still stored in memory while other cells are projected to the end of that same period (see Lamson, slide 19). This results in a memory trap; you cannot process all the model cells without running out of memory, because of limitations of the 32-bit operating system. In fact, most projection systems will allow you to project a model of only maybe two to 6,000 model points in this case, but good simulation of the market risks under scope in the C-3 Phase II requirements will likely require many more model cells than this. If you are including interest-rate risk in your Phase II model, you must also do a good job of simulating fixed-account crediting rates and disintermediation risk. So we're left with some trade-offs to consider. One approach is to use the option suggested in Appendix 6 of the C-3 Phase II Academy document, which is to try to deal with interest rate risk separately.
I'd like to turn to the topic of basing results on business in force prior to the

valuation date. Early on in the VARWG, we considered some ways to shift some of that work from January backward into the previous quarter. There are some considerations that you should take into account in designing your own method, should you decide to do this (see Lamson, slide 21).

Our June 2004 report to the Life and Health Actuarial Task Force (LHATF), which you can access at http://www.actuary.org/pdf/life/varwg_march04.pdf, will give you some of the background of the two methods that we developed. One was the interpolation method. It attempts to build a relationship between the account values and a net-amount-at-risk calculation, similar to that under AG 34. You develop enough points prior to year end that you can interpolate a function that you can then apply to a net-amount-at-risk calculation based on year-end values. The second method is called the informed projection method. Using that method, you use your projection system to predict the amount and the characteristics of the business that will be in force at the end of the year, so you can run stochastic projections in mid-December.

Turning to the subject of auditing the stochastic projections, there are several capabilities that auditors and examiners should have available to them (see Lamson, slide 23). Many of them surround being able to trace a contract from the standard scenario file to its model cell and then being able to examine an Excel workbook containing detailed results for that cell, along with a way of validating the results back to those that were contributing to the CTE value.

The stochastic scenario projections involve billions of calculations, and it's incumbent on the actuary, I believe, to facilitate a review of these results by others, or else you run the risk of having those results be suspect. You need to provide validations to earlier results, and those must be easily done. Inspection of large volumes of data must be done fairly easily, and you should take advantage of every available technology to lessen the burden on those who check our results.

FROM THE FLOOR: Larry, you seem to indicate that the phase-in is applicable to everybody. But when I was reading the actual guideline, I thought that you had to be using this hedging strategy for the phase-in to be effective.

MR. GORSKI: No. The hedging is applicable to everyone. If you're hedging, you have the option of phase-in or not.

FROM THE FLOOR: So if you're not using a clearly defined hedging strategy, there's no phase-in?

MR. GORSKI: No. If you're *not*, you *do* have a phase-in. The language in the ACLI component of the instructions is a bit confusing. That's one of those things to which I referred earlier. If you are not hedging, you phase in. If you are hedging, you have the option of either phasing in or not.