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## **Session 14Sem Annuity Risk Management Seminar: Annuity Risk Management—Overview**

**Track:** Product Development, Risk Management,  
Investment, Financial Reporting

**Moderator:** Narayan S. Shankar

**Panelists:** Francis P. Sabatini  
Narayan S. Shankar

*Summary: Companies today in the annuity market, be it either in the fixed or variable product markets, are facing ever-changing economic conditions. The risks associated with these products are well known, and the techniques applied by many companies have helped mitigate these risks, and in many cases have found ways to improve profitability. This seminar takes a detailed look at the subject of annuity risk management and how this can be applied to new product development, as well as in-force product management.*

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**Note:** The chart(s) referred to in the text can be downloaded at:  
[http://handouts.soa.org/conted/cearchive/NewOrleans-May05/014\\_bk\\_new.pdf](http://handouts.soa.org/conted/cearchive/NewOrleans-May05/014_bk_new.pdf).

*This session introduces the subject of annuity risk management and presents the key concepts of this topic. An overview of current practices and best practices for annuity risk management in a changing and dynamic economic environment also are presented. Each major type of annuity product (variable, fixed and equity-indexed) is presented, with a focus on how companies today apply these risk management techniques to their overall product management strategy. The various types of risk to be managed also are discussed.*

**NARAYAN S. SHANKAR:** I'm the life-practice staff actuary at the SOA. Francis Sabatini is a partner at Ernst & Young, LLP, and the chair of the Risk Management Section Council. He has presented at every SOA spring annual and valuation actuary meeting in the last five or 10 years.

I'll speak first about some basic principles and concepts of risk management. We don't get a chance to get into these fundamentals in a typical SOA meeting. It's good to look at fundamentals. Mr. Sabatini will transition to that mode by bringing up the 12 most important issues to worry about in annuity risk management in the current environment.

My two main objectives –are to cover some basic concepts and principles and to discuss business risk. That area often gets short shrift in actuarial presentations, but I'll include it here for completeness. I'll spend some time on it because of its importance. It puts everything that we do in the actuarial realm into the right context. Keep in mind that there are business drivers for everything that we do, and the financial implications of our analyses draw much of their purpose from the business environment or the business risks that are present.

The basic concepts and principles that I'll talk about give a big-picture view from a 100,000-foot level. Risk management failure is often caused by missing something that was not picked up or by grossly underestimating the risk of something that actually was on the radar screen. A frequent reason that those things occur is not stepping back and looking at the big picture to see what could happen. I'll discuss those basic concepts. If you apply them consistently, you will be thorough. You will

not miss anything, and the result will be a very effective risk management program.

There are three main manifestations of risk. I'll talk about the considerations that go into evaluating risk. These are the things that you use to get a handle on the magnitude of the risk. I'll also cover analysis techniques. There are two major techniques that are used to analyze risk. These are applicable not just to annuities, but to a variety of products. They tie everything together. What are the actual things that you do to manage risk? What tools are available? There are just a few major tools. Almost everything that you do falls into one of these categories quite easily. The strategies for managing risk are the paradigms that we apply in a complete risk management program from beginning to end. I cover the paradigms, primarily, from the perspective of managing business risk or annuities. But the thought process, the way you go about it, those paradigms arise in actuarial risk management, as well.

The type of manifestation of risk drives almost everything. What consideration should you focus on? How should you approach the risk? The analytical technique you use is influenced greatly by the type of risk manifestation. The analytical technique you use and the applicable tools, as well as the appropriate strategy, all are driven the risk type. Often, multiple manifestations are present in a problem. Typically, different approaches are used to analyze and manage each. And that can be done fairly independently of each other. It's often a good idea to look at a risk in isolation, not just as part of a big mix of everything going on. By looking at it in isolation, you get some insight into whether you are handling that particular risk as completely as you need to. Often, risks are looked at in an integrated fashion. There are interactions that need to be addressed, as well. This isn't set in stone, but it's not a bad discipline to look at each manifestation separately. Effective risk management requires a mastery of all of these different kinds of manifestations.

Of the three risk manifestations that I'm going to talk about, first is random deviation, the routine fluctuations around an expected value. Suppose that you're expecting certain results, and there's a deviation. Do you know if that is because of random volatility, or is it because you figured your expectation wrong? That's not a

very easy question to answer. Quite often when I ask that question, I don't get a good answer, because people haven't measured what they expect the deviation would be if they had hit the expected value correctly when they built their model. So that's a very important question. It is the first one to ask. It gives you a handle on what you do with it. If it's just a routine random deviation, the way that you deal with it is quite different than if you missed your estimate.

The second manifestation is a systematic deviation from what you had modeled, what you expected. Like in annuity risk management, the words "systematic risk" are used frequently in the context of market risk. I'm talking about something quite different. I'm talking about a biased estimate of the expected value. You think that the mortality is going to come in at 3 percent, but the underlying mortality was actually 3.5 percent. It is a misestimate of what you should have expected.

The third manifestation is catastrophic deviation and extreme outcome, which is usually due to an aggregation of non-diversifiable and unhedged risks. This is what is currently in vogue. It's an important area in annuity risk management. It's the most complex and exciting area of risk management. It's one that actuaries are starting to get control over, because life actuaries haven't had to deal with that in the past very much. It's a type of deviation that's on the radar of casualty actuaries who frequently are dealing with aggregations of non-diversifiable and unhedged risks, such as in earthquake losses, floods and situations for which you have strong dependencies among the exposures. Life actuary is usually the only practice for which they really have had to deal with this in the past with respect to interest-rate risk.

For each of these considerations in evaluating risk, I'll talk about what type of risk manifestation it applies to most, as you try to get a handle on that particular kind of risk. Number of exposures is very basic in figuring out and evaluating the risk. When you have a large number of exposures in a case that has low dependencies among the exposures, you know that the risk is lower than if the number of exposures is small. That's the first consideration in getting a handle on the magnitude of the risk that you might be facing. All of these will help you get some sense of how big the risk is. It is important to figure out how big the risk is. Is it

something that's trivial or is it a major risk in the situation you're facing? The second is the dependency of the exposures, and that's critical for catastrophic risk.

How much data is there, and how applicable is it to the situation that you're facing? If it is applicable, how stable are the trends? Depending upon these factors, you may have a greater or lower risk. And the sensitivity to exogenous effects, such as the economy or regulation, is especially pertinent to business risk. Depending upon the uncertainties in these situations, you may have a substantial degree of business risk, rather than otherwise. In a multi-period situation, whether you have serial correlations is quite important in interest-rate risk, for instance. You may have the long-term average figured out quite well, but there might be high serial correlation from period to period, which is known to be a factor in interest-rate risk.

Information asymmetry is an issue that you face in underwriting. How effective are the underwriting tools that you have in place? Actuaries need to take a close look at exactly how underwriting is performed, because it is the key approach to reducing information-asymmetry risk classification. Getting a handle on the underwriting that's being done helps you understand what level of risk you might be facing. Also, how effective are the underwriting tools that are being used? The morale hazard (which is the effectiveness of tools to align incentives) is especially important, for instance, in casualty insurance, for which insurable interest is a lot more of an issue than for life insurance. If insurable interest is low, there might be high incentive to create losses instead of avoid losses. So the morale hazard is where the policyholder has an incentive to create losses rather than avoid them. Tools are used to align incentives between the policyholder and the insurer, including things like deductibles and limits.

Then you must consider options and the ease with which they can be exercised. Consider price consistency and whether there are arbitrage opportunities. If there is any under-pricing or mispricing, is there an easy way for that to be exploited systematically by a few people? This can result in very large losses if they're not avoided or forestalled. Are there theories and techniques available to model the risks? The more vague or lack of availability of good ways to model the risk, the more the exposure is. The excess points to whether this particular consideration is

a major factor for that type of manifestation of risk. You'll find that many of the traditional considerations are applicable to systematic risk. Some of these newer considerations that haven't been used or focused on as much by actuaries in the past are the ones that are applicable to catastrophic risk analysis.

There are two primary analytical techniques that actuaries have applied. One is the deterministic method with scenario and/or sensitivity testing. That's normally a good way to analyze situations for which you have well-diversified risks. The main potential is for systematic deviation. You don't have a big catastrophic potential and low overall volatility. When you have high overall volatility, a different technique might be important to apply. But when you have low overall volatility and well-diversified risks, deterministic methods have been effective and have been used for decades by actuaries. A lot of times, when models are built, pricing is done, and analysis is done, the heart of the matter and measuring what kind of risk you have is not in building the model and coming up with a mortality table or putting together the asset-share spreadsheet. Doing the scenario or sensitivity testing is how you understand if you have misestimated the expected result and the implication. That is a measure of risk.

In terms of how much you could have misestimated the expected result, that analysis is what you do during the various considerations that I talked about. That tells you, having made an estimate of something, how uncertain you are about that estimate or mortality or market return. That is the consideration that you should use—that level of misestimation potential—in sensitivity testing to see how much results might be impacted. The real analysis, in terms of risk, is in the sensitivity testing, not in the model building, at least not in the asset-share model building. In the model building of mortality rates, for instance, there is analytical need to get an assessment of the potential error in your estimate.

The other technique that is being applied more is stochastic modeling and simulation. This is applicable to catastrophic risks for which there are correlated risks and path dependencies. It is useful in analyzing the potential outcome, so you have high volatility in a multi-period timeframe. Even if there are not many dependencies in the various risks that you're looking at, high volatility itself is not

easy to handle until you do a simulation. It's useful in that context, as well. The results are sensitive to your inputs. It's garbage in, garbage out. That's something to keep in mind, especially when we are dealing with products for which we have little or no historical experience.

The behavioral assumptions are guesswork for many companies at this point. The results are very sensitive in terms of what you think that the withdrawal rates are going to be, etc. And the naïve model that has been used for a long time, especially in financial-market analysis for which you use a lognormal distribution, is fraught with potential problems, because it is known to reflect market returns poorly. The stochastic model selected, interest rate and equity market affect the modeling that you do. It might be quite important to try a variety of models; try a number of parameters to get a good handle on what the sensitivity actually is and what you're exposed to.

Everything that I'm saying about risk-management tools sounds basic. And that's what it is. It's something that you've been using for a long time. It's the sort of thing for which it's important to step back and be methodical. Really, the interesting thing is that there aren't many more. Everything that you do reduces to one of these. The first tool is prevention. In the context of insurance business, that is, generally, risk selection. You don't want to issue policies to someone who has six months to live. You want to prevent that by applying good risk-selection methods—limits, exclusions and covenants. In the context of operational risk, you want to have very thorough process controls. That way, in an operational context, you're not exposed to risks that you're not able to bear. That is one basic tool.

And the timeframe—this is a Bayesian approach to management. You limit your guarantee period in cases for which you have great uncertainty as to what the outcome is going to be. You monitor results and very quickly respond. This is important, particularly in business risk management for which there are tremendous uncertainties as to what sales targets are going to be, what the expenses are going to be, and so on. This is probably the main tool that actuaries have used for managing systematic deviations over the time that those techniques were applicable to the types of risks involved.

Diversification (which is reduce the scale and expand the scope) is another very basic tool. In the early actuarial exams, you concentrate almost exclusively on diversification and measures of volatility in a situation for which diversification is, primarily, the main applicable technique. In diversification, expanding the scope is to get more business when you have only a few risks that you're covering, and write more policies that are independent of each other. But reducing the scale is another diversification aspect that needs to be considered. If I have \$1 million to invest, putting it all into one stock is not being diversified. But if I invest in 100 stocks and reduce the amount that I invest in each stock, then I have a reduction in scale as well as an expansion of scope. I have applied both techniques to diversify.

The transfer of risk is pooling, which has been the primary insurance mechanism for centuries. That is where extreme risks are pooled by the reinsurer, for instance, in loss sharing. These are other standard techniques that are applicable, especially to catastrophic risk management and hedging, including crossing exposure and transferring it to speculators. Hedging is a particularly new thing. It's one that more insurance companies are using now. In a nutshell, if you have random deviation as your main concern, you diversify and focus on number of exposures. If getting your expected result correctly (certainty in data) is your primary issue, then you can handle that by prevention and timeframe management, which includes underwriting, contract design and experience monitoring. If catastrophic potential is your key issue, then you use these tools: prevention, transfer and hedging. Again, that reduces to underwriting, contract design, reinsurance and derivatives. That was a short overview of the things that you should think about if you design a risk-management program and analyze risk.

I'm going to turn to my second topic, which is business risk. Every industry faces business risk, though most of them don't face actuarial risks. Business risk can be reduced to three issues at the financial level. One is recovery of the investment capital. The money that you put into marketing or product development or systems and property, plant and equipment, that's investment capital. How do you get that back? That's money already spent.

The second major aspect of business risk at the financial level is coverage of fixed costs. This is money that you're going to spend no matter how many policies you write. The management of variable cost is the third main driver of business risk. Scale is a very important aspect of business risk management if investment capital and fixed costs are a large part of your expense infrastructure. If those two dominate, as they do for certain types of annuities products, it's an especially important thing to keep in mind. The key driver of business risk is the choice of strategy. What has a company decided to do?

Success in business depends upon two things. Offer products that people want and control cost. It's as simple as that. Offering products that people want is a matter of achieving sales targets and price targets. It depends upon pursuing the right opportunities. It sounds simple. Achieving expense targets depends upon developing key competencies and performing business activities efficiently. Who's responsible for all of this? Company management is. That's their focus. And all of the hard work that actuaries do, no matter how sophisticated our analysis, isn't going to help much if management is not pursuing the right opportunities or doesn't build the right infrastructure and the competencies and the expense framework. That's an area that is a big unknown in many cases. But that doesn't mean we should just cop out, because actuaries can be key contributors in helping their managements understand the business risk and the impact of their actions.

Actuaries have a unique understanding of the big picture, especially in insurance companies. Most of the professionals don't see how all of the different pieces fall into place. Actuaries are being called upon to demonstrate more business savvy, more business acumen and better communication skills. You've heard this especially in the last year or two. The image campaign is another area that tries to address this. Getting involved in looking at business risk, rather than just burying ourselves in the spreadsheets, is an important way that we can contribute.

Firms are more likely to fail due to business risk than actuarial risk. That doesn't mean that actuarial risks are less important. It just means that actuaries are doing a fantastic job at managing actuarial risk. At the slightest slipup that we make, the results are immediately clear. There are tens of millions of dollars of losses if

actuaries misestimate something or don't react fast enough. In fact, there are cases for which that has happened. To give management some credit, business risks are a little harder to analyze. There's less data.

How does business risk manifest? It's insidious. When actuaries mess up, there are large losses materializing very quickly, so you know it. But when something goes wrong on the business-risk side, usually it's the result of weaknesses in lines of business. Consistently, one line of business is showing losses. Five years go by. They don't seem to be able to do much about it. It never gets back on track. There are persistent losses. And after several years, you give up and sell that business off to somebody else, or you have a merger or acquisition or something. That's how businesses manage risk. And if you think back to what your own company did in the last 10 to 15 years, you'll see that this has happened a lot of times.

That's an overview of what business risk is. What are the relevant considerations, the kind of things to think about? To assess what the magnitude of the risk is, you go back to those considerations. What are you going to apply those considerations to? There are many things to keep in mind when analyzing business risk in a situation. What are the trends in customer needs and preferences, which create demand? How likely is it that people are going to want the product that you want to sell? Industry competition and substitute products, and so on, apply to the supply situation. How much is out there? Are you getting into a crowded marketplace in which there is a lot of stuff being sold, and you're just one more person in a commoditized situation? Consider the value chain of a delivery mechanism. How are you going to distribute this? Who's adding how much value in the chain? There are other issues, like regulatory or legal risk. And how good of an operation do you actually have in place? These are the considerations.

I'm going to apply this to a variable annuity (VA) to examine how business risk pertains to VAs. It's going to be a quick overview. What value does the VA promise the customer? It offers investment upside, downside protection, tax deferral, etc. What are the competencies that a company needs to have? They can manage new distribution capabilities, because new distribution outlets are typically the way the companies get into this business. Product development and marketing,

administration systems, and risk management are the competencies that are necessary to build. Risk management is a really important one, because it's not one of those things for which you can jump in there without knowing how you're going to handle the new kinds of risks that you're going to take on.

The revenue-cost structure is established through mortality and expense (M&E) charges, guaranteed premiums and revenue sharing. It happens on a recurring basis. These are annual or monthly collections tied to account values. That's one aspect of the revenue structure. For the cost structure, you have substantial fixed costs, most of which are incurred prior to sale. But there are some recurring fixed costs. The variable costs are commissions, mostly up front, depending upon the type of share you're selling. I'm focusing on what might be the most popular kind of product. The commissions are paid up front. All of the money has gone out the door before you collected a dime in revenues. And you set yourself up, in terms of revenues, to collect them on an account-value basis, which is quite volatile.

There are longer recovery periods through M&E charges and revenue sharing. Ten to 15 years to recover the money spent up front isn't totally unlikely. And the revenues are vulnerable to market downturn and policyholder lapse. These two factors may be correlated highly and are very path dependent. Even if the market is trending up due to this interaction, there are issues that are not well understood until you model them and test them. There is a lot of friction in the value chain. Typically, if you add it all up, about 3 to 3.5 percent is what the charges are to the policyholder every year. Think about who's getting value. About 100 basis points go to the broker for selling the product. Another 100 basis points go to the fund manager for moving securities around. And 100 to 150 basis points go to the insurer for adding value, because that's where you have product development and financing and guaranteeing, which is where the value is in the product. Finally, 50 to 75 basis points go back to the policyholder. That's the guarantee. Claims are paid.

If you think about it, there's about \$1 trillion of fund balance in the industry. That's probably not an accurate number, but I think that it's not too far off. And then there's about \$35 billion in revenue. Out of that, we pay salaries in the investment

industry of \$20 billion to the brokers and fund managers. And about \$5 million to \$10 billion is either returned to policyholders as benefits or paid as premium for hedging. That's another big chunk. The insurer is left with about \$2.5 billion in profit. I've been told that about 25 basis points after-tax margin is what, typically, VA writers are making, which translates to about 20 percent of target ROE. On the insurer capital, a big part of it is deferred-acquisition costs from all of those commissions paid. There's also risk-based capital. The irony about VAs is that insurers used to make a lot of money on spread profits. But those spread profits aren't there anymore in the VA product. Secure source of earnings was partly used in the past to fund acquisition cost. Now it's all done through a different charge structure.

There is a paradigm that is appropriate if you want to manage business risk well. Before you enter the market, consider the competition and the competencies. What are you set up to do? What can you do well? Then you qualify these outcomes, which is what doesn't happen in our firm. Strategic planning is often a "pie in the sky" exercise. Doing that well is important in order to have a program designed ahead of time for managing your risk. When analyzing sensitivity and designing a favorable revenue and cost structure, make the cost variable, as much as possible. Transferring risk up and down the supply chain and outsourcing are ways you avoid taking on more financial risk than you need to.

Use contractual techniques to dampen volatility in revenues and expenses. If tying everything to account values is not a good way, use other approaches, such as different kinds of shares. If you can, come up with a creative share structure that would sell well in the market. Integrate across products to dampen the cyclical effects of product balancing. Sales in VAs are going to be low when markets are down. That might be a time when fixed-annuity sales are going to be high. It might be good to be diversified across product lines and thereby dampen any excessive volatility in overall revenues. And then, post-sale, be vigilant.

**MR. FRANCIS P. SABATINI:** I have a theme: "Frank's Top 12 Annuity Risks." I also will talk about taking a leadership role in managing risk. I'm going to come at it from a slightly different perspective, creating a culture for managing risk. Risks

aren't the things that we normally think of. The things that will manifest themselves in the way of risk are the things that we don't normally worry about. The buzzword these days is "operational risk." I want to try not to lose sight of what annuity-risk managers should be doing to manage annuity risk in all the different forms, sizes, and shapes that it comes in.

Now, here are my top 12. Coming in at No. 12 is extended period of low interest rates and policyholder behavior. We've had a circular trend in interest rates for almost 20 years. Every time we think that they're going to go higher, they stay low or go lower. So we're faced with a minimum-guarantee risk. It's sort of like a slow death. Unlike most of the other risks that we face, they're not particularly event-driven. It's like having a leaky faucet drip on your forehead as you're tied down to a table. After a while, it just gets unbearable. We're at a pivot point, because if interest rates stay where they are, the situation is going to get worse. There's an ultimate level at which portfolio rates will go, spreads will get compressed, and earnings will be depressed. And if interest rates go lower, the possibility of even a negative spread might be possible.

How many years do interest rates need to stay low for the pain to become intolerable? If you don't know the answer to that question, from a risk-management point of view, you should go back to your jobs and perform that calculation. Policyholders have figured out that they have a good deal. You see that in the lapse patterns. We can hope for a rise in interest rates or we can think about what we should be doing to manage the exposure. You should be looking at risk-management programs that might include derivatives. I realize that buying derivatives in the current environment is rather expensive in an absolute context. But in a risk/reward context, it might be the appropriate thing to do. Of course, we're all issuing new policies with lower guarantees. But that doesn't solve the problem for the new business. In addition, a lot of the business that we have is running out of surrender charge. It makes the problem for a rise in interest rates a little more problematic.

We could extend duration. Some of us have survived by having longer portfolios. There are others that have gone short, anticipating a rise in interest rates. That

strategy has not been successful. My point is that if you're not quantifying the exposure, helping management understand the tradeoff between staying unexposed or staying exposed or doing something about it is key from a risk-management point of view. If it happens and you knew it was going to occur, and it was quantified, then you've done your job. At the end of the day, you either take the risk or you find that the risk is intolerable, and you do something about it.

No. 11 is a spike in interest rates and having to deal with producer behavior in response to that rise in interest rates. From a risk perspective, this is more exciting. If it happens, the consequences are going to show up quickly. We have an increasing amount of business that's moving out of surrender charge. We've pulled back, many of us, in terms of the amount of business that we're writing. From a rise-in-interest-rate perspective, this isn't helping much because, as time goes on, more of our business is exposed to unabated policyholder behavior. Of course, it's what the producer does with the policyholder that's important. So all of our assumptions about policyholders' behavior and what they would do when faced with a real spike in interest rates will be tested. Our assumptions—the 25 or 35 percent shock lapse and ultimate lapse-rate assumptions—are going to be tested.

More importantly, how our assets are positioned against the deferred-annuity liability, in particular, is going to determine the consequences. The key message is "measurement." You must measure it and communicate it to management in an effective way so that they understand the pros and cons of Strategy A versus Strategy B. What's the stress-test scenario? What if they spiked up 2 percent in the next 18 months? How many policyholders would elect to roll over into a new contract at a much higher rate? Of course, we have a buffer. Interest rates could move 1 percent, maybe 2 percent, before there was any mass exodus. But we need to start thinking in terms of that event, quantifying it, and thinking of ways to manage it and helping management understand the relative tradeoff of a derivatives-based strategy or even a reinsurance strategy to manage the risk.

No. 10 is regulation. The best example that I can think of, in terms of how regulation can take a product that you thought might have a chance at being profitable to turning it into one that's not nearly as profitable, is some of the events

around C-3, Phase II. I keep wondering, when it passes, what multiples are we going to be asked to hold? Are we going to hold 100 percent of C-3? Are we going to hold 175 percent of C-3? What is that going to do to the inherent profitability of our in-force products? What are the implications for fixed products? What are the implications of a principles-based valuation framework on all of our annuity products—C-3, Phase III, for our deferred annuities, for example, taking hold. Clearly, regulatory risk is a form of operational risk. One way to manage it is to not be overexposed. You need to start thinking about that as you go through your product-development process, particularly if it's on the near-term horizon. I certainly wouldn't want to develop product today and not consider C-3, both the reserve and capital implications in terms of the product-development process. That's only one example. There are many others, but this is particularly relevant for the annuity business.

No. 9 is credit risk. This isn't a new exposure. We've had it all along. Insurance companies have made money on credit risk for many years. In other words, the spread that you've gotten by investing in risky assets on a cumulative basis has far exceeded the losses that we actually have incurred. The real risk, in my mind, is that when the losses do occur (and there's enough history to suggest that they occur with some frequency, and there are different events that cause them), the key is to make sure that the risks that you incur materially aren't greater than the risks that everybody else incurs in the industry. We don't spend enough time on credit risk management. As actuaries, I think that we need to spend time understanding credit risk management — understanding the exposure, how much credit risk we really have on our balance sheet and how that might compare to our peer group, as well as understanding what risk correlations exist in terms of your balance-sheet exposure. There's some evidence to suggest that the companies that have fared better on credit risk, historically, are the ones that had a better understanding of how much contagion there was in the portfolio.

No. 8 is VA hedge programs for implementation issues. You really can't talk about annuity risk these days without talking about variable annuities. I'll be honest. There are a couple of VA categories on my list. And VA hedge-program implementation issues wouldn't naturally come to mind. But I believe that one of

the big surprises we're going to have in the next couple of years is that something will go wrong with the hedge program. I don't know what it is. I don't know what form it's going to take. Somebody will have a big earnings hit or a big financial outcome, because something went wrong with the hedge program. Implementing hedge programs means implementing a good control environment, good processes around the whole effort.

I don't know if it will be unauthorized trades. We could have a rogue trader. There could be valuation surprises. You could expect the value of the assets to go one way, and they don't. Hedging VA guarantees involves a very complex process. It is not simple. You're going to get movements in the assets that you're not going to understand. There's the skew and the "Greeks" and the "second-order Greeks." And it's going to surprise somebody. It's going to show up as an earnings surprise somewhere. The key risk-management action is making sure that you understand as much of it in advance of the actual event as you can. Do scenario analysis and analysis on the transaction, so that you understand that you're not going to get that kind of earnings volatility.

The other thing that I worry about is model accuracy. Most of these programs require you to do some sort of calculation to create a hedge target. If something is wrong inside the model, you're getting the wrong target, the trader is buying to the target, and it turns out that you under-hedged, you'll be concerned. There are a lot of things to think about in terms of the execution of the program. You need to do due diligence on it. You need to educate your management about the exposures. You need to take steps to minimize your exposure to those kinds of events. The less discipline around the program, the greater the exposure to an event.

No. 7 is VA hedge-program cost issues. Do you honestly believe that you know how much it's going to cost you? One of the key unknowns in the industry is the true cost of a hedge program. I think that we're going to get there. There are a lot of people who are working on simulation techniques that allow you to examine the cost distribution, reflecting all the trades and transaction costs and execution risk. But we don't have that right now. One of the real unknowns that we need to focus on is helping management understand how much the program costs. If you're a

"delta hedger," that's an even bigger bet, because generally, when delta hedging, you really are implementing a variable-cost program. If you're doing full Greeks, that doesn't mean that you've locked in the cost. It just means that you've reduced the variance on the cost.

The other thing that we need to worry about is that we can't have the tail wagging the hedging dog. There's a lot of activity surrounding hedging that's being driven by accounting considerations. We need to work through that, as well. One of the things that I worry about is, if volatility doubled tomorrow or if interest rates took a dive of 1 percent, what would you do? That's going to have a dramatic impact on the cost of options that people are buying. Would you raise your prices? How long will you go before you raise a price? Probably, as long as you think that the decrease in interest rates or the increase in volatility will persist. What's the strategy for responding to that environment? To me, that's a big uncertainty. We're leveraging the fact that volatilities are at a relative low and that interest rates are stable enough. We'd like them to go higher, but we could end up with a scenario in which we have dramatically increased the cost of hedging. And from a risk-management point of view, what is the strategy for dealing with that?

No. 6 is VA un-hedged exposures. VAs, for the most part, have a death-benefit un-hedged-exposure problem. From what I can tell, most companies today don't hedge death-benefit products. The trend is more toward hedging our living benefits. Staying exposed may be a profitable but risky option in helping management understand that the consequences of that are significant. I know that prior to the last few years, a lot of the business was reinsured. But more business is being written. Even if it's on less-risky benefits, that's still an exposure. It accumulates with time. Ultimately, you're going to have to address that issue, but it's a big risk. And as the base of annuitants gets older, the probability of having to pay a claim increases, on average. As annuity-risk managers, the question is what you should be doing to help management understand whether or not they want to stay "on the bed" or not.

No. 5 is VA policyholder behavior. From a financial point of view, it is probably the biggest risk that we face as writers of annuities. I'm indifferent to whether it's fixed

or variable. Although, on the variable side, it's probably the most significant. It's a valuation issue in terms of the value of the liability that we're going to hold on our balance sheet. It is also a hedge-program issue. You implement a hedge program against the GMWB benefit. The real question is, how many people are going to exercise the benefit and when? There's no data to support an assumption. I've suggested to the Risk Management Section Council that we undertake a research project in which we find a way to interview policyholders and ask them: If they were in a position and had the guarantee, what would they do under certain circumstances? We have no way of knowing. We've made some good assumptions. We've made our best-guess assumption. We have no way of knowing whether or not it's going to be liberal or conservative. One thing that I can guarantee everybody about their hedge programs is that you're either over-hedged or under-hedged. The thing to do is to help management understand the consequences of one or the other. There's no mitigation to one. The way to mitigate it is to not write the product and not have to implement a hedge program. But if you can't do that, you need to understand the risk. And there are tradeoffs. You can make a conservative assumption. It drives up the cost of the hedge program and ultimately may drive up the cost of the product. But there's some range that you have to work in, and you need to look at those alternatives. Of course, in looking at all of this, it impacts other things like valuation of liability, income volatility, the amount of capital that you're ultimately going to hold, and the amount of credit that you're going to get from your hedge program. It's a complex issue, and it's something that we should be spending a lot of time on.

No. 4 is concentration risk. What are the four things that American Skandia, General American, Mutual Benefit Group and Executive Life all had in common? Concentration risk. Concentration risk is really a risk, because it means having too much of something. This, ultimately, could bring your company down. Where is most of the production and the premium in the insurance industry today? It's in annuity products. It's not something that you should take too lightly. How do you manage it? You can limit the amount of business that you write in some reasonable manner, engaging management in a conversation about how much is too much, looking to diversify the balance sheet. Rating agencies are going to start moving toward a balance-sheet-based measure of capital. Concentration risk is going to

factor into that, as it probably does right now in terms of the way that they establish their ratings. Diversified companies have less concern about some of the issues that other companies have when they have a high percentage of their business in a particular product line or a particular guarantee.

No. 3 is operational risk through product design ancillary features. The best example that I can think of is the dollar-for-dollar withdrawal provision for guaranteed minimum death benefits (GMDBs). Somebody said that we needed to accommodate how partial withdrawals are handled on GMDBs, We did it dollar-for-dollar, not thinking that there was economic exposure. What are the benefits that we're putting into our products that somebody is going to figure out are exercisable later on? The best I that can tell, the dollar-for-dollar issue is not as dormant as most people might think it is. The benefit is being used. If you haven't measured the usage in your companies, you should do so. What process is in place within an organization to make sure that somebody doesn't write a policy or create a product with a feature that is going to create unexpected results and have a significant impact on the organization? In my mind, this is an operational risk that ultimately manifests itself as a financial risk. I have an associate who says that every risk is an operational risk, and there's some truth to that.

No. 2 is litigation risk. Right now, all of the lawyers are focused on what's going on with the attorney general in New York. We should all be happy. Let them spend their time doing that, because eventually they may come looking for us. One of the nice things is that they've tried in the past, and we've been able to fend them off. But all they need to do is win one, and it becomes an epidemic. Company practices around deferred-annuity-rate setting could be an issue. The one that I worry about the most is the policyholder class-action suit on GMIBs, saying that they thought that it was a guarantee of principal at maturity. "What do you mean I've got to buy an annuity?" All of a sudden, the margin that you had in the conservative annuity-purchase rates goes away, because some judge says that's not what the person thought they bought. And you've got to cash them out. There are other examples of that; I don't mean to pick on that particular product. Hopefully, that scenario never will occur.

As risk managers for an annuity operation, what do you do to prevent those things? In the example that I just gave, there needs to be a clear discussion from a risk-management point of view about that exposure, even before the product goes to market. Somebody should be looking at the product from that point of view, independent of the people that are developing the product (because you get too close to it), challenging how the product might be sold or used and to protect yourselves to put the appropriate disclosures in place. I know, it's an SEC-registered product, and they signed the disclosure and everything else. We'll see what happens when it ends up in a court of law. I worry about that one.

There are some others not on the list. Longevity risk is becoming an issue. Companies are starting to toy with the idea of selling longevity-based guarantees. There are a couple of products out there. For example, at age 65, we guarantee to pay you an income for life as an option under a VA. Another one that I didn't put on the list is the risk that we price something at 10 basis points when it should be priced at 30 basis points, GMDBs for example. Then we end up with a big block of business, and it turns into something else. That's somewhat integrated with the regulatory risk.

In my mind, the No. 1 risk is market conduct around distribution. It ties in with the No. 2 risk in terms of the suitability issue. It could be market conduct around replacements. It could be market conduct around age. It could be market conduct around anything. As risk managers, we have to think about what we are doing in our organization to have the controls or the processes in place to minimize our exposure to these kinds of risks.

**FROM THE FLOOR:** You said that you have to watch out for taking on more than other companies? Why is that important?

**MR. SABATINI:** For example, one of the things that credit-risk managers focus on today is this whole idea of industry correlation. You can have an exposure to automakers, but they're correlated with manufacturers of glass, the steel industry, and so forth. You could be overweighted in related industries. If there's difficulty in the auto industry, it could impact the other parts of your portfolio. The whole idea

is understanding the correlation among different types of industries. It's an industry-correlation issue, as well as how your business is distributed across different asset classes and ratings.

**GRAHAM IRELAND:** I'd like to put a slightly different spin on your No. 3, operational risk. In any of your work, do you deal with companies that are worried about operational risk from a technology point of view? In other words, they go through the trouble of launching a new product. They're selling it. They're administering it on an expensive and complicated computer system. And they find out, years down the road, that the benefits that customers are getting are not what was in the contract at all. They were something else, because the product hadn't been tested adequately or the people in the service center didn't understand what they were supposed to be doing or were doing manual work-arounds.

**MR. SABATINI:** That's an example of what I had in mind when I talked about company practices. If I understand your point, what you've told the policyholder is much different than what you actually administered. Then somebody says that they thought they got something else. The next thing you know, you have a class-action suit. You spend a lot of money in litigating the position. That's one form of it. I haven't seen that one, but I've seen some potential litigation. Somebody wrote a contract establishing how they will set their crediting rate. And then, they behaved differently. And somebody else challenged it and said that they should have gotten "x" dollars more in credited interest on the policy, because they didn't credit interest the way they said they did. It is the same sort of idea. What you do in practice is different than what somebody might interpret in reading your contract or your marketing materials. What are the controls and processes around that? The one theme I want to leave you with is that it's the operational things that are really going to bite you. You need to work hard in putting those procedures and control environments in place to minimize your exposure. At the end of the day, we'll survive low interest rates, even a spike in interest rates. We're doing well with hedging. We have a lot of the financial stuff under control. It's really the operational stuff that I worry about.

**FROM THE FLOOR:** I thought I'd just mention that sometimes you could have a pricing exercise that shows that a product is profitable over its lifetime, but year-by-year earnings could be very volatile, especially when you're hedging with derivatives.

**MR. SABATINI:** I don't disagree.

**STEPHAN J. GRUBER:** With GMIB approaching exercise and your dollar-for-dollar withdrawals, what's the status with viaticals and entering the marketplace?

**MR. SABATINI:** Is there anybody in the room who can answer the question? I'm not sure I'm up to speed on that, but that could make the list, too; the viatical exposure, the risk that somebody's going to buy out these policies. They have to be in the money first for them to be of any attractiveness. Imagine if you had 100 percent exercise on your block.

**FROM THE FLOOR:** I'll play devil's advocate. Both of you are preaching to the choir. I think virtually everybody in the room agrees that there are risks, but management doesn't always listen to what we have to say. After all, management makes the final decision on what we, as a business, want to do. In your dealings with this with your clients, what has happened when you have talked to management and they evaluate it but then go in a different direction. What's the role that the actuary should play in that kind of situation?

**MR. SABATINI:** That's a great question. My experience with management—and we're management, too—if they have all of the information at hand, anybody in the company can make a decision. I've been with CEOs that say they just don't think that's going to happen. Then, if and when it does happen, that executive will say that they made a bet, and they lost. Now, certainly, I've never met an executive that was willing to bet their company. Typically, I've heard this question: Is this something that could cause me to bet the company? That's why I was preaching the diversification tune earlier on. I think that when they have enough information, they make good decisions. If they go in an opposite direction, it's because they've decided to take that risk.

Companies are putting in tolerance and making some very concrete statements about how much risk they're willing to take. I think that we're still struggling with that, as an industry. That's, in part, what the whole ERM effort is about. How much risk is tolerable? A lot of public companies think in terms of 10-cents-earnings per share. They can't afford to take that. Or they can't afford to take a percentage loss in embedded value, and look at risk in that context. I think that when they're getting the right information, if they decide not to be as conservative as you might otherwise want them to be, at least they have the information. Generally, they don't have the information. They don't know it, and they're managing a company by gut.

I was with a CEO recently, at a presentation regarding risk in a particular line of business. That company had a typical interest-rate exposure, and the presentation was about interest-rate risk. It had the classic disintermediation "short straddle." If interest rates stayed within 1.5 percent of either side of where it was, it was okay. Otherwise, the world came to an end.

We walked out of the meeting. And the CEO said, "I don't know how to react to that, because they just showed me one line of business. We have five major lines of business in this company. If I looked at that exposure in the context of the entire company, I don't know what I'd do, but I certainly don't know what to do based on the presentation that was made today."

I think that, a lot of times, you need to think of your management in those terms. You need to help put it in context. Typically, they'll make good decisions.