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SESSION 3

Practical and Theoretical Considerations in Strengthening Reserves Based on Cash-Flow Testing

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PRACTICAL AND THEORETICAL CONSIDERATIONS IN STRENGTHENING RESERVES BASED ON CASH-FLOW TESTING

MR. STEVEN A. J. SEDLAK: I'd like to introduce the panel. We're going to try to deal with the practical and theoretical considerations in strengthening reserves based on cash-flow testing. The order of our presentation will be theoretical first and then practical. I will lead off in order to set some ground rules, define some terminology, and hopefully, put things in perspective.

To illustrate the need for perspective, I heard a story about a valuation actuary who was asked why the expenses on his valuation projections didn't equal actual expenses. The answer was that the difference was due to overhead costs. The next question, of course, was why wasn't overhead included? The answer was that surplus is supposed to handle those costs. I think for purposes of reserve adequacy that's clearly the wrong answer. Accordingly, defining our terms should be worthwhile.

The first presenter will be Ed Robbins. Ed Robbins is a principal of KPMG. He has given a number of presentations, and he will be speaking on some ways to be able to study the tail of the distribution of results. Following Ed will be Sue Collins. Sue is a consulting actuary with Tillinghast/Towers-Perrin. She will be giving a case study on an evaluation of a company that possibly was in a little bit of trouble. Then batting last is Vince Zink. Vince is vice president of finance of Ohio State Life. He supervises both actuaries and accountants, so this is someone we obviously have to accord a little bit of respect. He's going to speak on the use of cash-flow testing to justify the strengthening of formula reserves.

When we're talking about strengthening reserves or possibly destrengthening them, the key is reserve adequacy. In other words, if reserves are adequate, they're strong enough, and if they're inadequate, then we have to strengthen them. None of this is really rocket science.

First, I'm going to give you a definition of reserve adequacy. There are probably several definitions, and there might be as many definitions as there are people in this room. There's a question of

whether or not new business would be included, so I'll touch on that briefly, and then I'll cover the basis of the values that we utilize in determining reserve adequacy. I'll also cover what I call time issues. These are such things as the projection horizon and recognition of interim values. Finally, I'll discuss how you reflect terminal values, what should be included in this process and how you actually determine reserve adequacy.

Reserve Adequacy -- Future results from business will not consume any surplus. This definition of reserve adequacy basically says that the future results from the business will not consume any surplus. In the case of the individual who was fairly blasé about the overhead costs, his company was conceivably gobbling up surplus with overhead and would violate this definition. What are the consequences of this definition? Well, as I've said already, no surplus can be consumed. You can borrow it, you can use it, but you cannot permanently expend it or consume it. That's a fairly important point because there are other thoughts on this subject. One of these is that interim values would need to be included, but we'll get to that a little bit later.

One of the questions that comes up is whether or not one should include new business in determining adequacy. The standpoint of the valuation actuary is he or she is not typically projecting or making any assumptions as to the new business. We're not really addressing the adequacy of the reserves on the new business. We are, to some degree, relying on new business to the extent that we're worrying about cost levels. For example, if you chop your new business off immediately, you would have a situation where your costs would probably deviate significantly from what you have currently. If we get into things like dynamic solvency testing or dynamic financial condition analysis (which is its alias), then we would use the new business and reflect it in our projections.

Now what should we be using when we're making this test? What should we actually be looking at? We're testing statutory reserve adequacy, so GAAP really doesn't match very well. Market value measures might work if we could define liability market value adequately. However, in my opinion we can't, so you should be using statutory values in this process. To do otherwise will

create a disjoint between what you're trying to test, your *statutory* reserve adequacy, and the measurement that you're using.

Time issues concern such things as reflecting interim values, the point of measurement, and the projection horizon. Under the adequacy definition that I utilized, you don't use the interim values because you're permitted to use the surplus or borrow it for a while, but then you have to return it. The philosophy here is to mature the policies, or at least to get them through to the end of some period of time, generally most or all of their lifetime. My interpretation of the Commissioners Reserve Valuation Method (CRVM) and Commissioners Annuity Reserve Valuation Method (CARVM) is that this is what is intended. There may very well be other opinions, and we can probably get to them in the question and answer session.

This definition also avoids what I call the early duration loss problem. An example of this would be a block of newly written life insurance business. Generally, there's a fairly high initial commission, and neither the premiums nor the commissions on the first year basis have been paid through fully. What you'll see then is typically a negative number in the first calendar year following the valuation date because this commission flows into earnings. If you looked at interim values you might say the reserves are inadequate. You can aggregate or do a number of things to avoid this particular issue, but not using interim values in the first place gets you out of this situation altogether.

Avoiding interim values implicitly assumes that the interim needed surplus is available. It's clearly less conservative than looking at the lowest value that you ever get. Alternatively, you can change the adequacy definition and refer to interim values, but then you're removing some management discretion. Phrased another way, you're putting another constraint on management because of the fact that they have to now ensure that there's enough reserve in one way or another to support those interim losses.

The point of measurement is the date at which we measure adequacy. Many companies use an accumulated value of surplus. You can do this, but then you have a question to answer: What does a negative value at year 20 mean in terms of reserve strengthening today at the valuation date? Another question also arises. If you have a block of negative accumulated value on a 20-year horizon and another block of structured settlements with a positive accumulated value after a horizon of 40 years, how do you add these two values to demonstrate adequacy?

There may be other answers, but I think it's probably better to use the present value. The present value should be scenario dependent. The accumulated values and the testing is scenario dependent, so it doesn't make sense not to be scenario dependent when you compute the present value. I think the theoretically correct answer would be that your discounting should be based on what any extra current reserve would be invested in.

Horizon should be determined so that the business remaining at this point is immaterial. Now what does that mean? There are all sorts of definitions you can use, and I'm not going to say any one of these is correct. It's somewhat of a judgmental process, and I think it should best be left to the valuation actuary with the one caveat that you should be consistent in how you determine the materiality.

Let's move on to how to handle terminal values. If they are really immaterial you'd ignore them. Another alternative is to use terminal market values. However, you'll need to compute a market value of the liabilities which is somewhat of an intractable problem, at least it is now. Discounted cash flows and surrogates such as asset book values or cash values are things that are often suggested. One thing you have to watch out for with some of these surrogates is that they don't always match your overall obligations. For example, structured settlements or term policies have no cash value, but there may be a substantial value of the liability remaining depending on your horizon.

What items should you include in your cash-flow testing? Include anything and everything that contributes to the future results. My story about overhead costs is relevant here. Other items include any material optionalities that happen to be contained in the assets or in the products. All assumptions should be reasonable, should reflect the current experience, and/or the current operations.

You may use trends that are expected to continue. My personal opinion is that you can only recognize future actions that have been agreed to, so things such as a plan that hasn't been adopted should not be reflected. Actions should be within your capability. If you can't do it, it's pretty unreasonable to reflect it in your cash-flow testing. Such activities should be in place or adopted or agreed to at a high level. A good rule is that future actions can be taken into account if it looks like there's a reasonably good probability that they will be implemented.

You have to restrict yourself to doing, not dreaming and planning, not predicting. As an example, if you have a proposed hedging program, you probably wouldn't want to include it. However, if it is in place or it has been moved along to the point where you can really say with a reasonable degree of certainty that it's going to be implemented, you could include it. Thus, if you posit a future investment strategy that eliminates all negative scenarios, you really can't assume it in your cash-flow testing unless you can say what it is and that you're actually going to adopt it.

No reserve can protect against all risk so we need to ask: how much reserve is adequate? Another form of this question arises if some of your New York Seven scenarios are negative. A brief answer to this is that you make a determination of what kind of odds or what kind of comfort you want to accept. In other words, the reserves and the underlying assets are supporting the business some percentage of the time. Let's call this percentage a comfort level (you can call it anything you want to). I'd steer away from the term confidence level because that has a different meaning in statistical terms. Numbers that I've heard in this regard are from 75% to 85%. In other words, the odds range from one in four to about one in six that some surplus will actually be consumed. This takes the

position that while you can't totally guarantee it, you're trying to shoot for a fairly good probability that you're not going to eat up any surplus.

Now this particular answer says that the New York Seven scenarios are not enough. It also says you're going to have to do something using stochastic scenarios. If you look at a bell curve distribution, it says the valuation actuary is fated to dwell on the tail of the distribution of results.

Now we must generate random projections. That's a lot of work, especially if you are under the gun and have time constraints. We need enough projections to describe the tail of the beast. We don't actually need to know or look at the rest of the distribution. All we have to be concerned with is the disaster scenarios.

The first question to answer is: What confidence level do you want to have so your sample, as embodied in these random scenarios, will adequately describe the tail? Again, you don't have pure certainty. The next thing is to choose the comfort level. The more time you have, the more scenarios you can run in order to get a better description of the tail. More confidence in results requires a larger sample and more scenarios. If you chose a higher comfort level, you're farther out on the tail. Again, this requires more scenarios.

One little constraint to keep in mind is that you probably want to keep the confidence level higher than your comfort level. I don't think it makes much sense to say something like, "My comfort level is 80% and my confidence level in it is two-thirds." This sounds like a contradiction to me.

I have a couple of methods for choosing scenarios which I'll describe. One of them is brute force. This is to "simply" run enough scenarios to describe the tail with a high confidence at the chosen comfort level. Table 1 shows the number of scenarios needed to obtain the comfort levels at the confidence levels shown.

TABLE 1
Approximate Number of Scenarios Needed -- Lower Confidence Levels

Comfort Level	Confidence Level			
	90%	95%	98%	99%
75%	25	30	35	40
80%	35	40	45	50
85%	45	50	60	65

This will give you the results you need to have as far as reserve adequacy. The methodology for doing this is to take the results of your projections and rank them from worst to best. The numbers in the above table were based on using the fourth worst result to determine adequacy. The reason for this is, if you were to use a lesser number, there's a very high probability you'll overestimate the amount of strengthening you'll need. Quite frankly, I don't know what this probability is. I've asked that question and the answer seems to be that this is one of those rules of thumb like "40 is a minimum size sample to get the average."

Anyway if that result is positive, you have adequate reserves, at least at the comfort level you chose. If it's negative, you're inadequate by approximately that amount. To determine the amount needed to strengthen reserves, it's not strictly accurate to use the absolute value of that negative number because more reserves will generate more cash flows, and that will change your results. If you have time, a more accurate answer can be obtained by assuming your initial reserves increase by this amount and then rerunning. If you don't have time, the initial approximation should be reasonably good.

An alternative method is called graduated density functions. Here you fit a smooth curve to the results, try to estimate the probability density, and then determine where you are on the tail. This is what Ed is going to discuss. A third method is to use representative scenarios. These are scenarios that are chosen to represent groups of similar scenarios. Finally, there are scenarios based on low discrepancy sequences. These are marvelous, wonderful, theoretical creatures chosen to most

uniformly fill a space of possible scenarios. I'm not going to comment anymore on these because I don't know that much about them other than they're out there.

Now some caveats for this process. As I said before, we have many assumptions in our cash-flow testing. Your scenarios should be realistic. There's much work going on to try and find random scenarios that at least are statistically related to what has happened historically. We also have the fact that we're not generally modeling the C-1 and C-2 risk. Thus, the comfort level may not be representative except insofar as a pure C-3 risk. Finally, all of these tables and methods in no way eliminate the need for judgment and good old common sense.

I thought I'd also give a little comment here on reserve adequacy versus surplus adequacy. A definition of surplus adequacy is the future results from your business will not use or consume more than total surplus. In other words, I won't run out of surplus at some point in the future. It's interesting that this definition is in one way weaker than reserve adequacy because it will actually allow you to consume some surplus.

However, it's a lot stronger in another way in that you have to reference interim values. If I run out of surplus in year seven, the game is over. It doesn't matter if I get it back. I have a problem. I'm probably going to be taken over by my state of domicile, so I have to do something to avoid that. Now it may be that if surplus will come back in the future, the rehabilitation will be relatively easy, and the guarantee fund assessments will be relatively small. However, rehabilitation still is a problem for the existing management of the company for obvious reasons. Thus, we'll probably want a much higher comfort level. Looking at this another way, I don't think you want to go in and tell the president of the company or the board that you have a one in six chance of going broke sometime in the future.

You are farther out on the tail if you increase the comfort level, so under the brute force method, for example, you're going to want correspondingly higher confidence levels, and therefore, you're going to need some fairly heavy scenario testing. I would say, incidentally, that 95% is approximately the

level that is being looked at in conjunction with risk-based capital (RBC). The number of scenarios needed at various combinations of these higher comfort and confidence levels is shown in Table 2.

TABLE 2
Approximate Number of Scenarios Needed -- Higher Confidence Levels

Comfort Level	Confidence Level		
	99%	99.5%	99.9%
95%*	200	230	260
99%	1,020	1,100	1,310

* approximate RBC comfort level

I have one final point. Reserve adequacy can influence surplus adequacy. Obviously, the stronger reserves you have, the less likely you are to dip into surplus, much less consume it. However, the opposite is not true and surplus adequacy does not really guarantee reserve adequacy. Thus, I can compare RBC to surplus and get a very nice ratio. However, if my reserves are basically inadequate relative to my assets and liabilities, I can still have a need to strengthen reserves.

MR. EDWARD L. ROBBINS: Thank you, Steve, for doing such an excellent job of explaining how difficult a subject this is to get your arms around. Steve called me about three months ago and asked me if I had something worthwhile to contribute on this subject. That was kind of a tough question, but I had just finished up a project that I thought could contribute to some clarity on the results of cash-flow testing. We did a project that basically spoke to the interpretation of cash-flow testing results and, as Steve indicated earlier, it basically deals with fitting your results to a smooth, continuous probability density function.

Let me ask two questions first. I'm using Steve's terminology of comfort level, because I think that's probably a pretty good indicator of where we want to be. First, what should our comfort level be? Second, how credible are the results that we're seeing with respect to that comfort level? Put

differently, what is our comfort level with respect to our estimated comfort level? It's kind of "comfort level squared" or something.

In my experience, a significant portion of valuation actuaries are now doing stochastic cash-flow testing in addition to the required scenarios and in addition to other deterministic scenarios. Just for your information, the Academy Risk-Based Capital (RBC) Task Force is now looking extensively into use of stochastic cash-flow testing, to get a better handle on the C-3 risk component of RBC. Many of you believe, as I do, that the C-3 component of the current RBC formula is woefully inadequate to determine the C-3 risk. Meanwhile, there's a body of information that most actuaries have now developed that gives a far better handle on the C-3 risk than the simplistic formulas in the RBC formula.

What is the difference in results between deterministic cash-flow testing and stochastic cash-flow testing? Very simply stated, deterministic cash-flow testing tells you in theory what would happen if this particular set of input went in. Stochastic cash-flow testing, on the other hand, gives you all those old Actuarial Exam part two favorites of expected values, standard deviations, variances and, most of all, it attempts to give you the entire density function.

One of the major problems with stochastic cash-flow testing as I've seen it applied is that it has been misapplied. I'll give you an example. Ten years ago I was at a professional meeting and somebody was giving a presentation on the results of stochastic cash-flow testing. He had 40 scenarios that he had run and three of them were failures, i.e., showed negative results. He went on to talk about the expected value and the standard deviation of the implied distribution. He looked up a table of normal distribution values and figured out the number of standard deviations away from the mean that zero point was. He then concluded that the probability of failure was 2.3% based on the table. The problem with that logic was that three scenarios out of 40 had failed. That's 7.5%, not 2.3%. Anyway the point is, it's often more difficult to get your arms around what the probability distribution really is than meets the eye. And the variable is probably *not* normally distributed.

I think it boils down to basically two questions. First, what's the best way to interpret the results? In other words, how do you look at the results and make real conclusions and make management decisions? Second, what's the best way to design the study to get credible results, so that you can believe in what you're seeing?

We're not at the point yet where we're comfortable with our assumptions or the number of variables that we're actually stochastically varying. For example, perhaps the interest rate path should not be the only path that we should be varying. We might be wanting to look at stochastically varying lapse rates, mortality, expenses, or whatever.

Let's put all that aside and assume we're getting some good stochastic results. What is the main problem with the asset adequacy analysis process with respect to stochastic cash-flow testing? I think the answer is that the great majority of results are successes, but the really interesting part of the distribution is the tail and that gives you a real credibility problem. You might run 200 scenarios and get three failures, so what does that really mean? The tail in that example is, obviously, not credible. So a reasonable approach appears to be a curve-fitting process of some sort, in other words, "Son of Graduation."

A good example of the need for smoothing and filling the pragmatic results is that you could have distribution A where you have a small percentage of failures. Distribution B is exactly the same except there are a whole lot of successes that are close to the failure point. Your fitting process should somehow take into account the fact that there were a whole lot of results that were close to the failure point in the second distribution.

I collaborated on a paper, "Application of Risk Theory to Interpretation of Cash-Flow-Testing Results," which was published in the Spring 1997 *North American Actuarial Journal*. The two other authors are much better mathematicians than I am. I think I was there to give them some of the practical implications, but the other authors were the primary contributors to the mathematical concepts discussed. Sam Cox is an FSA and a Ph.D., and Rich Phillips is a Ph.D. Both are on the

faculty at Georgia State University. The paper responded to several items. Number one, what variables should you choose? Typically, actuaries will choose something like present value of ending book surplus, or something like that. Second, how big a sample do you need? Steve Sedlak referred to that issue earlier in this session. Third, how do you define ruin? We'll go into the various ways you can look at defining ruin. Fourth, what is our methodology for curve fitting? Those are the issues that I'm going to speak to for the rest of my presentation. I'll go through the first three rather quickly.

Choice of variable, "ending surplus," and "present value of ending surplus" are typically what actuaries will use in the asset adequacy analysis process for purposes of the actuarial opinion and memorandum regulation. Both "book surplus" and "regulatory market surplus" are used in these measures. There are other choices once you get beyond asset adequacy analysis. Let's say you're doing dynamic financial analysis or you're doing pricing. You're using cash-flow testing for these other types of purposes to project where your company is going. Maybe you want to use as a variable the lowest RBC ratio over the whole time horizon for a particular scenario. That will give you a distribution of the lowest RBC ratios that you might encounter. It will tell you how much business you can produce at a particular pricing level, for example, to keep your lowest RBC ratio from going below a certain level. There are many other types of variables you can possibly choose, and since we're really dealing with essentially a statistical subject, the choice of the variable doesn't matter in terms of the mechanical processes.

Picking of the sample size. There are several approaches to this. Let me just go through a couple of them. One of the approaches that academicians use is that, once the variance or the second moment about the mean is reasonably stable, you can stop asking for additional sample elements. There is another approach. Your handouts show a Z statistic which is normally distributed. It has a mean of zero and a variance of one. The concept is basically that if your Z statistic is 0.3, for example, then you know that that's like 0.3 standard deviations away on this statistic. In that case you can assume that you have not gained a lot of additional benefit by going out to sample size number two (like 500) from sample size number one (like 300).

There is still another approach. There's a study note in the Society examinations that deals with how to review reserves, and it shows how to optimize both your confidence limit and the cost of the sampling process. It shows basically how you can actually choose your sample size based on the cost for drawing each sample relative to the value of a smaller confidence limit. That gets a bit theoretical, but I thought I'd mention it.

We're now moving on to the more exciting part of the program. I think when I talked to Steve about the curve fitting process, he said something like, "Be still my beating heart." Anyway in writing our paper we took a look at several methods that we rejected. Some were of the old classical risk theory approaches, Esscher and Edgeworth, which I kind of enjoyed working with as a student. Those are very complex to work with, and they don't give you any better results than some of the results that we've seen in other approaches. Additionally, they don't give you entire probability density functions. They give you point estimates only.

The normal power approach, which many property and casualty actuaries use, is equally ineffective. It gives you only point estimates and is rather complex to use. The semi-parametric method that was mentioned in the paper also does not give you an actual probability distribution. So what we ended up with was, if you will, a two-by-two approach. They are what we called, "Parametric," and Mixtures of Parametric." For example, take a commonly used probability density function (PDF) like a normal density function or a gamma density function, or another of the more common density functions, and simply for the pragmatic distribution you're getting to the parameters of that density function. That's all that the "Parametric" approach is. Under the "Mixture of Parametric" approach, you might say it's 30% of one distribution and 70% of another distribution. Thus the mixtures approach gives you more parameters to fit your curve to, so it's really just a weighted average of two or more density functions.

I mentioned the two-by-two approach. You could either use a "Parametric" approach or a "Mixture of Parametric" approaches. Think of those as two columns. To get the two rows of the two-by-two, we ask, "How do you go about fitting the parameters of those density functions to your data in your

pragmatic distribution?" We came up with two methods that worked reasonably well and we believe give quite good results. One is "maximum likelihood" and the other is the "method of moments."

The method of moments tries to achieve accuracy to the third or fourth moment of your distribution. Remember that the mean (expected value of x) is the first moment and then the expected value of x^2 is your second moment, and so forth. When we're talking about parameters, what we mean by example is that the normal density function has parameters μ and σ. The gamma density function has its parameters. There are density functions used in loss distributions that have as many as three parameters. So the concept is, if you have three parameters, you can probably go out to three moments of accuracy. The first three moments of your density function are each equal to the first three moments of your pragmatic distribution at the end of the fitting process, and that gives you a fairly good fit.

The maximum likelihood approach looks at the set of parameters in your distribution that is at a maximum for that pragmatic distribution. In other words, you take the probability density function of the first element in your sample. In other words, what's your PDF of $x(1)$? You multiply that PDF times the PDF of $x(2)$, times the PDF of $x(3)$. You end up with a huge product of that multiplication. What set of parameters makes that a product maximum? That tells you the set of parameters that fits that curve the best. By the way, statisticians do not deal with that huge product. If that product of factors is at a maximum, then the log of the product is also at a maximum. So the log of the product is the sum of the logs of the probability density functions, and that's basically what they tend to use.

These processes are all reasonably simple approaches on Excel spreadsheets. They're not as complex as they might appear at first:

$$\text{lik}(x;\alpha) = \prod_{i=1}^{n} f(x_i;\alpha).$$

> The idea is to choose a vector of parameters $\alpha=\hat{\alpha}$ so that, of all the models described by various values of α, the model $f(x;\hat{\alpha})$ assigns the highest probability to our observation x. Very often the functional

form of the logarithm of the likelihood is simpler to use than the likelihood itself, so often (throughout our study) we work with the log-likelihood function:

$$\ell(\alpha) = \ln\left(\prod_{i=1}^{n} f(x;\alpha)\right)$$

$$= \sum_{i=1}^{n} \ln[f(x_i\alpha)].$$

Once we've determined the parameters for the PDF, estimate the accuracy by confidence or by Kolmogorov-Smirnov (KS) statistic.

Once you've performed your curve filling by maximum likelihood or by the method of moments, the next question really becomes, how do you evaluate that job you've done? Steve talked about comfort levels and confidence levels, and that's an important issue. There are many approaches that are theoretically available to determine how good your probability density function really is relative to your pragmatic distribution. And one statistic that statisticians will use on something like this is what they call the KS statistic.

$$D_n = \max_x |F(x) - F_0(x)|$$

where n is the sample size, $F(x)$ is the empirical distribution based on the sample, and $F_0(x)$ is a hypothetical distribution. This is explained by Hogg and Klugman (1984) and Bickel and Doksum (1977). The random sample cdf lies within c of the true cdf with probability α, where $P(D_n \leq c) = 1 - \alpha$. In other words, if we look up c in a table of values of D_n, corresponding to α and n, then the following inequality holds for all x with probability $1 - \alpha$:

$$\hat{F}_n - c \leq F(x) \leq \hat{F}_n + c.$$

For our work, we have $n = 500$ and we chose $\alpha = 5\%$. For this value of α and samples of this size, $c = 1.36/\sqrt{n} = 0.061$.

The concept is that you simply calculate the maximum difference in absolute value between your pragmatic cumulative frequency distribution and your smoothed cumulative frequency distribution. The maximum cumulative difference is your KS statistic. You can actually look up, given the degree of difference, what your confidence limit is on what you've chosen.

Go ahead and give some of these approaches a try. I think Steve came out with a good pragmatic chart of confidence level versus comfort level, and this is another approach you can think of using.

MS. SUE ANN COLLINS: For my portion of the presentation I'm going to go back to the early days of cash-flow testing and present a case study, one that we were forced to wrestle with back in 1993. It is going to focus on the practical aspects of what we did then. I think some of the tools that Ed has described would be very useful going forward, now that we're all much more comfortable with the process itself.

It would seem to me that a majority of the companies' cash-flow testing is a very detail oriented, time consuming exercise, and generates a whole lot of useful information for the company. But it would also be my observation that many actuaries are not forced to deal with what I would call problems on an annual basis. As you may guess, when we're called in to assist in this area, it usually is because there are some problems to address. What I'm going to do is to go through the facts of the case study, tell you a little bit about the nature of our roles, and show you what was ultimately done. I wouldn't suggest that this is the only thing that could have been done.

Our primary role was to look over the shoulder of the valuation actuary and then to produce a second opinion on the reserve adequacy. The initial work was completed as of September 30, 1993, but the ultimate opinion was for the end of the year. My intent is to present sufficient information so that you'll be able to draw your own conclusions. I have reread our files to a great extent on this topic, but if I've left out some relevant information because I'm too close to it, I'd be happy to take any of your questions at the end and disclose what other information we may have had at the time. It's not my intent to disclose the name of the company involved in this case study, although some of you

may be able to identify which it is. Since the company's identity is largely irrelevant to the points I wish to make, if you have any questions I'd certainly appreciate your keeping the name of the company out of them.

The data are as of September 30, 1993. Before presenting the results of the cash-flow testing, I'll give you a bit of background on the company, going over the nature of its liabilities and its assets. The company had approximately $1.1 billion of liabilities in force, and $550 million of those liabilities were in the separate account. The remainder were in the general account. The major lines of business for the company were:

1. Variable life and annuity, with total liabilities of about $650 million with $130 million of them in the general account. Those were largely connected with policy loans.

2. Individual disability income with approximately $200 million in liabilities.

3. Immediate annuities -- about $250 million of liabilities.

It also had a small amount of general account deferred annuities.

The sum of the Interest Maintenance Reserve (IMR) and the Asset Valuation Reserve (AVR) for the company was about $20 million and the company's capital and surplus was $50 million.

In the cash-flow testing models, the company modeled all of these liabilities and provided for the run-off of the IMR and the AVR, and allowed for future changes for IMR in the model.

As required in cash-flow testing, the company made a segmentation of the assets between those that would support the liabilities and the IMR and AVR and those that would be assigned to support surplus and the miscellaneous liabilities. It's generally desirable in exercises such as this to be able to assign fixed-income assets to the models, i.e., bonds and mortgages. In this case, we couldn't do

that. The company had some significant asset issues, and we were forced to deal with the assets we saw on the balance sheet.

I put the assets into two groups -- one I'd call run of the mill and the other is unusual assets. Of the $550 million of assets in the general account, 87% were run-of-the mill assets -- Schedule D bonds, public/private bonds, Ginnie Maes, i.e., collateralized mortgage obligations (CMOs), assets for which the cash flows were relatively easy to predict. Policy loans and cash were also included in the run-of-the-mill column. The mortgages were in two groups: one I would call core mortgages and one referred to as noncore mortgages. Total mortgages were $58 million. Just over half were in the core category, which the company had experience on for a number of years. The cash flows were relatively predictable and hence the performance of these mortgages were relatively predictable.

The other assets that I've called unusual were in three groups: noncore mortgages, Schedule BA assets, and real estate. The real estate was all acquired in satisfaction of debt and the BA assets were, by and large, assets that had been pushed down to the life company from a prior parent.

The real estate was about $24 million. It consisted of seven properties, however, one property was on the books for $22 million. This property was a marina; it had some concession stands and it had some lots adjacent to it. Subsequent to September 30, 1993, but prior to when the company was doing the work for the opinion, a significant chunk of this property was sold and that was reflected in the future cash flows.

The noncore mortgages consisted of six commercial mortgages ranging in size from $1 million to $10 million. A number of them were second mortgages and had various restructuring options coming up in the next several years.

The Schedule BA assets were the ones that had been pushed down to the life company from a former parent. There was a large single asset -- an $18 million limited partnership that was basically a basket of different venture capital investments ranging from cable T.V. to technology firms. The

remaining $16 million of BA assets was another $10 million in venture capital investments. They certainly are not the type of assets where the cash flows are easily predictable or ones we would like to use in cash-flow testing if it could be avoided. The other thing that's worth noting about these unusual assets is the company had paid a great deal of attention to these asset categories in the two years prior to September 30, 1993, and had written down the value of many of these assets over that time period.

The company has five primary lines of business: individual disability income, immediate annuities, variable life, a small amount of variable annuities, and a small amount of general account annuities, and some immediate annuity business. I'm going to go over the characteristics of the disability income (DI) and the immediate annuity business because those lines had the most substantial impact on the cash-flow testing results. There wasn't anything unusual about the company's other lines of business.

As far as its DI business, the company had been a significant writer of individual disability income business, mainly in the professional market. During the 1980s, the company, as many other writers, had introduced what I would call some more modern policy provisions in these contracts. They had written a substantial amount of business with a lifetime own occupation definition of disability. They provided for residual benefits and provided for cost-of-living adjustments among other things. Turning to the specific characteristics of the business as of September 1993, the majority of the DI business was noncancellable. Some 53% of it had indemnity amounts that had benefit periods either to age 65 or lifetime, and 41% of the business had residual benefits associated with it. A total of 72% of the business measured by amounts of indemnity had a definition of disability that was own occupation for the life of the disability. And to exacerbate this issue, the company had some very narrow definitions of occupation. Also, during that period of time, the company had liberalized its financial underwriting standards.

If we take a close look at the occupation of the company's disability income population, we can see that more than 52% of these insured worked in the health care field, and this wasn't viewed as a high

percentage at the time. It was a position the company managed to get itself into, however. There was enormous pressure on health care professionals due to the ever-expanding scope of managed care as well as the possibility of potential regulation at the federal level. Also, for the period running up to September 1993, the company had seen marked deterioration in its disability income results. For example, the company's GAAP interest adjusted loss ratios had moved from 55% in 1990 to 84% by the end of September 1993. That was their overall experience. If we were to look at the experience for the doctors on their own, for example, their loss ratios went from 45% to 110%. If we were to look at the loss ratios for policies with lifetime benefits, we'd see that those loss ratios went from 65% to 151%. So we had some significant facts that we were going to have to deal with.

Looking at the immediate annuity line of business, the company had written this business primarily between the 1983 and 1985 period when interest rates were much higher than they are now and certainly much higher than at the end of 1993. The valuation interest rates on this business ranged from 6% to 13.25%. More than 80% of the business was not subject to life contingencies, and was a mixture of lump-sum business and scheduled payment business. By the end of September of 1993, there were two things that were very apparent. There was a substantial mismatch between the notional assets that had been assigned to this business and the liabilities, both in terms of the interest earned on the assets and, also, the duration of the assets which was well less than the duration of the liabilities. I mentioned the notional assets assigned to the immediate annuity line of business. These did not directly influence results since we didn't attempt to look at reserve adequacy by line of business. We looked at it for the company in total.

Just a few more points before I show you the results because some of these points ended up influencing the final decisions the company made. The models were all run for 30 years. As I said, the models were all done on a total company basis, and they reflected the company's existing reinsurance agreements. We used best-estimate assumptions for the most part. This wasn't an issue for many of the assumptions. Mortality expenses and persistency were all pretty easy to come to grips with, although the persistency on the variable life business was a bit suspect. The company had been in and out of the newspapers and every time there was a mention in the newspaper, you

could see the lapse rates go up. So it was a bit of an art to figure out what was going to happen in the future, and trying to determine what experience was a blip, and what was an underlying trend with regard to the lapse rates.

The morbidity assumption took a lot of time and energy to set, but it was set to reproduce the company's experience over the period of 1992-93; there was an attempt in designing that assumption to also reflect the nature of the company's business. The idea was that certain people who did go on disability might otherwise be healthy lives and have normal life expectancies, and perhaps only go off disability upon death or if their benefits ran out. Hence, we made a provision for normal life expectancy for a certain percentage of the disabled lives.

The company had sold a block of variable life business back in 1990 subject to certain experience refunds. We were three years out from that transaction. The experience had been favorable on the mortality and lapse for that block, and the company had received to date some substantial experience refunds. The estimated present value of the future experience refunds, considering several different opinions, varied anywhere from $25 to $31 million, so it was a substantial number.

With all that as background, we ran the cash-flow testing model using the prescribed New York Seven scenarios and, also, one with an inverted yield curve. Based on the results we observed, and it certainly could be argued that the current reserves didn't appear to be adequate.

Back in September of 1993, we asked what we should do? We turned to the actuarial literature for guidance and to determine what the next steps were. This is what we found. We found there was very little in the way of guidance on what to do next. Our reading of Actuarial Standard of Practice (ASP) 22 said that we had to do some more testing.

There was not, back then, a great deal of guidance in this area, and I'm not sure that for many of these issues there's a great deal of guidance today. When we were working on this issue four years ago, we had a team of actuaries from the company, our project team at Tillinghast, as well as access

to other senior Tillinghast professionals. With so little guidance available and difficulty in being an expert on all of these things, who does a small company valuation actuary who is facing these issues turn to?

Be that as it may, we decided we needed to answer a series of questions before we could come up with an appropriate level of additional reserves. We took it for granted that we were going to have to look at a number of stochastically generated interest scenarios. We didn't have a clue about how to set probabilities for a series of deterministic scenarios.

The first question was how would we generate these scenarios. There were a lot of different scenarios described in investment and economic literature, but as a practical matter, we only had one available to use. Given this scenario generator, the question was, what yield curve should we use? You might remember that the yield curve at the end of September 1993 was at its lowest point in 20 years. We were several months out from that point at the time we were doing this work and the yield curve, at least for the longer maturities, had risen 40 basis points. Did we have to use the September 30, 1993 yield curve to generate the scenarios? How many scenarios did we have to use? I think Steve has covered that topic quite well. What was the appropriate pass mark to use? We defined the pass mark to mean the amount of additional reserves and the corresponding assets that had to be added after the valuation date in order to pass x% of the scenarios.

We asked ourselves two other questions. Could we use off-balance-sheet assets? We wrestled with this one quite a bit. We read what ASP 22 said. We also read what the early exposure draft said. In ASP 22, Section 6.5 is titled, "Additional Disclosures," and it says that you need to include the disclosure and discussion of a number of things in the actuarial memorandum if you use them. One of those is the use of off-balance-sheet assets. So, it seems, on some level, that it was contemplated in the standards.

We looked at the first exposure draft, and there was a bit more on off-balance-sheet assets than the final version of ASP 22. It described several off-balance-sheet items, such as unfunded obligations,

leases, and so on. The asset side made reference to agent debit balances that aren't admitted for statutory purposes. That's the extent of the information we could find on off-balance-sheet assets.

The other question we had was, could we reflect the company's intended restructuring of these unusual assets? We thought the guidance there was a bit clearer. The standard actually says any anticipated future actions by management to address adequacy concerns should be considered in forming the opinion.

To get to the end of where we were, we used the scenario generator that was in our software system, and at the time it was the only one available. It was a lognormal generator using the September 30, 1993 yield curve. The generator works off two mean reversion rates that must be input, i.e., one for the 90-day rate and one for the 10-year rate; for these rates we used 10-year historic averages of the rates. We used 50 scenarios and had decided that an 80% pass mark is what we wanted. We did, in fact, reflect the anticipated experience refunds that the company would receive over the next four or five years based on the sale of business in 1990. We reflected the intended management restructuring of the unusual assets, i.e., the real estate, the noncore mortgages, and the BA Assets. As an end result, the reserves were, in fact, increased by $45 million at that point in time.

Just a bit of an update for the curious. The company now runs 100 scenarios, not 50. The pass mark is still 80%. The reserve levels are still adequate using these criteria, and there hasn't been any cause to destrengthen the reserves since September 1993.

MR. S. VINCENT ZINK: The other speakers have dealt with the practical nature of strengthening reserves or determining reserve adequacy. My particular portion will discuss a practical situation to our company that resulted in the destrengthening of some formula reserves. I hope that I'll be able to share with you the importance that cash-flow testing played in this process. That includes a special focus on the regulator precedent and the regulatory environment that gave us permission to destrengthen some reserves.

Our staff was allocated time to review the actuarial guidelines. I'm specifically referring to the actuarial guidelines that the NAIC puts in the financial examiner's handbooks. The one that I'll draw attention to is Guideline IX-B which attempts to clarify methods that would be used for valuation under the Standard Valuation Law for some specific lines of business. These lines of business are individual single premium immediate annuities that do not have smooth benefit payout patterns, or that may have a deferral in the initial benefit payments, or, specifically, those used for structured settlement annuities.

I'll give just a little bit of history. In 1980 when the Standard Valuation Law was coming into vogue, we saw that the Standard Valuation Law was looking at a requirement that the valuation interest rate factors be distinct by the various issue years of a policy. This was an attempt to make a correlation between investment rates for a given receipt period and the chosen valuation interest rates. There's no doubt there was a focus at that time on the group line, group guaranteed investment contracts. In contrast, in the early 1980s, structured settlement annuity business was a minor product offering.

I'll talk briefly about structured settlement annuities. My comments will come primarily from our experience with assuming a block of business and the 1991 SOA study note that covered structured settlement annuities. In 1980, it was a minor line, and thanks to the IRS ruling in 1979, it started becoming a much more significant line of business. The IRS ruling was, if a claimant has no right to a discounted present value of some sort of a court award and has no right to rearrange a schedule of payments, then all the income would be received tax free. This clarification of taxability of investment income on the funds along with a significant rate of growth in the size of injury awards throughout the country sparked a rapid expansion in the use of structured settlement annuities. In 1979, if there was $150 million of new funds going to buy annuity premiums for structured settlement annuities, by 1991 this number would approach $3 billion. These figures showed significant growth.

The regulators needed to respond to this. The regulators looked at the valuation mechanisms used in the Standard Valuation Law during the mid-1980s. The valuation law itself was primarily for contracts where the reserve would decrease and not increase over time. With structured settlement annuities, which concentrate on periodic payments with geometric increases and on large deferred payouts, the regulators sensed both nondecreasing reserve patterns and a significant reinvestment risk. The long-term nature of the liability flows along with fluctuating interest rate markets, especially one that had fluctuated down from the very high rates of the early 1980s caused the regulators to formulate some clarifications and guidelines for valuations under the Standard Valuation Law. Hence, we have the responses that are inherent in Guideline IX-B.

In December 1988, the NAIC Valuation Guideline attempted to clarify the choice of interest rates that should apply to various benefit streams as one would use for structured settlement annuities. The responses in the NAIC Guidelines served to split a structured settlement annuity into smooth annuity benefit flows that are not increasing by more than 10% per year on a block basis or 15% or more on an individual contract basis. That would be labeled as the annuity benefit and that would follow the typical valuation interest rate guidelines based on guarantee periods, contractual surrender provisions, and so on. But if there are benefit payouts that go beyond the annuity definitions (let me call them other), these need to be valued as single payments using the specific interest rates appropriate for that type of benefit structure. The important part of Guideline IX-B is the choice of appropriate valuation interest factors for the different portions of payment patterns under various structured settlement annuities. Hence, one contract may have multiple interest rates as a choice for valuation purposes.

There are 10 points in Guideline IX-B. Point number eight says the regulator or examiner should request that the insurer demonstrate that the assets are sufficient for the liabilities using cash-flow projections of the supporting assets and the liabilities under various interest scenarios especially for declining interest rate scenarios. Based on the reading that I did of all the other actuarial guidelines, I did not find any other guideline that specifically said, "Thou shalt check it out using cash-flow testing," and "Thou shalt watch out for declining interest rate scenarios." So this is definitely a

bonafide example of regulators saying use cash-flow testing, use a specific interest rate scenario to do your valuation actuary work. It puts a recognized focus on a specific scenario of declining interest rates.

One further item contained in Guideline IX-B is the requirement that the insurer not simply use the contract issue dates to determine appropriate interest rate for valuation purposes. The insurer, to protect against the large reinvestment risk of structured settlement annuities, must be prepared to do a revaluation using the date of acquisition of supporting assets as a new issue date. For example, if an insurer has, in 1986, exchanged all those high yielding assets that were acquired in 1982 for lower yielding assets, then the annuity contracts need to use the appropriate Standard Valuation Law interest rate assuming 1986 issue dates instead of 1982 issue dates.

The practical case at our company that led to the analysis and research on this project stemmed from a relatively significant block in our books of structured settlement annuities that was reserved at that time at a statutory valuation rate of 4%. The underlying assets supporting this block of business on a statutory basis yielded in excess of 7%. On a GAAP basis, we were using a valuation rate in the 8% range. The block of business used the prevailing IRS tax rate of 7.5%. We asked our regulators if we could consider raising the valuation interest rate to the Standard Valuation Law maximum of 7.5% because this block of business was all issued in 1981. The response from the regulators was, you'd better check out and adhere to Guideline IX-B if there's to be any demonstration of a reserve destrengthening.

So our filing packet with the state included our demonstration of cash-flow testing as presented for this product line in recent years. That cash-flow testing certainly showed excess surplus being generated in future years under either the top down or the declining interest rate scenarios that we had in our cash-flow testing. In our recommendation we demonstrated the appropriateness of a valuation interest rate that we chose for the block looking at the benefit structure, looking at our portfolio of assets, and we demonstrated the appropriateness with respect to either smooth annuities or those with significant payment spikes in the future. We believe that our cash-flow testing process

will continue to show surplus growth even under declining interest rate scenarios. I'll summarize it by saying that we believe that the cash-flow testing part of our demonstration was critical in this demonstration to the regulators in gaining the approval of our reserve destrengthening process.

FROM THE FLOOR: Mr. Robbins, you referred to a paper. Where could I get a copy?

MR. ROBBINS: Do you get the *North American Actuarial Journal*? It's in the Spring 1997 edition.

MR. MICHAEL H. FRANTZ: I have a question of Mr. Robbins. You said use Excel to do your statistical work.

MR. ROBBINS: Yes.

MR. FRANTZ: You talked about using method of moments and maximum likelihood to estimate the parameters. Do you do that in Excel?

MR. ROBBINS: Yes. There's a feature in Excel called Solver where you can take a bunch of parameters and get a function of those parameters to be a maximum. Solver will solve for the best set of those parameters. It doesn't always work in method of moments. Sometimes you can't find a root for that. But, in general, it's a pretty good method.

MR. FRANTZ: Are there other packages you use besides Excel?

MR. ROBBINS: We just used Excel.

MR. FRANTZ: I noticed you had some formulas in your handouts that came from a book. What book do they come from?

MR. ROBBINS: Our paper in the *North American Actuarial Journal* that we wrote has the formulas in a fair amount of detail. It also has an extensive bibliography.

MR. FRANTZ: Ms. Collins, I enjoyed the presentation of your case study, but you didn't talk about expenses. I was wondering what type of expense assumptions, not specific, but generic, you used.

MS. COLLINS: The company had a unit expense study. We looked at the expenses the model generated. This company was being watched by many people, and there was a detailed expense projection over the next four or five years. The company was not writing new business, so we felt that all of the expenses had to be included in the model. The model expenses were a little bit short in the first couple of years between what the company expected to spend and what was in the model, so we did make a provision for excess expenses.

MR. FRANTZ: One last question to the whole panel. The present value statutory surplus seems to be the main number that you're looking at when determining adequacy. You talked about other distributions. Did you look at the distributions to determine whether normal is appropriate, or is gamma appropriate? It seems that we're all using normal here, and it's a question of whether it is appropriate or not, especially running only maybe 50 or 100 scenarios.

MR. SEDLAK: I did not mean to say that normal is an appropriate distribution. You typically have a distribution that is skewed to the adverse tail because of the various options against ourselves that we put in our policies, plus any asset optionalities.

MR. ROBBINS: As Steve indicated, the distribution of results is typically a curve skewed to the left. It is kind of a mirror image -- a flip-flop of a gamma distribution, which starts at zero and is skewed to the right.

MR. DOUGLAS S. VAN DAM: My question has to do with something Mr. Sedlak said earlier in terms of not using surplus for any of the expenses. What about interest on surplus? What's your feeling there?

MR. SEDLAK: I don't think that use of surplus or even the interest on surplus would be indicated. When we say reserves are adequate, we're trying to say that the assets associated with those reserves are sufficient to support the liabilities. If you start to inject some interest from surplus into that process, you in one way or another are starting to rely on the surplus itself. That is not to say that you don't measure any surplus accumulated in the future in this process before making this discount.

MR. VAN DAM: My next question is, can you make some argument that there are some expenses that are also not related to the business? I would like to know if the rest of the panelists have any comments on this.

MR. SEDLAK: I think if you can make a case that there are some expenses that are utterly unrelated to the business, you might be able to exclude them. The problem with this is how you do it. In other words, can you do this without being unintentionally less conservative than you might want to be. I think the problem that you have is you must have expenses that are solely related to the surplus component as opposed to the business that you're trying to address. In general, that would seem to be mainly investment expenses associated with the surplus, which automatically would be taken out if you're using a unit expense for investment costs.

MR. ROBBINS: Steve, let me just make one point and it's somewhat of an answer to your question and somewhat of a question itself. There's always an issue as to how much expense belongs to future business, and how much belongs to the existing block. That's a really tough question and that may have been to some extent what you may have been referring to as well.

MR. VAN DAM: Possibly. Sometimes you have an insurance company that's getting the expenses passed down from a parent company that's not the insurance company. They're getting expenses allocated, and there can be all sorts of reasons for putting in taxes which we won't say out loud.

MR. STEVEN LANE CRAIGHEAD: Ed, I've done several weeks of study on your paper and I have some positive and negative results.

We have a series of projections over a three-year period. In these projections, we ran 10,000 scenarios through our corporate model. These represented something like 54 different lines of business. I obtained a total of 107 data sets, and I used these as a basis of testing your theory within your *NAAJ* paper. We found that 87 out of the 107 data sets passed the Kolmogorov-Smirnov test at a 95th confidence level. This says that the overall distribution match was very good. However, when we looked at the truncated tails (and we only looked at the left 10%) only 45 out of the 107 passed.

Another comparison that we did was we estimated the one percentile using your methodology versus the 10,000 trial raw score. In 1992, on one of our major lines of business, which is in billions of dollars, your model estimated $160 million at the one percentile. We estimated $168 million which looked very good. In 1993, however, for the same line of business, your method estimated $100 million and ours estimated $194 million.

MR. ROBBINS: Your full sample showed $194 million with respect to your full sampling of 10,000 scenarios?

MR. CRAIGHEAD: Yes that was the full sample at 1%. So you were being conservative by $100 million. In 1994 you were at negative $65 million versus our $39 million.

MR. ROBBINS: $39 million positive?

MR. CRAIGHEAD: Yes.

MR. ROBBINS: Okay.

MR. CRAIGHEAD: On what kind of base?

MR. ROBBINS: How big was the block?

MR. SEDLAK: I think it was about $5 billion.

MR. ROBBINS: Okay.

MR. CRAIGHEAD: Just for the fun of it, I did it also at the 0.1% level, so you can see I'm far out in the tail. In 1994, we estimated it at 0.1%. We estimated a negative $100 million. You estimated negative $745 million, so we really don't want to push your methodology too far.

MR. ROBBINS: You're right, in the tails it's very tough.

MR. CRAIGHEAD: Yes, it is.

MR. ROBBINS: Obviously, running 10,000, or better yet 10 million samples will give you the better result. One of the things we've discussed is actually truncating the probability density function. For example, you could just take the worst 20% of results and use only that portion.

MR. CRAIGHEAD: Right. That's sort of what I did with the extreme 10% tail. In addition, at the 20% level, you still didn't pass; you passed less than 50% of the time in that situation. It is a hard problem.

MR. ROBBINS: You bet it is.

MR. CRAIGHEAD: I've also spent the last several months working on mixture problems. Here I was using the same 107 distributions. However, I was using mixtures of normals distributions. Very few would pass the overall distributional test, so there are some difficulties in using mixtures. It's possible that using mixtures on your generalized beta type two distribution may work better than the normal distribution.

MR. ROBBINS: Did you use the generalized beta?

MR. CRAIGHEAD: I used the generalized beta for these other results. I just used normals for the one about the mixtures.

MR. ROBBINS: Okay.

MR. CRAIGHEAD: Does your testing involve more severe interest scenarios than the seven deterministic scenarios, or are they designed to fill in the tail?

MR. ROBBINS: Stress tests are typically deterministic tests where you would take a given set of input and see what happens. I wasn't really dealing with that. Maybe someone else could take that question.

MR. SEDLAK: Actually the intent of our stochastic testing is to, in fact, fill in the tail and to get a good sample of the distribution such that we can examine and make statements about this tail. I've observed that when you run several hundred stochastic scenarios, you will drive things out of the woodwork that do not appear on the New York Seven scenarios, so generally you get more severe scenarios as a by-product.

MS. JACQUELINE H. WETCHER: I have a question for Mr. Zink. You mentioned strengthening reserves, and destrengthening your reserves for structured settlements block issued in

1981. Have you had any experience in needing to strengthen reserves for the same reason for later issue dates, like those issued later in the 1980s?

MR. ZINK: No, we have not.

MS. WETCHER: I guess it could work the same way.

MR. ZINK: Yes.

MR. DANIEL J. KUNESH: My question, because I sense negativism from two of you, is for the panel as a whole: Do you believe that the standards of practice, as they currently exist in the area of asset adequacy testing, are adequate to provide guidance to us as appointed actuaries and to provide the kind of confidence that regulators and policyholders need from us?

MS. COLLINS: As far as availability of guidance, I think there's probably more today than there was four years ago. When we were dealing with our questions, the particular question that was very difficult and had a significant impact on the outcome was whether it was appropriate or not to use off-balance-sheet assets in asset adequacy testing. We ultimately concluded that it was okay. I certainly didn't take that decision lightly and, in fact, considered going to an organization like the Actuarial Standards Board (ASB) for guidance ahead of time. We ultimately did not do that.

MR. KUNESH: I have a follow-up question. When you were looking at the tail of a distribution and were talking about stochastic scenarios, how much went into the stochastic nature of the nonasset assumptions? For instance, the spiral in DI was mentioned. Isn't it possible that the tail is somewhat swamped by how much variation there is in the other assumptions that may not be modeled stochastically? Could anybody comment on that part of it?

MS. COLLINS: I think that's an absolute fact and that's why, in this particular case, we tested alternative morbidity assumptions, although we did not construct a scenario of possible morbidity assumptions and attempt to do a distribution on it.