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## Session 33PD

### The Risk-Based Capital C-3 (Interest Rate) Project

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Panelists: Robert A. Brown

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*Summary: The NAIC Life Risk-Based Capital Working Group has been working on modifications to the C-3 (interest rate risk) component of the statutory risk-based capital formula. Changes being considered may have a significant impact on the work of the valuation actuary.*

Mr. Larry M. Gorski: Today's session deals with the current NAIC project to improve the methodology for quantifying interest rate risk in the regulatory risk-based capital (RBC) formula. After some introductory comments by me, I will turn the session over to Bob Brown. Bob is leading the efforts of the AAA's Life RBC Working Task Force to assist the regulators in this project.

The peculiar feature of the current methodology as developed and adopted is that if an actuary strengthened reserves as a result of asset adequacy analysis, this action would in turn increase the RBC. This is a perverse result. If you increase the reserves, presumably you have a situation where the reserves and the supporting assets are doing a better job from an adequacy standpoint. Why should you be penalized with a higher RBC requirement? It doesn't really make much sense. Next, sound asset/liability management is not being rewarded. Since we are dealing with a industry-wide, broad-brush approach, companies that are doing a very good job in asset/liability management are not being rewarded in any way. Also, mismatches other than duration, for example convexity, are not considered. Other risks were not considered. For example, with the emergence of equity-indexed annuities (EIAs) and other equity-based-type guaranteed general account products, mismatches between the liabilities and supporting assets are not considered in the RBC formula. So, that gives you some feel for the current methodology and factors and the shortcomings with the current system.

Table 1 will give you some indication as to the overall impact of the RBC formula by component. What you see is a tabulation of RBC amounts for the life insurance industry as a whole by the various categories. There's a C-0 category that was not in the original formulation of RBC, but it could be added to the C-1 component to

give you a total amount for asset risk. We're talking about \$62–63 billion of RBC for that category. There's another \$17.5 billion for the C-2 insurance risk category. The C-3 interest rate risk category amounts to about \$10.9 billion. The health risk category comes to \$24 million. It's a very small amount. And, the so-called business risk or all other categories, the C-4 risk, is a little over \$3 billion. The number to compare that to, the denominator, when we start talking about ratios, is \$94.8 billion. That's the total RBC before the covariance adjustment. So, the interest-rate risk or the C-3 component as of year-end 1998 was about 11.5%. Comparing the \$10.9 billion to the \$94.8 billion, we're not talking about a major component of the RBC structure, but it's not insignificant. There is something there. Just for comparison purposes, the same distribution as of year-end 1991 is C-1 70.5%, C-2 16.1%, C-3 10.1%, and C-4 3.3%. My recollection is that 1991 was the year that was used for testing purposes. The formula, I think, went into effect in 1992 or 1993, but industry data for 1991 was used in the testing stage, and the C-3 amount, the component we're talking about, is basically the same. For 1991, it was 10.1%. For 1998, it was about 11.4%. The increase in the interest rate risk component is not due to any increase in risk taking by insurers in the interest rate risk area. It's due to the fact that companies probably have reallocated their asset portfolio and reduced the C-1 component somewhat. Also, the C-2 component, the insurance risk component, was modified in 1998 to bring in a factor for risk management on the health side. And so there was an overall reduction in the C-2 component. I think both of those actions probably contributed more to the relative increase in C-3 than anything else.

TABLE 1  
LIFE INSURANCE INDUSTRY  
YEAR-END 1998 RISK-BASED CAPITAL  
1,332 COMPANIES REPORTING

Component	Required RBC (billions)
Asset Risk-Affiliated Amounts (C-0)	\$18.1
Asset Risk-All Other (C-1)	44.5
Total C-1 + C-0	62.6
Insurance Risk (C-2)	17.6
Interest Rate Risk (C-3a)	10.9
Health Credit Risk (C-3b)	0.024
Business Risk (C-4a)	3.3
Health Administrative Expense (C-4b)	0.5
Total C-4	3.8
Total Risk-based Capital before Covariance	94.8
Total Risk-based Capital after Covariance	84.5

Source: 1998 Statutory Annual Statements

Now you have some feel for how the interest rate risk component plays out relative to RBC. The question is, "Why do the regulators desire to improve the formula

given the objectives of the RBC formula and the historical data on RBC?" Is it a reasonable request of the regulators to move in that direction? And is that request something that is going to bear fruit for regulatory efforts in general?

Our primary speaker is Bob Brown. Bob has been active with the AAA's Life RBC Task Force for five or six years now and has been spearheading the effort in this particular area. He knows more about this project than anyone else on the face of the earth. Let me give you some background on Bob. Bob is the assistant vice president and actuary with CIGNA's pensions operation, working on product development, portfolio strategy, and regulatory issues. His regulatory activities include reserves for guaranteed separate accounts, synthetic GICs, and RBC, as well as new regulations affecting qualified group retirement plans. Bob has been active with the Academy group for more than five years.

Bob will base his remarks on the final report from the AAA's Life RBC Task Force on the C-3 interest rate project. That report reflects two to three years worth of work. The report was received by the NAIC at their meeting a couple of weeks ago in Atlanta. For those not familiar with the NAIC process, what that means is that the product was, in effect, turned over to the regulators. It will now become a regulatory product. It was produced at our request and will become our work product. We, in turn, exposed the document for comments. The comment period has been extended to December 5 or 6. We gave everyone approximately two months to review the document and provide comments back to the regulators. At the December 1999 meeting the document and comments will be discussed.

Some regulators are strongly in support of this project. Other regulators, nonactuaries, are probably neutral at best and may not understand all the intricacies of this more rigorous type of approach. There are some regulators who, I think, are opposed to the idea of tinkering with the C-3 component. The original formulation of RBC intended the formula to be objective and based on annual statement information. However, to do justice to interest rate risk, one has to go beyond the annual statement. Some regulators feel uncomfortable in going beyond that original charge.

The report from the Academy includes not only the actual recommendations from the Academy group but a substantial amount of background and historical information. You'll find in the report several appendices, including a discussion of pilot testing that took place during the development stage; a document captioned "Frequently Asked Questions"; the actual changes to the RBC booklet that would have to be implemented in order to carry out this idea; and a discussion of the recommended guidelines and considerations in using the new methodology. And, with that, I'll turn it over to Bob.

Mr. Robert A. Brown: Larry gave some background for why the regulators came to the Academy several years ago to ask the AAA to refine the methodology behind the C-3 component, which is, of course, the interest rate risk component of the RBC formula. The Academy's Life RBC Task Force created a spectacular subcommittee composed of many talented actuaries who labored with me for a

long time. Initially, we considered, at a conceptual level, how to approach refining the current methodology. Then we had to deal with the practical issues of how to make this something that could actually work and be a part of the annual process rather than just a theoretically nice idea.

Basically, what we ended up with is to say that instead of the C-3 component of RBC being just what you get when you multiply these small factors by these reserve amounts for each category, it will now have three different parts, each one of which will work differently. The big change is in the first part, Part A. Our decision was based on the fact that something substantial has changed since RBC first came on the scene, and that is that asset adequacy analysis and cash-flow testing has matured. It has become a standard part of the way many companies are doing their annual valuation work. The cash-flow testing models reflect some very thoughtful work in terms of modeling, assumptions, and so on. This is the best work being done in terms of measuring interest rate risk, yet it was totally ignored when it came to setting RBC for interest rate risk. It seemed to us that we should capitalize on the work that was being done, those models that had been built, and that which was already in place to improve RBC.

We felt very strongly that we did not want to mandate companies having to start doing this work if they didn't do it already. On the other hand, if this was something that was being done as a part of the valuation actuary work and the asset adequacy work, then we wanted to capture and use it to refine the C-3 RBC measurement in that regard.

We then addressed the question, "Which products do we want to include in this new approach, and how do we want to do that?" We basically decided that for the most part the interest-sensitive products that we should be measuring were the broad class called annuities. This is the definition of annuities that we have in the recommendation, which is about as broad a definition of annuities that you could construct: "For this recommendation, 'annuities' means products with the characteristics of deferred and immediate annuities, structured settlements, guaranteed separate accounts, and GICS (including synthetic GICs and funding agreements). If cash-flow testing of debt incurred for funding an investment account is required by the incurer's state of domicile for asset adequacy analysis, it is included. Equity-based variable products are not to be included, but products that guarantee a bond index and variable annuity sold as fixed are if they are cash-flow tested." It is not just individual annuities. It is not just single premium deferred annuities. It includes deferred and immediate and individual and group, including both separate account and general account, as well as synthetic GICs and funding agreements and other things that work like GICs. Pretty much everything is included, as long as the testing and the cash-flow analysis depends only on interest rate variation.

For the purpose of this phase of our project we excluded EIAs and indexed annuities in general because we did not have a way to restrict which model we wanted you to use and which scenarios we wanted you to test. We did not want to delay this project. It had been in the works quite a long time already, and we knew that we

weren't about to have a quick answer to that. So, we deferred the things that depended on an index or on modeling common stock behavior to Phase 2 of our project so that we could move forward with Phase 1. Basically, annuities are pretty much anything you can think of along the lines of annuities, GICs, or structured settlements, as long as it doesn't involve modeling equity indices or equities.

RBC was intended to define capital requirements, which are adequate at the 95th or 96th percentile level. How are we going to get something at that general level of adequacy? Are we going to say to the appointed actuary you figure it out, and let everybody come in with their own answer? That wasn't what we chose to do. This is RBC. This is a regulatory requirement. This is something that is used to determine whether a company has adequate capital to stay in business. We felt that we needed to come up with a specific set of scenarios that would be used for the purpose of setting RBC. In doing that we had a number of technical challenges, one of which was to decide what kind of distribution function we wanted to use in the first place to generate the interest rate scenarios. One also has to think about how to disseminate those scenarios both currently and in the future. If we're going to be running a whole bunch of scenarios every year, and if some companies use September 30 for their testing date and others use December 31 for their testing date, some use quarterly rates and others use annual rates, how would this be put out there? We ended up with a computer spreadsheet. If you load in Treasury rates for the as-of date that you use for your cash-flow testing and tell it what rate frequency you want, it will provide all these rates.

The next question is, "How many scenarios do I need in order to get in the general ballpark for testing way out on the tails of a distribution?" We decided that you really can't get by with a random set smaller than 200, and even that's kind of pushing the limits a little. We also decided that we could not, as a practical matter, say we think insurance company actuaries should run 200 scenarios each year-end in time to get these numbers out in the spring. We didn't really think that that was a very acceptable thing in the real world. Again, we were trying to get an answer that was acceptable from a practical and a theoretical point of view.

Capitalizing on models that already existed was one of the practical aspects that we were focusing on, but another was that 200 scenarios are just too many. So, if we don't know how to use a random set of less than 200 to get an acceptably accurate answer but we know 200 is too many, what's the solution? It finally hit us that when you look at the 200, they are generally uniformly spread across a sample space. An awful lot of them are dull—they just don't go anywhere because they never really determine any of the measurements of bad outcomes. If you lose money at that, you'd lose money if rates stood still. They're just not stressful scenarios. If we could somehow throw away the 75% dullest scenarios and keep the rest out of the 200, we could get almost as precise a result, after recalibration, as we get from the 200, recognizing that these scenarios are not uniformly distributed—these are the 25% worst. We should be able to get almost as good a result by testing only 50 scenarios.

Our next challenge was to find the 50. We had already tested the 200 scenarios against a variety of different interest-sensitive products with a variety of different hypothetical investment portfolios. Some of them were nicely matched from a duration viewpoint and nicely laddered, but some of the others were really awful in terms of duration mismatch or other ill-behaved characteristics to make sure that these scenarios were measuring the right thing and that we were getting measurement results that made sense to us. This then turned out to be the testing platform because if these were the right 50, then by running these 50, taking the worst ones of those and determining something like the 95<sup>th</sup> percentile, recognizing that these results needed to be recalibrated for that, we should have gotten similar results to what we got with the full set of 200. That was our criteria to decide whether we accomplished the job. And they actually came out very well. We used those same interest-sensitive products, models, and portfolios, but we only ran the 50. Now, we cheated a little in picking the 50 because we looked at which of the scenarios were giving us bad results. We kind of knew that they should have gotten us fairly close, but they did anyway.

Now, one thing I haven't talked about yet is, "What are we measuring?" What does it mean to measure the capital requirements under these scenarios? This is not a term that is part of asset adequacy analysis. What do you measure here? On this one, to some degree, we were helped because that type of question had been posed when the original RBC formula was created. What is the standard? What is being measured? What is the philosophical approach to capital adequacy? First of all, we're measuring statutory solvency. We're measuring solvency as it appears in the statutory blank. We are measuring year-to-year results—it may all come out all right in the end 30 years from now but does the company go broke 3 years from now? We're looking at the year-by-year accumulated gain or loss under these scenarios on a statutory basis. What we're doing is calculating for each year the accumulated statutory loss for each interest-rate scenario for each product, if any, and then we're picking the worst one of those for that scenario for that product. For our purpose, the worst one is the one with the highest present value (PV) at time zero. So, it wouldn't necessarily be the year with the most severe accumulated loss if it were only slightly more severe than the previous year. Discounting it back might give you a somewhat less severe PV.

The next step is to look at the accumulated statutory gain or loss for each scenario for each of these interest-sensitive products. You rank the results and then take a weighted average of the results at the tail. Of course, if I have one product that behaves well when interest rates go up and behaves poorly when they go down and another product that behaves poorly when they go up and well when they go down, they can't simultaneously go both up and down. We allow the aggregation of the results for all the products in that universe so that when we are ranking the scenario-specific results we are ranking them on a whole company basis, not on a product-by-product basis, so there can be some offset there. We felt that it was important to do that because we know that in some instances companies will combine a short duration and long duration product into a single intermediate duration portfolio as one of the ways they manage their duration risk, so it was important to allow that sort of thing to happen here as well.

So, the final C-3 requirement is what you come up with when you take these 50 scenarios and run them for the Category A products, which are the annuity products and single premium life (SPL), which were being cash-flow tested anyway as a part of the asset adequacy analysis. This produces Component A of the three-part C-3 RBC result on this new or proposed basis.

There are other products that have some interest sensitivity that are not annuities. Many companies have some annuity products that are not cash-flow tested either because the company is not subject to asset adequacy analysis certification or the certification work is done by some other means than cash-flow testing. In both of these cases we were not intending to mandate that the company start building a new cash-flow model, so the products in both of these cases fall into Category B, "other products," and for these products what goes into the formula is the same factors with the same rules as under today's C-3. We're not changing that.

We added a third component, and this is new, which is in response to some concerns that regulators have had that in some instances some ill-behaved assets in an insurance company's portfolio are not being evaluated for RBC purposes. They are obviously being measured if they're part of the testing envisioned in Category A. But if I'm investing in Collateralized Mortgage Obligation (CMO) support tranches or interest onlys (IOs)—not to do any name calling, but assets that can surprise me a lot and can blow up on me under certain severe interest scenarios—shouldn't there be some way of picking up an additional capital component even if they are not supporting products being tested from an asset adequacy standpoint? One of the rating agencies has an algorithm for mortgage-backed securities that they've been using for the last couple of years. We were aware of that and looked at that approach, but that approach doesn't look at the impact on the statutory balance sheet on a year-to-year basis. So, that doesn't fit the format that's used for RBC work.

What we ended up with, after a great deal of thinking and debating, is that what we should care about is assets where if interest rates do a certain thing, the asset value can end up turning very quickly into something lower than it's being carried at on the statutory blank. Basically that means assets that can be called, in the broad sense of the word, at below the current carrying value. IOs are an extreme example. For a typical interest-only strip on a mortgage pool, the payments will cease tomorrow if all the mortgages get paid off tomorrow, so I can go to zero value practically overnight. A CMO that I bought at 102% of par and that I'm amortizing over the expected lifetime of the mortgage pool could go to 100% tomorrow if the mortgage pool paid off very quickly. So, rather than require that people do some sort of dynamic modeling of all those things, we developed a very simple rule—take the difference between what you're carrying it at now and what it could be called at, and your Part C component will be one-half of that difference.

We now have three pieces. We have the piece based on cash-flow testing. We have the piece based on the current factors applied to the products that are not cash-flow tested. And then we have this new piece based on callable assets. And that's it, except that we did not feel, and many others did not feel, very comfortable

just saying add A plus B plus C and you're done. For one thing, every time a major overhaul in RBC has been proposed in the past, there has been an attempt to look at the impact it would have on the total industry capital. Clearly, what's on the current RBC diskette does not allow anybody to figure out in advance what Part A of this new approach would produce. The data is just not there.

Meanwhile, we think a lot of companies are not yet in position to be able to do detailed testing on their own book to see what this new approach would produce for them. Some of the regulators were concerned about an abrupt change in the total industry capital requirement and what that might mean. What if everybody worked out to be zero? Would that really satisfy the regulatory objectives or not? On the other hand, what if everybody worked out to be five times what it is today? That might be kind of a shock, and it might not be an answer that would be acceptable. From my company's viewpoint, what if we worked it out to be ten times what it is today and I found that out a month before year-end? That might be a little bit hard to deal with as well.

We decided that a practical solution for that and a good test platform to have is to say, "Well, do this work, but your RBC won't be more than double or less than half of what it is today based on the current methodology. Do this work, but calculate it the old way as well. We will limit the official RBC to this range so it will not be an extreme deviation from today." We felt that was an acceptable middle ground for now. When we get the submissions that show how it comes out capped and uncapped, then that can be evaluated. Very likely that range can be broadened out at some point in the future if it produces a reasonable result. That limit needs to be understood as something that is probably temporary, although not necessarily so, but right now the recommendation does cap the overall calculation and puts a floor on it.

One thing I didn't mention back when we were talking about how we got from 200 scenarios down to 50 is that there was some information about a 12-scenario set. What's that 12-scenario set about? We've tried to do as much industry exposure on this project as we could for quite some time. We haven't gotten a whole lot of comments, but one comment we've gotten quite frequently is, "It's all very well to say we already have a cash-flow model. All you have to do is run a few more scenarios and see how it comes out. But the fact is for our company and with our CMO model running 50 scenarios, it really is a lot of work. It's such a waste because every time we do cash-flow testing it comes out that we're so well-protected that we just can't make ourselves lose money no matter what we do. So, what do you think you're getting out of this one?"

I guess not everybody agrees with the last part, but they do with the first. What we said is we don't think we can do a very good job of calibrating the tail of this distribution with less than 50 even with this clever idea of ours, but maybe we could find a set that is guaranteed to give you a conservative result. If you have a product that is not a very big piece of your total exposure anyway and it really doesn't matter if the value for that comes out a little bit high or you're just so well-matched that you just can't make yourself lose money no matter what scenario



you run, maybe we can say "Here are 12 really conservative scenarios and a really conservative way to get that weighted average; if you want to run just those 12 scenarios and live with what you get, it is less work."

We then went to work to find within that 50, in a certain sense, the worst 12. Of course, you have to realize what's worst for one product is best for another. So, you're trying to pick all the corners in some multidimensional sense. And, again, we took a hard look at which things were giving us bad answers for which products and portfolios and tried to pick one of this and one of that and one of the other to come up with a simple averaging technique on the two or three worst results to get the final answer.

In trying to make this as practical as possible we provided a procedure that gives a conservative result, but for my mainstream product it may give a bad result. I might not be able to live with that, but I have all these second-tier products, or well-protected products, where I'd love that. It finally hit us there's no reason to say that you can't use the 50 scenarios for some products and the 12 scenarios for others that will give you too conservative a result because the 12 scenarios are conservative. But you can do it where it doesn't matter much and it doesn't harm the total answer much, and do the 50 scenarios where the additional refinement is worth the additional effort.

So, we ended up saying, "OK, here's the 12. Here's the 50. The computer spreadsheet scenario generator identifies both the set of 12 and the set of 50. It identifies the whole set of 200 too, if you want to try evaluating your book across the whole curve. If you ask it to run 200, be patient after you push the button." Even on a Pentium it takes a while, but the answers do come out eventually. The approach then, is to generate the 12 and use them or to generate the 50 and use them. Now, obviously you can't aggregate the results of the 12 and the results of the 50 because there's no way to line them up, so you do lose some of the benefit of aggregation by using the somewhat simplified method. These were the things we tried to do to make this as practical as possible. It is clearly more work. There's no question that it's more work. But we tried to make the work only where it did the most good, made the most sense, and added the most value, and not everywhere else.

The other comment that came up a lot dealt with timing. We heard "Well, that all makes good sense, and I really can't tell you how you could get a refined number for this any other way, but you need to realize we end up getting those numbers ready for the printer about two days before they have to go, and you're saying we need to run even a dozen extra scenarios. I don't know how we're going to do that in time." Nobody seemed very interested in pushing out the filing deadlines. On the other hand everybody agreed that the deadline for the printer and the deadline for when numbers really go in are actually several weeks apart, and that's kind of where the timing problems come from.

What our recommendation ends up saying is that you have to do the work in time to do the diskette filing. The diskette filing actually is due at the same time that the

printed blank is due, but if you're not going to be able to do all that work in time to get it in the printed blank it's all right to put in an estimate for your RBC, except that if it turns out your estimate is seriously wrong in the sense of being too low, you'll have to re-file that page. There's only one page of the annual statement that has RBC on it, two numbers, and that page would have to be re-filed in your domiciliary state and with the NAIC if that number is seriously too low. By this I mean the total RBC is more than 5% too low, or the new, revised, higher RBC would put the company at a regulatory control level. Other than that, if you're within 5% or if what you have on the blank is conservative, you don't have to re-file, although you may. If it's too high, you might want to re-file, but, again, you don't have to re-file. By doing it that way it basically allows the scenario testing work to continue right up to the filing deadline with the possibility of having to circle back around on that one page. This seems as though it produces a fair amount of additional elbow room. People seem to feel like that's probably the best they're going to do.

I'll next discuss assumptions, benchmarks, certifications, and sensitivity testing. These were some of the key areas of discussion and debate in the process of developing the recommendation so far. Some of the recommendations have been implemented rather recently, so some of them are still a little bit warm around the edges. What we are saying about assumptions is that the assumptions in general should be the same assumptions, the same methods, and the same matching of assets onto the liabilities: the same everything as is used for the cash-flow testing in the asset adequacy analysis but with one caveat—and that is that the scenarios are more severe than those that are tested in the asset adequacy analysis. Because of this, the assumptions need to be looked at to see if they still make sense way out in the tail of the distribution.

One assumption that's been highlighted in particular is the need to cover negative cash flow by borrowing and then paying it back next year when cash flow is positive. It may turn out that it doesn't represent very much borrowing or very many years in a row of borrowing for the scenarios that are used for asset adequacy analysis. It's possible, though, that under some of these scenarios that it would represent substantial borrowing for substantial periods of time; in that case, one really has to look hard at whether it is likely that that amount of money at that lending rate would really be available under those circumstances. If not, then at least under those scenarios, negative cash flow may have to be handled through asset sales instead.

There are situations where the persistency assumptions, the lapse rates, may follow an exponential formula but with a cap that may occur close to the maximum that you get under the normal seven scenarios. It may turn out that under these more severe scenarios you're way beyond that, so assuming that lapses don't go up at all might be really hard to justify. So, again, the first time through consider what these scenarios look like, what dynamic assumptions are in the model, and whether they still make sense with the outliers. This is part of certification, which is in the recommendations, but I'll discuss this a bit later. I want to talk about benchmarks first.

One of the concerns that we've heard from some of the regulators all along is, "If we're using the assumptions that are used for asset adequacy analysis—the assumptions that are developed by the company's appointed actuary—doesn't that mean that two identically situated companies would probably have somewhat different numbers because their assumptions probably would differ particularly under these extreme scenarios to some degree? Shouldn't we worry about that inconsistency? Shouldn't we try to find a way to do a better job of measuring interest rate sensitivity that does not depend on somebody's personal judgment?" Now, the Academy's Task Force has felt strongly all along that there's no way we can write a set of standard assumptions that is so comprehensive that it will do a really good job of measuring the behavior of all these different kinds of interest-sensitive products with all different kinds of provisions, investment portfolios, rate strategies, and everything else.

We aren't that smart. We don't think anybody's that smart. We felt that trying to come up with a standard set based on C-3 calculations would lead to a distortion of the interest rate risk and would, in fact, force companies to choose between using the strategy that gave them the low C-3 component versus the one that minimized risk on their business. That would not be, in our opinion, a step in the direction of improving the regulatory framework or the environment for the industry. But the concern is certainly understandable and it certainly has merit, so for a while the proposed solution was to write a fairly simple set of benchmark policyholder behavior assumptions. This is not to say that this is what the C-3 calculation that goes into RBC would actually be based on, but once every few years you'd also have to run the benchmark assumptions and see how that would have changed the answer. If using the benchmark assumptions gives you different answers, your domestic insurance department might want to see why.

People occasionally have told us about a couple of assumptions from the standardized set that we left out, but that was about it. Anyway, that kind of missed the point. There was concern that some regulators might see those benchmarks as somehow or another better than the more carefully chosen assumptions that the actuary was actually using. That could lead to a lot of problems down the road.

It was decided that we needed to go back and take a harder look at certification. Now, this had always been a tender issue because, unlike asset adequacy testing, no appointed actuary who has any survival skills at all would certify what we came up with as representing a good measure of the 95th percentile. Secondly, predicting what will happen if that scenario happens is pretty tough because a lot of those scenarios have probably never been observed for some products. I could say by extrapolation and general reasoning that I think it would be reasonable for it to come out a certain way, but I've never once seen it. I could be wrong. I can't certify that this is a realistic expectation. Still, we think it's important that the appointed actuary take a hard look at what's happening here, so we chose language that focuses on the appointed actuary certifying that the assumptions used for these calculations are not unreasonable for the products, scenarios, and regulatory purposes being tested.

It's not saying this is what would happen or this is what happened the last time. Certainly it is not saying this is the 95th percentile capital requirement; it's saying I've looked at the assumptions and they don't appear unreasonable. By requiring this actuarial certification requirement to go in with the diskette filing and also requiring that sensitivity analysis under key assumptions be done and be available for regulatory review on request, we feel that this is far more meaningful both in terms of tying it into professional standards and tying it into the real product and the real issues that companies deal with than any arbitrary set of benchmarks. Even though this does mean that two identically situated companies will no doubt have somewhat different numbers, both of their numbers are probably going to be a lot closer to the correct C-3 amount than some arbitrary standard set of assumptions could ever produce; therefore, it's a question of which gets closer to the intended regulatory purpose and intended outcome. That was our recommendation. It's not one that everybody is really comfortable with. It's one of the things that remains an issue.

So, what is actually submitted? What is actually submitted is the RBC diskette, but now it will show the results of the scenario testing for Type A annuities and SPL. Also, it will pick up that C component if there are assets that are callable below current carrying value. There might be a need to resubmit that one annual statement page that has RBC on it if it was materially understated. I think that might actually happen occasionally. After the first year or so, I think companies are going to get clever at figuring out which scenarios are probably going to get them close to what happens when they run all 50. They are going to find ways to get pretty close in their approximation so as not to have to bother with that, but I'm just guessing, of course. So, that's the proposal.

I need to talk a little about sensitivity testing. That's part of the requirement under the current recommendation—sensitivity testing must be done and must be available for regulatory review, but the test results do not have to be submitted unless they are requested. What's actually submitted is just the diskette and the certification.

What's to come? Phase 2. We aren't done yet for two reasons that we can see right now anyway. One idea I talked about is that the range of 0.5 to 2 times is probably not permanent. If it looks like this is accomplishing the intended purpose, the results and the outliers seem to make sense and the feedback we get from companies doing this for a year or two is positive, why limit it to 0.5 to 2 times? Why not broaden it out? So, there will be analysis of that. The filing on the diskette is required to show both the results of the testing without the cap and then the capped results so that the information will be there to see how many companies were impacted by the capping effect—how many on the top and how many on the bottom. What would have been the uncapped result? This will allow the regulators to know which companies are affected by the capping rules and to discuss with them why that happened. Do they think that made sense? The Academy can't do that because that's confidential, but the regulators can do that.

The other thing in Phase 2 is what I also alluded to before: There's an increasing family of products out there with guarantees that depend on either the performance of a market index of some kind of a stock portfolio, whether it be in the form of a minimum guaranteed result in variable annuity (VA) contracts if it's held for at least so many years or it is an EIA that promises upside of 60% of the S&P and a downside of 3%. There are ways of managing and matching that type of product. There are ways to do that type of product and to have more latitude for things bouncing around along the way. The concept about running the scenarios, measuring the year-by-year potential losses and trying to put some metrics on it that approximates the 95th percentile, makes perfect sense, but we don't have the methods to model market indices, and we certainly don't know how they correlate with the interest-rate scenarios and so on. So, there's a lot of work to do there before we can go forward and say here's the answer. This is an important class of products. There's a lot of exposure out there, and it's increasing. It's important that this be done. We think this is still the right approach, but we think there's a lot of hard work to do before we come up with some standard testing scenarios; at this point we haven't even begun to do that yet. So, these are the two parts of Phase 2 we see: products that reflect index or market performance to some degree and the expansion of the range.

I think that's most of the proposal. It's been a lot of fun. We've wrestled with a lot of issues along the way and we'd like to think that we figured out how to come up with results that we think are credible in terms of accomplishing the desired result without being too onerous from a practicability viewpoint or from a timing viewpoint.

Mr. Mark Howard Press: In your discussion of annuity products you had annuities that were cash-flow tested. You then went on to say that in the event that you had annuities that were not cash-flow tested they were categorized as other. Is that correct, Mr. Gorski?

Mr. Gorski: That's correct.

Mr. Press: And then did you go on to say that the old approach would be applied? Is that what you said?

Mr. Gorski: Yes.

Mr. Press: Then it would just be the factor times the exposure on the balance sheet? Is that correct?

Mr. Brown: Plus the C component, if any.

Mr. Press: So, in light of this recommendation you don't feel that there's not a significant risk that for the products that are not cash-flow tested that the C-3 might be not in line with what other companies may be doing. I'm just afraid that there might be some skewing involved when you're looking at the results.

Mr. Gorski: First I'll give you the regulatory perspective on that question. Maybe Bob can talk about the professional standpoint. One of the constraints that we all had to live by in working on this project was that the asset adequacy analysis requirements were not going to be modified to put any additional requirements on anyone. We were not trying to say that some product that is not being tested should all of a sudden become tested strictly because of the RBC requirements. If there is a concern with a nonlevel playing field or something of that sort, the issue is probably more appropriately addressed in the asset adequacy analysis requirements. For example, will some insurers start using methods other than cash-flow testing when cash-flow testing should be the method used? That issue should probably be addressed in the asset adequacy analysis forum and not through language in the RBC. Bob, do you want to add anything to that?

Mr. Brown: I don't think I can add much to that. I think we had the impression, and it may be erroneous, that companies that were required to certify asset adequacy and had substantial exposures of interest-sensitive products were in general doing cash-flow testing. We were trying to capitalize on that, but what Larry said is absolutely true. We did not feel that we were the ones to say those who aren't should start. That should be a combination of either regulatory requirements or Actuarial Standards of Practice (ASOPs), not something that should originate from the RBC side.

Mr. Howard H. Kayton: What's going to prevent these 50 scenarios from becoming a standard such that when we submit cash-flow testing we're asked by regulators why we didn't use the 50 scenarios?

Mr. Brown: Should I answer this question?

Mr. Gorski: Sure.

Mr. Brown: That's a question that came up a lot in one of our other forums. I'm glad you raised it. Also, that reminds me that I never talked about effective date. That was the one thing I left out. We're proposing that this be effective on December 31, 2000. I've heard your question many times the other way around. Can't we use the scenarios that we use for asset adequacy to do this in some manner? These scenarios are calibrated to measure 95th percentile. These scenarios are much worse than what you should be used for asset adequacy because we're not looking at the typical percentile underlying asset adequacy, which is usually 75% or 80%. These are much worse. The worst 12 are really severe scenarios. Anybody who understands that these are calibrated to be way out on the tail would understand that one should not be setting reserves on this basis. This is for setting capital.

Mr. Gorski: Concerning the comment on the effective date, while the proposal from the Academy did contain a proposed effective date, the effective date really becomes a regulatory matter, and, as I said, we've exposed the document for comments with the comment period ending the beginning of December 1999. In order to make the proposal effective on December 31, 2000, things will actually

have to move pretty rapidly at the start of the next year. I think we have to have everything in place by the March meeting with final adoption of the instructions to the report at the June meeting, so there's really a small window of opportunity to get things completed for year-end 2000.

Mr. Peter Hepokoski: First of all, I think you're to be congratulated for the work you've done on a fairly difficult assignment. I think we're going to end up with a much improved formula. I recognize we're talking about the statutory RBC, but I'm just curious if you've had any interest or discussion with rating agencies. Are they looking at something similar for their RBC formulas?

Mr. Gorski: I think Bob will answer that question. As an aside, the idea of modifying a C-3 component was something I was pushing seven years ago. It wasn't until some of the rating agencies started to come out with their own attempts at trying to incorporate a more precise measure of C-3 into their own RBC calculations that I think the idea started to catch on. Now, whether rating agencies adopt our work or not I don't know. Bob, do you want to answer that?

Mr. Brown: We are presumably going to have walk-throughs with at least two of the rating agencies so that they understand what we're doing here and why we think this methodology is appropriate. What they do with it from there is unpredictable, but we think they ought to at least know what's going on and understand why we think that this is a good idea. Hopefully they will decide this is something that can be used somehow, but it's always a little hard to know.

Mr. Allan Brender: I have four fast points. One, most technical perhaps, is if you had negative cash flows. There has to be some borrowing. Should there be a borrowing cost which is in excess of the risk-free rate or whatever rate you're using in your scenario? I ask that because usually you will have to pay something a little bit higher. I didn't get the sense that that was in there. Second, when I was looking at your certification I found that the certification says that assumptions are not unreasonable—that's a little bit of fudging. I would think that better wording would be that assumptions used are appropriate for the circumstances of the product or something of that kind. There's too much leeway.

Mr. Gorski: While I'm a regulator with the Illinois Department of Insurance and I chair the NAIC Life RBC Working Group, I had a chance to sit in on many of the meetings of the Academy working group, and several meetings spent a considerable amount of time devoted to this topic as a whole and your issue in particular. My view is that since we're trying to quantify risk at the tail of the distribution for rare events, my sense is that the professional actuary was going to be dealing with circumstances where there may be very little, if any, experience, either personal or industry-wide, to try to quantify these events. While I think the preference was for more positive language, as you were indicating, the Academy Task Force seemed to be very reluctant to move in that direction. The language that you read was a result of the give-and-take process of finding something that was moving in the right direction but something that the Academy Task Force members were not opposed to.

Mr. Brender: Two more points. The third thing that I was going to bring up is because you have this question of probable assets, when you stop and look at some of the recent experience with liquidity, which is sort of like calls on the liabilities, I was wondering if you had thought about putting in something for liquidity. Usually it's an interest-rate problem. My fourth and last thing is a comment in regards to things like variable products, particularly when there are equity guarantees. There was a really interesting research seminar put on by the Canadian Institute but jointly sponsored by the Society and the Foundation where there were some really interesting papers presented. People may not be aware of that session. It deserves consideration because it could be of some use in tackling some of those problems.

Mr. Gorski: I'll provide comments on your last two points. On the modeling of equities, I know that some of the other Academy groups I'm working with are using the work product you mentioned. I had the opportunity to work in an Academy group dealing with VA guaranteed living benefits and benefits of that sort, and that group is very interested in the work that came out of that session. Generally, the way in which the Academy has been supporting the NAIC on issues like we're talking about here is it first tries to get work done on the reserving side so that if an agreement can be reached on a recommendation for statutory reserves for VA guaranteed living death benefits work can begin on RBC issues. So, both those groups will be looking or have been looking at the work that you're referring to. What was your other point?

Mr. Brown: Liquidity.

Mr. Gorski: Liquidity. That has always been a difficult issue for regulators. I think many regulators over the years, and I have to say myself included, have sometimes equated liquidity with interest-rate risk. I know I've made statements of that sort at meetings, and maybe Bob can express the Academy working group's perspective on that.

Mr. Brown: Well, on that particular issue it's true sometimes they are confused, and sometimes things that are called liquidity are really because the assets are underwater because of poor duration matching. That should be picked up by the kind of modeling we're talking about here, but it's also true that I may just have to sell off \$1 million worth of assets in seven days. For instance, I may not be able to get full economic value. We don't feel that there's any way to fiddle with \$90 billion of RBC formula to pick that up because we don't think that capital exactly solves it, and we don't think it should be combined with the other situation. If it is going to be addressed, it needs to be addressed as some sort of a liquidity tolerance or liquidity window or something like that. We have discussed it, but we've really said that just adding a C-5 to the formula or making it a part of C-3 doesn't really accomplish that objective. Do you want me to address some of the other points he raised? On that first question about what should we put in for a borrowing rate, you reminded me that I never talked about what we should put in for an earnings rate either. The algorithm defined in the recommendation talks about what discount should be used



for the year-by-year accumulated losses, but it doesn't talk about what should be used as the asset earning rate, except to say that you should look at the net earning rate after appropriate default. So, you shouldn't just look at gross coupons. For the scenario generator that I was talking about earlier, you put in Treasury rates and get out Treasury rates. One would assume you'd put some sort of a spread assumption on top of that based on the investment strategy and some sort of a default assumption based on the nature of those assets, but we don't spell that out. Similarly, we were emphasizing it's important and makes sense to drill in to make sure that what you are assuming happens when there's negative cash flow is appropriate so that the spreads in the borrowing rate will be reasonable. Certainly that should be part of what's being reflected in the "not unreasonable" certification. So, I do think that it's in there in just about the same way and for the same reason as what we assume for spreads on the asset earning rate. Nonetheless, it certainly is very appropriate to look at, and certainly the risk-free rate is not what it should be. This brings me to the other point on the language in the certification, and that is that we are expanding what's being asked of the appointed actuary here; we need to be sure that the ASOPs reflect that appropriately. It turns out that the ASOPs dealing with the asset adequacy work are already in the process of being reviewed and rewritten. Initial conversations with the Actuarial Standards Board suggests that the way to do it is to work within the standards to say that these principles apply for asset adequacy work and RBC testing under this new approach or something like that. You have a professional responsibility to do something that makes sense rather than just look at the numbers.

Ms. Regina Lisa Lefkowitz: I have two questions. I assume by SPL you mean single premium life. What happened to the rest of the interest-sensitive life products like universal life? The second question is about the scenario generator. If it is being calibrated to produce extreme tails, are you going to release a new one every year after the September rates come out since that's a function of volatility and the other parameters vary from year to year? Even a change in the shape of the curve is going to change what the generator produces.

Mr. Brown: Yes, single premium and the scenarios. Some of the areas where we spent lots of hours doing "on the one hand/on the other hand" and "if we package it this way, we have this problem, and if we package it that way, we have that problem" (1) had to do with aggregation and what products go into aggregation, (2) how new business is handled, and (3) which products should be tested. We are not measuring volatility in earnings. We are measuring losses. Only losses count. The fact that I have a product that some years makes huge gains and other years breaks even but never loses money gives me a zero here. So, if I have a very profitable accidental death product, and I aggregate it with my annuity products, I can probably lower my C-3. That doesn't feel right. That doesn't seem like it actually has very much to do with my C-3 risk. It seemed as though on universal life and things like that, if I looked at margin volatility on runoff and I assumed no new business and continued with the acquisition recovery charges and so on and so on, typically it would be very, very, very difficult to make it lose money but that it was common to generate really big margins to the point that some on our group were insisting that that's so unrealistic. Now we need to model new business too

because those margins are really available on a going concern basis. You wouldn't really stop selling your most profitable product. Modeling new business, on the other hand, goes way beyond the asset adequacy model and raises all kinds of assumption questions. Assumptions can be set to get more or less whatever answer you want. Since we are talking about adequate capital in the event of liquidation, it didn't seem like putting new business in was the way to solve the aggregation problem. A better way to solve the aggregation problem was to not make those products available for aggregation. And so for the same reason that we didn't think that products having nothing to do with interest rates should be aggregated in, we also thought that most kinds of life insurance shouldn't either.

So, why did we include SPL? We decided that it may just tip the scales the other way, so we left it in and took everything else out. We tried to balance off these various concerns and come up with a solution that we felt made sense. Briefly on the scenario generator, we are using longer term historical volatility, so we do not think we ought to be readjusting the volatility assumption every year based on the implied volatilities in the current option pricing or something like that. Similarly, we have a mean reversion on the interest rate, but it's mild and it's long term. Right now it would have us gradually moving toward a higher interest rate than today, but that by itself is very mild. It's really the volatility that drives the model. If we don't have an inverted yield curve now, which we don't, from time to time the model will invert the yield curve anyway in the future. If you have an inverted yield curve, it will tend to revert toward normal over time. We think that it's a pretty sturdy model, and if you input the Treasury yield curve right now it will give you a good pattern of stressful results. It picks the same scenario numbers each time because they maintain their basic character. The ones that are increasing continue to be increasing. The ones that are highly zigzaggy continue to be highly zigzaggy. So, we think it continues to be a good stress test of the various kinds of things from any starting point. By making it available in this manner, as a computer spreadsheet, means that it's out there already. You can try it out for today's interest rates before somebody pronounces what it is. You can try it out for various hypothetical situations and see what it would produce.

Ms. Ellen M. Torrance: We at GE Financial Assurance often do our cash-flow testing work with as-of-September models because all the actuary needs to do is give a yes or no answer. Yes, our assets are adequate to back the obligations or with x dollars more they would be adequate, but this RBC thing is looking for a specific number. Will there be any way that we can base that off of the September model, maybe prorate something up or down?

Mr. Brown: I'm glad you brought that up. Basically, what we're saying is assuming that the overall portfolio strategy and portfolio have stayed the same but your business has grown 5% or more, we're just saying if you're using September, then prorate it up or down.