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VALUE-AT-RISK, RISK-BASED SURPLUS, AND C-3 RISK-BASED CAPITAL

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VALUE-AT-RISK, RISK-BASED SURPLUS, AND C-3 RISK-BASED CAPITAL

MR. DOUGLAS A. GEORGE: This session is on value-at-risk (VAR), risk-based surplus, and the C-3 component of the risk-based capital (RBC) formula. There are a couple of ways this session is different from many of the sessions we have at the Valuation Actuary Symposium. One of them is that the sessions usually concentrate on only a regulatory component or only on a quantitative analysis; this session is a mix between the two. Although there's a mix, I think there is a lot of synergy or overlap between the different topics. Value-at-risk and risk-based surplus are very related, as we will see. Also, the approach to the C-3 component of RBC is a quantitative approach. We're moving towards a more quantitative methodology for valuing the component.

The other thing that's different about this session is the presenters. Rather than having the company actuary be the moderator with the consulting actuaries as panelists who try to sell you things, we have a consulting actuary as the moderator and the company actuaries who will try to tell you what they know about the subject. I mentioned this to one of the organizers of the symposium, and she said, "Wow! They might actually learn something." I think we will learn something today. I've seen the material from our three presenters, and it's very good, and there's a lot to it.

First up we have Alastair Longley-Cook. Alastair is the corporate actuary for Aetna where he's responsible for its financial risk management. He has been at Aetna for 26 years. Alastair has written a number of publications on value-at-risk and other quantitative methods, and he's a frequent speaker at sessions. He's going to address mostly value-at-risk but then talk briefly about risk-based surplus.

Next up we'll have Mike Hambro. Mike is vice-president and actuary of National Life Insurance Company of Vermont. He serves as appointed actuary. He works with asset/liability management and has a lot of experience with derivatives and surplus management. He's also right in the middle

of turning his company into a mutual holding company, but that subject should be set for a separate session. Mike's going to talk about risk-based surplus.

Finally, we have David Sandberg, the appointed actuary for Life USA in Minneapolis. He's a member of the C-3 Risk-based Capital Subgroup of the Academy's RBC Task Force. Dave's going to address the C-3 component update.

MR. ALASTAIR G. LONGLEY-COOK: How many in the audience are familiar with value-at-risk concepts? About two-thirds. How many are using it in their companies or in their consulting practice? About 10%. I think that's indicative. It's beginning to be implemented in various ways. We use value-at-risk at Aetna in our financial risk management process. I'm going to talk about some of the practical implications of how to use it in a real-life setting.

The new *Professional Actuarial Specialty Guide for Asset/Liability Management* appeared in my in-box a few days ago. It's a very nice little brochure with little sections on each subject and many good references. There's also a good section on value-at-risk with some good references. The one that I found to be helpful is J.P. Morgan's Risk Metrics which you can download from its Internet site. Much of the documentation, in terms of the mathematics, is there in case you're not familiar with it already. I'm just going to touch on that briefly. Then, I am going to talk about what value-at-risk is in general and how to apply it in general insurance settings rather than just a derivative portfolio type of situation.

Value-at-risk can be defined in different ways. It's trying to get at maximum loss. This basically came out of the banking industry. Those in the banking industry were trying to get a handle on the derivative portfolio exposure by looking at what the loss in the value of that portfolio is over the time it takes to get out of that position. It's usually a fairly short period of time. We're talking about a continuous distribution of possibilities, even though some of those positions can't go below zero. In terms of the short-term loss, it could be anything from a small amount to a fairly large amount;

there is no maximum loss. It's a probability distribution. With a pre-defined confidence level of 90%, 95% or 99% (it varies depending upon who's doing it), how much can you lose by holding that particular position? Value-at-risk is a change in value over time, and that's an important concept.

Here's one of three formulas I'll use:

If $V_{\Delta t\, i}$ is $N(\mu,\sigma)$, then $VAR_i = \chi \cdot \sigma_{V_{\Delta t\, i}}$

where $\chi = 1.65$ for a 95% confidence interval and 2.33 for a 99%.

I think a comment of Steve Hawkings' (author of "A Brief History of Time") editor was: "For every formula you put in your book, your readership will decrease by one-half." He put one formula in his book. I think I have three. We're actuaries, so we can handle it. If you use the so-called parametric approach to value-at-risk where you're relating your change in value to an underlying parameter, (say, a change in interest rates), and if that change in value over time (delta T) is normally distributed, then you just get the relationship between the amount of the loss and the standard deviation. The factor is either 1.65 or 2.33 depending upon which confidence level you use. As I said, 90%, 95% or 99% are common ones. For a risk that's normally distributed (which many aren't), that's a fairly straightforward type of formula. For risks where the second derivative is important (where you have convexity), you would need a second order factor. I'll get into that later.

There are other ways to come up with value-at-risk, including scenario projection and use of the historical returns or historical distribution in value over time. The problem associated with historical data, of course, is that to get a reasonable amount of data you have to go back fairly far. The further back you go, the less representative those data are of what's going on today, particularly in today's very volatile markets.

Formula number 2 is as follows:

Uncorrelated Total VAR = $[\Sigma_i \text{ VAR}_i^2]^{1/2}$, assumes risks are independent.

Correlated Total VAR (adjusts for correlation among risks) = $\chi \, \sigma_{V_{\Delta t}T}$

Where $\sigma_{V_{\Delta t}T} = [\Sigma_i \, \sigma_{V_{\Delta t}i}^2 + 2\Sigma\Sigma_{i<j} \, \sigma_{V_{\Delta t}i}\sigma_{V_{\Delta t}j} \, \rho_{V_{\Delta t}ij}]^{1/2}$

and $\rho_{V_{\Delta t}ij}$ is the correlation coefficient for risks i and j.

The hard work and the number crunching comes about through the issue of correlation. If your risks are uncorrelated, and normally distributed, you're just adding up variances. That's pretty straightforward. They are usually correlated, particularly when it comes to interest rate risks. If you're looking at different spot rates, those would be highly correlated. But if they're normally distributed, you have a fairly straightforward way of coming up with a matrix of variance and co-variance to do a usual combination. Then the difference between the uncorrelated addition and the correlated addition would be how much either positive or negative synergy you're getting out of your risk exposure. One of the important results of doing this analysis is that you can find out where those synergies are and try to seek out better synergies that are helping you. Then, you can get rid of synergies that are hurting you.

Let's discuss some of the pros and cons in terms of the practical application. I won't spend a lot of time on the advantages because I think they're sort of mom and apple pie. The applications of VAR reflect more accurately and more dynamically your risk profile. In the past, many actuaries and many insurance companies have relied on an internal or external risk-based capital approach. Actuaries felt that as long as they were figuring out how much capital to allocate to a particular line of business or a company, they were doing the appropriate risk evaluation and measurement in terms of both the solvency as well as measuring performance compared to that capital.

The problem with that is that it tends to be driven by outside influences such as rating agencies. It also tends to be very sticky. It's very hard to change capital requirements. You get a lot of push-back from the business areas or the pricing people. You might not be able to keep that assigned capital up to date. If the real estate world is changing as it did in the 1980s and the interest rate environment is changing as it did in the late 1970s and early 1980s, then you're going to be behind the eightball if that's what you're relying on. This allows you to literally update all of these assumptions daily so they know at four o'clock every afternoon what their risk exposure is. Insurance companies usually don't need to do that, but banks do.

I want to spend a little more time on the difficulties because it's attractive, shall we say, to just take value-at-risk and use it whole cloth in the insurance setting. There are several reasons why it doesn't work very well. On the asset side we're not trading market value securities day in and day out. We tend to have a buy-and-hold strategy. Many of the methodologies you'll read about in value-at-risk literature are inappropriate. Going to the second derivative to get a fix on the effect of convexity, for a lot of risks, isn't necessary. It is in some cases, but in many cases it isn't. As I said, daily or even monthly recalculations may not be necessary. Arbitrage-free interest rate paths, for instance, when you're looking at risks over many years, may not be needed. In fact, they could be misleading.

On the liability side, the market value of liabilities either doesn't exist or, if it does, it doesn't reflect fair value, and you get into this endless debate about what discount rate to use when you're doing that. I tend to work with risk-free rates, and it was interesting to hear Peter Duran say that that's the way FASB seems to be leaning. The time horizon is key here. Value-at-risk, as it was developed, is very short term. In the insurance environment, we're looking at maybe a quarter or even a year (which is what we use), as being more meaningful. What's most important is many of the risks that we are faced with are not measurable in terms of stochastic models. I think of legal liability or some kind of public relations fiasco. Just a wild card risk that nobody knew about suddenly pops up. It's very hard to model and anticipate those. Unfortunately, those are the ones that do you in.

Why do value-at-risk at all? Just because you can't model all your risk doesn't mean you shouldn't model any of it. Over time, perhaps we can chip away at some of the ones that are harder to model.

In terms of coming up with a risk profile, financial risks can be modeled with a stochastic model, and the operational risks consist of all others. You have to look at both, and value-at-risk is more applicable to the former.

Because many of us are involved in the asset adequacy analysis, I want to focus on how to develop value-at-risk from that. That's when you have all the tools to calculate VAR. It's just a question of putting it together. Nowadays, the valuation actuary will have measured change in the present value of future cash-flows to interest rates stochastically, and maybe shock changes for other risk drivers.

To develop value-at-risk, you need to do a little additional work. That tail of the distribution of results that you get from the stochastic testing is not where you want to look to get value-at-risk, because that doesn't have the concept of change over time in it. Basically, you need to take the mean of that distribution to get fair value and then crank up your model and run those stochastic tests all over again, beginning at a different starting rate. It could be one standard deviation apart, but it doesn't have to be. Any Delta *i* that is meaningful in your situation will do, but you need to begin at a different starting rate and run them again and take the expectancy of those. The change in expectancies is your Delta *V*. You can then calculate duration in asset/liability management. It is the change in that value over the change in the rate, normalized by dividing by *V*. That duration in value-at-risk terminology has been referred to as a sensitivity index because you can use it for any risk, not just interest rates.

VARs can then be developed by calculating δ_i for each risk driver, r_i.

$$\delta_i = \frac{\Delta V}{\Delta ri \cdot V}$$

When looking at other risks, you can do a shock change and measure sensitivity that way. Then you can calculate the standard deviation of value by multiplying by your sensitivity. If driver volatility, $\sigma_{r_{\Delta t_i}}$, is defined as one standard deviation change in underlying risk r_i over time period, Δt, then $\sigma_{V_{\Delta t_i}} = \delta_i \cdot V \cdot \sigma_{r_{\Delta t_i}}$. That leads directly to value-at-risk.

If you haven't done stochastic testing for interest or some other risk where you need to get a feel for embedded options or some other measure of convexity, then a first estimate would include doing a shock test, but you lose the convexity measure in that. For some of your portfolios that may be acceptable. I proposed another method that's written up in *The Financial Reporter* about a year-and-a-half ago. It uses the required New York 7 Scenarios. If that's all you have, it at least gives you a way of coming up with a probability distribution from those seven.

Next is advanced applications. An obvious one would be to determine risk-based capital using VAR. I think that's what many companies have done without knowing it over the years in terms of their own risk-adjusted formulas, but this puts it on a more up-to-date reactive basis rather than setting it in stone. Then, as I say, if you use that to measure performance in a risk-adjusted return on capital, then you have a risk-adjusted measure that's pretty useful. You could use some good efficient frontier analysis by doing a grid of returns or some measure of performance versus VAR. You can then determine where you want to be on that grid in terms of different products and different investment strategies.

Another application about which I wrote an article in the January 1998 issue of the *North American Actuarial Journal*, is risk-adjusted economic value analysis. I bring this up because, if you've done what you need to do to calculate VAR, you basically have just about all you need to do these calculations. Discounting the future cash-flows at a risk-free rate is attractive. The trouble is that it does not adjust for risk directly. Many people adjust for risk by using a higher hurdle rate, an option-adjusted rate, or some other method. Peter Duran talked about using probabilities of cash-flows. I guess that takes into account embedded options when you take the expected value of a lot of different scenarios. However, if you're looking at future cash-flows of a line of business, and they have uncertainty connected with them, how do you reflect that uncertainty in the present value directly? A way of doing it is calculating a risk-free equivalent, or a certainty equivalent value by making the risk adjustment directly. The derivations are in my article. Again, look at just a very simple case and compare it to the other formula. If you have normal distributions, then the risk adjustment to that present value at risk-free rates works out to be this fairly simple formula where a is the degree of risk aversion.

$$\text{Risk Adjustment}_i = \frac{a}{2V}\sigma_{V_i}^2$$

Where: σ_{V_i} = Value Volatility: one standard deviation change in V as a result of change in risk i

a = the degree of risk aversion (e.g., 5.9 demonstrated by investors in the S&P 500 over 1950–97).

What might a risk profile look like? We at Aetna, and other companies identify the risks in the first column and then develop, on the far right, your correlation coefficients and the underlying driver volatility (see Table 1). We are assuming that the standard deviation interest rate change over a year is 1%. You need to develop the durations or, in a general sense, sensitivities to the drivers by doing the testing that I talked about. That's something that you need to produce. The value volatility just falls out as the combination of those. If you combine them using the correlation coefficiencies, you can see that you can get the uncorrelated total and the correlated total and see the effect of synergy. By using that, you can then calculate your value-at-risk using whatever confidence interval you want to use. It doesn't matter a whole lot, as long as you keep using the same one. That would give you a quantitative measure of your risk exposure, which you can use to prioritize your risks and see how they change over time. These are the two principal uses of value-at-risk.

TABLE 1
Risk Factors

Embedded Value (V) = 100

Risk	Value Volatility σ_{Vi}	Sensitivity to Driver δi	Driver Volatility σ_{ri}	Correlation Coefficients			
				Defaults	Interest	Mortality	Withdrawals
Defaults	50.0	25	2.0%	1	-0 1	0	0 2
Interest Rates	22.8	24	1 0%	-0 1	1	0	0
Mortality	10 0	100	0 1%	0 0	0	1	0
Withdrawals	2.0	2	1.0%	0 2	0	0	1
Uncorrelated Total	55 9						
Correlated Total	54 2						

The other columns in Table 2 are used to flesh out the controls you have on that particular risk and what action steps you plan to take over the planning period to decrease that risk. In some cases, if it's very low, (e.g., the mortality risk might be deemed to be lower than it needs to be) maybe you can be a little more aggressive in terms of your underwriting approach. You can see the effect of that using your risk profile.

TABLE 2
Value-At-Risk Profile

Risk	Driver	VAR	Controls	Action Steps
Defaults		83		
Interest Rates		38		
Mortality		17		
Withdrawals		3		
Uncorrelated Totals		92		
Synergy		–3		
Correlated Total VAR		89		

Then, finally, applying a risk adjustment to the economic value gives you, in my mind, a more quantitative method of utilizing VAR analysis (Table 3). In other words, you can't really do much with value-at-risk. You can't subtract it or add it to anything. It's just a measure or (an index). This risk adjustment gives you a way of saying, "If my unadjusted embedded value is 100, I should reduce that by these amounts according to those formulas for each of these risks." You can see what you're left with in terms of cash. In terms of a certainty equivalent, it is only $45. Then you must ask if that is better or worse than what you'd get if you sold that block of business. How does that change if I increase or decrease my exposure to these various risk profiles? Indeed, how does it change over time?

TABLE 3
Risk-Adjusted Economic Value

Unadjusted Embedded Value = 100

Risk	Value-at-Risk	Risk Adjustment
Defaults	83	47
Interest Rates	38	10
Mortality	17	2
Stocks	3	0
Uncorrelated Total	92	59
Synergy	–3	–4
Correlated Total	89	55
Risk-Adjusted Value =		45

MR. MICHAEL J. HAMBRO: I'm going to talk about risk-based surplus and some specific methodology that we've used at National Life. When appropriate, I've changed numbers for proprietary reasons. Why use company-specific RBS? After all, there's the NAIC RBC formula out there, and that has become a well-established formula. It has a lot of credibility in the rating agencies, and many companies use the RBC formula, or a percentage of it, for their own surplus planning.

Some of the reasons for performing an internal RBS exercise is, first of all, it does address company-specific risks. The RBS project also takes into account a company's asset/liability practices, a company's business practices, and its decision-making processes. One of the things I like about it is it seems to provide a good bridge between valuation actuary testing and dynamic financial condition analysis. National Life, like many other companies, has a bit of work to do on dynamic financial condition analysis, but I think risk-based surplus provides somewhat of a bridge there. The important question that an RBS formula should answer is, given a company's current assets and

liabilities and an investment and product management strategy, how much surplus should the company hold to have a specific amount of confidence that it will be successful in maturing its business?

You know the individual risks C-1 through C-4. The general RBS process that we used was first to establish a methodology for quantifying each of the respective risks, decide on a confidence level, and then correlate the risk to establish a total company RBS formula. Let's start with the C-1 RBS. I'm going to focus on bonds and commercial mortgages because the other asset classes are small. I'm going to provide a detailed description of the bond RBS process that we have gone through.

First, National Life uses expected bond defaults as an actual pricing item. We deduct expected bond defaults from our interest crediting and from our net investment rate in all of our analysis. The thing that's important is that we're not just looking at bond defaults. We're looking at the degree to which bond defaults exceed expected bond defaults. Default cost is defined as a probability of default times the loss upon default. We use Moody's study, and that provides these default rates by rating category. We also need to have an assumption about default recovery rates. Given that a bond defaults, how much are you going to actually lose as a percentage of book value? The recovery rates and the respective standard deviations are based on the seniority and the security of particular bonds.

The next thing we need to do is build the bond portfolio model. We have a seriatim model. We have less than 1,000 bonds, so it's not a big deal to do a seriatim model. Let's discuss the respective data items that we need. The bond modeling methodology is needed to project the bond inventory for 50 years. You should do 1,000 projections and use Monte Carlo simulation.

In the projection process, you calculate the total expected bond default cost for each year in the projection. We're going to base that on break-even default charges that are known at the beginning of the projection. We also calculate simulated default losses for each bond using Monte Carlo simulation. We do this by generating a random number between zero and one for each bond in the year of projection. If the number ends up being greater than the bond's default probability, then the

bond is assumed not to default and just continues to its next year, or it might mature. If the random number is less than or equal to the bond's default probability, the bond is assumed to default. Once it defaults, then we have to figure out how much we lost on that default. We're going to go back to our recovery rates and the standard deviation of recoveries. We're going to generate another random number between zero and one. We're then going to convert that random number to a standard normal distribution. We take that zero/one number and multiply it by the recovery standard deviation, and then add it to the mean recovery rate. The bond's loss is going to be the book value minus this recovery number. The bond is then removed from the rest of the projection.

We're going to calculate total simulated losses for each year in the projection for the entire portfolio, and the measure we're going to use is the excess loss, which is the simulated loss for the entire portfolio minus the expected default cost. We're also going to tax adjust to reflect that capital losses are a deductible item. When you want to determine surplus, that will be very important.

The RBS measure is defined as follows: We're going to choose an appropriate after-tax discount rate. Alastair talked about some of the considerations in the discount rate. You can use a risk-free rate, a tax-adjusted rate, or your hurdle rate. It depends on your view of things. For each of the 1,000 projections, you're going to define the excess loss as EL_t. Then, for each duration, you're going to calculate the present value of these excess losses. I'm going to define that as the present value of cumulative losses through duration n. For each n, for years one to fifty, I'm going to take the maximum of the present value of excess losses. This is the main RBS measure for bond RBS. I'm going to calculate the maximum present value of cumulative losses for each of the 1,000 projections. I'm going to then rank this maximum present value of cumulative losses in ascending order. Each maximum present value of cumulative loss determined through a projection measures the maximum cumulative deficiency between default charges and simulated defaults. If you have that number for the maximum present value of cumulative losses for the projection (MPVCLP) at the beginning of the projection, and you know how the projection is going to turn out. Then you know how much surplus is enough to make sure your bond portfolio remains solvent at each duration.

If I rank the MPVCLP in ascending order, and if result 980 is $30 million, then that means at the 98 percentile, the company's bond portfolio would require $30 million of surplus. A better way to do it would be to do some smoothing. Since 1,000 scenarios is a relatively small number of scenarios, you might want to smooth them by taking the average of results 976 to 984. If I divide the dollar amount of risk-based surplus by the initial book value of the bond portfolio, then I get the RBS as a percentage of the entire portfolio. That's what we did.

In addition to determining the risk-based surplus for the entire bond portfolio, we also wanted to determine the RBS for each rating category. We captured the excess losses for the entire portfolio and for each bond rating category. As you might expect, the sum of the maximum present value of cumulative losses across rating categories is greater than the total bond RBS number for each confidence level. That's because there's a small sample size when I do each bond category separately. In addition, I'm not getting any covariance effect when each bond category is projected separately. We wanted to get bond RBS by rating category. We also wanted to reproduce our total bond RBS. We took the ratio of the entire portfolio bond RBS to the sum of the individual rating category RBS amounts, and then we multiplied the RBS for each bond rating category by this ratio to get our final result. It looks something like Table 4. Like I said, for proprietary reasons I adjusted the numbers.

TABLE 4
Bond RBS as a Percentage of Book Value by Rating Category

Desired Confidence Level	NAIC 1	NAIC 2	NAIC 3	NAIC 4
90%	0.25%	0.49%	2.16%	17.13%
95	0.30	0.58	2.62	20.97
98	0.38	0.71	3.28	24.40

The next important investment category for us is commercial mortgages. Unfortunately, there's no standard industry data on mortgage experience, and mortgage cash-flows can take several different paths. We also know that commercial mortgages have unique underwriting and unique deals and correspondents for each company. There's really no one standard way that commercial mortgage portfolios are managed or are underwritten. In the early 1990s, we built a commercial mortgage cash-flow projection system to model the deviations of the commercial mortgage cash-flows from their contractual cash-flows.

We used the SOA/ACLI commercial mortgage rating system that was developed back in the early 1990s when some companies were having a little bit of commercial mortgage difficulty. This has 13 underwriting criteria. Mortgages are graded from one to five—one being excellent and five being a real problem loan. We rate each mortgage annually to keep the system up to date. The mortgages are classified by property type and rating and the mortgage status (current, delinquent, in process of foreclosure, or restructured). We then take this information, and we throw it into an APL probability transition matrix model, our projection model. This is something we developed specifically for commercial mortgages. We project each mortgage to maturity, and given the mortgage's initial rating, type of property, and status, the mortgage will either stay in its current status, improve, deteriorate, or even go belly-up in process of foreclosure. Each mortgage's status for a particular duration in the projection depends on the specified probability assumptions. Some statuses have adverse cash-flows depending on whether they are delinquent or in process of foreclosure, or restructuring. We do 1,000 projections using Monte Carlo simulations for the mortgage portfolio, and we use a methodology that's very similar to what you saw for the bond portfolio. We use these projections to calculate our expected cost of mortgage defaults or mortgage adverse cash-flows. We also use the projections to get the deviation around the mean so that we can get an RBS amount.

There are two lines of business related to C-2 RBS: morbidity and mortality. For morbidity, our disability insurance (DI) business is a very small, declining block. We reinsured this in the early 1990s; therefore, our DI expertise has left the company. Thus, we use a function of the NAIC RBC formula for DI. It's really not an important component for us. Mortality is important, and when we

undertook this project, we thought we could use parametric distribution functions to calculate RBS. After a while, Monte Carlo simulation gets a little old, so we looked at parametric distributions. Unfortunately, after quite a bit of effort and some rigorous investigation we found that there was a poor fit between the distribution functions and our actual experience. We went back and examined the past 20 years' death claims, but due to the relatively low incidence of claims and a wide disbursement of face amounts that we have, the pattern of results produced a very poor empirical fit for parametric distributions. It seems that parametric distribution functions are better in the group area, for something such as prescription drugs, which has a more predictable and tighter pattern of claims.

We went back to our old friend, the Monte Carlo simulation, and we took our 300,000 policies and grouped them into representative population cells. We projected the policies, using pricing assumptions to obtain a lot of the data. For example, there was expected death claims, lapses, and reserves.

We used the projection results as input for our APL-based Monte Carlo projection simulation which, again, is something we developed off-line. We also took into account the various reinsurance programs that are becoming increasingly important for us and many other companies. We projected all 300,000 policies over a 30-year period. We did 1,000 projections, and the yearly measure we captured was the difference between the simulated death claims and the expected death claims. That measure was the yearly excess death claims.

Then, similar to what we did for bonds, we chose an after-tax discount rate. For each of the 1,000 projections we defined excess losses for year t as EL_t for each duration. We calculated the present value of cumulative losses for each duration and then took the maximum of the present value of excess losses, which was our main measure. For each projection we ranked the measures in ascending order and then chose the amount that was appropriate for the confidence level that we wanted.

C-3 surplus is determined by projecting the company's existing assets and liabilities under changing economic environments. One of the two important items to capture when you're doing this projection is the interest-contingent nature of your asset portfolio. This is true if you have collateralized mortgage obligations (CMOs) or any type of derivatives or asset that is callable or an asset that has a prepayment feature or where interest rates can determine the cash-flow patterns. We also want to use dynamic policyholder behavior so that we can appropriately capture the respective put and call options that we have granted the policyholders for many years. These projections are generally done on a vendor-supplied model.

C-3 projections take into account not only the quantified interest rate risk, but also the inherent product margins and reserve levels. In many ways, these projections are really dynamic gross premium valuations. Another way of looking at it is the asset/liability projections dynamically test product margins and reserve levels. You could use the same projections to calculate mortality and asset default fluctuations. However, I don't know of any model that correctly incorporates both interest rate risk, mortality risk, and default risk on a dynamic basis without making some assumptions that may be inappropriate, or where not enough information is known to make those assumptions.

A key issue in doing these C-3 projections is running sufficient scenarios to get appropriate statistical credibility while considering computer run time. The system we use does run into this issue. Run time is very precious. We figure we can run 200 to, at most, 500 scenarios, which probably would not give good statistical credibility. In order to limit the scenarios but retain the statistical credibility, we're examining, among other things, low discrepancy sequences. We've looked at Faure and generalized Faure sequences. They appear to be the most promising, but we're finding that we may not be using enough sample points as we go across dimensions. We've got to have many dimensions to do this work, so we might need too many sample points than we can actually afford. We're looking at other things. We're still not giving up on Faure and generalized Faure, but it doesn't appear to be a chip shot.

Finally, we have to put this package together. We have all this different quantification, and somehow it has to be tidied up into an RBS formula. Before you do that you might want to consider stress or disaster scenarios. Most of what I've shown so far is random fluctuations from an expectation—things like the 1918 flu epidemic which took three deaths per 1,000. Also consider a global economic meltdown. I'm not saying that this has to be directly incorporated into the final formula, but, at the least, it should be considered.

You also need to come up with a C-4 risk formula. C-4 risk is a general catch-all category. We don't have a C-4 formula that's proprietary. We might use the NAIC formula here. What I've heard is that a company's C-4 needs and its acceptance of an appropriate RBS formula are inversely correlated.

Finally, let's discuss combining risks. How are the C-1, C-2, and C-3 risks correlated? The NAIC formula takes the square root of C-1 plus C-3 squared plus C-2 squared, and C-4 is outside that. That's a possibility. We have not finally settled on what we're going to do. Are we going to use an additive formula or employ some type of appropriate covariance.

MR. DAVID K. SANDBERG: Is there some additional information we can pull out of cash-flow testing to look at our C-3 risk? The previous two presenters have shown that the profession has come a long way in trying to look at organized and logical ways to assess and measure risk. There is a standing Risk-Based Capital Group at the Academy. They formulated a C-3 subgroup to look at ways of measuring and assessing the C-3 risk.

The current C-3 risk formula has several shortcomings. This probably isn't news to anyone, but we currently look at the liabilities independent of the assets. Because of the actual way that the current formula is calculated, we don't look at any relationship between the assets and liabilities; we just apply a factor to the liabilities. In addition, the reserve level does not really assess the mismatch risk. You could be the appointed actuary at a company and determine a need to establish additional

reserves because there is some mismatching in the investment strategy. When you post those additional reserves, you would actually end up increasing the risk-based capital charge even though you would assume that your action was meant to decrease the risk of that event.

In addition, we don't take advantage of work that we're already doing. The cash-flow testing is meant to measure C-3 risk, and we would hope to be able to spring off of that work and provide some useful information. Jim Reiskytl mentioned that his company manages its business by looking at the pricing assumptions. It sets those up, and then looks at its experience as it unfolds. Then they manage their business that way and throw in statutory and GAAP accounting that really gets in the way of trying to manage the business. What you'd like to be able to do is hope that the financial information you prepare could actually be useful in helping you understand and manage the company.

Actuaries are always good at pointing out problems, and we'd like to find some ways to improve on the current process. In many ways, cash-flow testing is seen as a way to determine whether you passed or not. Most of the time it's a pretty routine question. Let's hope we can get some additional information out of this process she has: (1) If we can, we'd like it to be consistent with other risk-based capital measures. (2) We should be able to use the intermediate values in your projection. (3) We would like to have a C-3 factor that doesn't have a cliff effect where you go in discreet intervals. (4) You should reflect the fact that your risk reduces as you're looking at more policies. (5) Conservative reserves should give you a lower C-3 factor. (6) You don't want to double-count margins. As Mike said, there are margins for other risks. You don't want to be using those in your C-3 risks. (7) Again, you want to seek an improvement over the current process, but we don't need to find perfection. (8) The process should motivate good behavior. (9) Hopefully it's not complicated. (10) It's fair and it provides useful management information about the company.

So, the approach was started, and a recommended framework was presented at the September NAIC meeting. It might be effective in 1999's annual statements, but that question is still under review. The reason is that this isn't really something you can test with diskette data or for which you can ask information to be sent. The company would need to know that as part of its cash-flow testing, it

would look at this analysis and then be able to include it. The NAIC could look at it and see the effect of it. The current status is that the report was presented in September outlining the framework. A more definitive report will be given in December. If it's possible that it could be included for 1999 year-end, it will be. If it's going to be too quick to implement, then we may need to push back, but we're hoping to be able to use this information soon.

What did the Academy Task Force learn from the study? I think the answers were fairly obvious, as we expected, but it was nice to be able to go look at six to eight companies with different products. Riskier asset strategies do show higher C-3 charges, and if you take duration bets, then you can see that coming through in the testing that was done. The process that Mike highlighted that pertains to C-3 risk is the same kind of idea. You run a large number of scenarios. You rank them in order, and you look at the 95th percentile. If you want to do some averaging, you can do that, too, for the 93rd through 97th percentiles. When you aggregate results, you get less risk. There is some sensitivity to how you define your excess lapse function. People still seem to think that if you duration match, somehow that reduces your interest rate risk. We were able to use strategies that showed the duration match, but if you're using barbells or ladders improperly, it can still end up with significant C-3 risk.

There are four key pieces in the framework that was proposed. First, who does it apply to, and how do you talk about a set of standardized random scenarios? Second, you want to use the company's cash-flow model to determine the C-3 charge. The other idea is that you want to limit, in the first few years, the fact that the credit that you get could not be less than half of your current charge, and it would not be more than twice your current charge. As regulators get a chance to review data over a couple of years, they can adjust it appropriately. Finally, determine a C-3 charge for surplus.

As for scope, the ideas that would apply are the material interest-sensitive products, GICs, single premium deferred annuities (SPDAs), two-tiered annuities, the single premium immediate annuities (SPIAs), and structured settlements. This is not meant to create additional work for people if they

don't feel it's appropriate. If you have a minor line of business, and you say it's not worth spending the time on it, then you could choose to opt out of the testing but go ahead and take the maximum charge for the C-3 piece in your risk-based capital.

We started by using a set of 200 scenarios to do our testing on; then we tried to determine how you can limit those answers or limit the number of scenarios you might have to look at. Low discrepancy sequences are certainly one of the options that we've looked at. The other ideas that we've looked at are picking 50 representative scenarios that are some of the worst scenarios, or using the worst case of 20 scenarios. I'll come back to this later, but the idea is that scenario generation could be done under the direction of the Academy, the NAIC, or some academic group that could distribute those scenarios with a September or December framework, depending on how the timing of this gets worked out.

There are three approaches to picking standardized random scenarios. First, you could rank them by average interest rate and volatility. You get a two-dimensional grid, the idea being that if your average interest rate through the scenario was higher or lower than the others, the volatility is higher; that's more likely to be a stressful type of scenario. The idea is we're not trying to find the perfect answer or pin down the precise answer. We're trying to create a methodology that allows you to get better results and be able to identify risky asset positions or investment strategies a company may be taking. Another idea is that you could possibly identify the worst 50 or near worst across product types. If you took the top 75, you might find that there's not a lot of difference between them, even though there's not a perfect correlation across products. It still gives a representative measure.

When you use a company model, one of the issues in cash-flow testing is the actuary sets all of the assumptions, except for eight required scenarios that are required to be tested. One of the questions that we're dealing with is whether there is standardization that should be used or whether you should use the best-estimates that the actuary has? You should have required disclosure of any changes in assumptions from year to year and, most likely, some kind of required sensitivity of the lapse function. The dilemma is that if you have standardized assumptions, you cannot really reflect the risk that your company has. There are different markets, different product types, risks that are unique

to each company, and generally you would think they're the best qualified to model and assess that. If you have a company that is on the edge, is there undue pressure on the actuary to soften his assumptions so that a company might pass the test? Whatever the format of the information, the regulator needs information in order to regulate. Maybe you can do that by doing required sensitivity testing. Maybe you can do that by defining a standardized lapse function. There are alternatives that we're looking at, and that's probably one of the issues that we'll be presenting as a recommendation in December.

You would disclose the required amount to the regulator. On the assets supporting surplus, you need to look at some of your vulnerability to statutory losses due to interest rate changes. We're still working on that methodology.

Some of the current issues are how scope might be linked to Section 7 versus Section 8 opinions. Can you be exempted or not? Should this be included with that, or does this come through as a separate issue? We hope to keep this somewhat separated from the discussion and allow companies the flexibility. If there will not be a meaningful risk, go ahead and take some standardized charges or use standardized factors. Again, there is the standardized versus best-estimate.

One last point. What does all this mean? And I'd like you to think for a minute about the question of what is it that we're trying to do. We've had some really great presentations on ways that we can use our analytical tools and understandings of probability and finance to come up with some measurements and some numbers. The key question is what kind of decisions or cut-off points come out of this? For example, we talk about setting up a 95th percentile or we talk about a reserve level at some 65th or 80th or 85th percentile, but what does it mean? Typically, reserves are meant to cover something over the life of a product. When we look at risk-based capital, are we talking about the probability of the company failing? In other words, if I say that I'm setting the 95th percentile, and I have 100 companies, does that mean that I expect five of them to fail, or does 95% mean that it's a margin so that there is time in order for the company to take corrective action before the company can fail? Also, risk-based capital is often seen as something that's looking over a three- to five-year horizon. The distinction between reserves versus risk-based capital is important to keep

in mind here. I just think we need to be careful as we think and talk as a profession about 98th percentile or 95th percentile, and as we look at some of these risk measures. We need to be careful about giving the impression that this is talking about a probability of failure or that we're certifying to some probability level. We're using these probabilities to give information based on the assumptions that we started with.

We have all this information on a technical direction and how to better use the information that we have. What is it that's useful, and can we actually spring off of the information? How comfortable do people feel with the idea that the risk-based capital or the cash-flow testing could actually be used to calculate risk-based capital measures?

MR. GEORGE: Let's talk about Dave's work first, and then we'll go back to Mike and Alastair and see if there are any questions for them. Dave, can you lead an open discussion about the C-3 component?

I have a question. We're talking about a number of scenarios here, or at least we may be, depending on which method you end up with. I know a number of our companies, especially our large ones with many lines of business, have trouble running a number of scenarios for cash-flow testing. I know some that really limit themselves to seven, plus just a few more because they really feel like that's all they can accomplish. What are your thoughts there in terms of being able to make sure we can do this type of analysis from a practical standpoint?

MR. SANDBERG: There's two things. On one hand, if a large company is saying that it has a block on which it has difficulty running scenarios, then it should be in the position to either say, we will take a maximum charge because it's a minor piece of business or a minor line of business, and it's not important. If, on the other hand, it is saying that it can't run the scenarios, and it is a major line of business, then it needs to be doing the analysis. We currently have the safety blanket that says all you do to look at your business is apply a lot of factors to it and add them up at the end of the day. That should enable you to be safe from a regulatory oversight. Then management can ask the question, "How much risk do we have?" We might say, "We don't know. We spend all of our time

on the financials and preparing numbers." That's one response. You either need to be doing it or you should be willing to take a standardized charge on it.

The second is that the idea of using a lower number of scenarios should allow you to include it as part of your regular cash-flow testing. If you use 20 scenarios, and if you fail any of those 20 scenarios, then you either take a maximum charge or, if you think it's appropriate, you should do a more full-blown test to more accurately describe the risk

MR. LARRY M. GORSKI: Some history might be helpful here. When risk-based capital was first being discussed and eventually adopted five or six years ago, I think everyone recognized there were little shortcuts being taken in the development process. Not everything was quantified to the level that purists may have wanted.

As time has lapsed, people have been using risk-based capital for capital allocation and other purposes, and, as that has taken place, there has been pressure put on regulators to refine certain elements of the formula. One in particular that is being discussed now is the co-variance adjustment and its impact on common stock within the RBC formula. There has been changes to the slope of the bond factors in the bond factor methodology, and other things have taken place. They've always been in the direction of reducing risk-based capital requirements. From the start, I felt that the C-3 area was an area that needed some improvements in quantification, if for no other reason than to balance out some of the other adjustments taking place. I'd use this as sort of a balancing out of the items that might be adopted to reduce the RBC requirements. But it also moves towards a customization by making it a more company-specific type formula. I think the prime view of risk-based capital is still the margin idea to give the regulator a margin to react to adverse situations. But, at some point in time, it also becomes a takeover mark, too.

MR. SANDBERG: That's good information and helpful to keep in mind.

MR. GEORGE: I have another question. Is there a fear that our capital requirements might increase due to something like this? Given the position that we're in and given that a number of the

people in our industry feel like our capital requirements are quite high compared to other types of financial institutions, this makes it more difficult for us to compete with them. Is there fear about C-3 right now being a rather small piece of the whole RBC formula for most companies? Are we increasing the amount of capital that we're requiring by doing this?

MR. GORSKI: That's why I view this as part of an overall package of counterbalancing elements. If the adjustments in the co-variance formula get adopted, it is estimated to have a 10–12% reduction in risk-based capital. If other things take place, there may be other reductions in risk-based capital. I don't see this necessarily increasing risk-based capital to a level greater than it is now, but it may put greater capital requirements on those companies that need the additional capital requirements from a regulatory perspective. You talked about making sure it encourages good behavior. When we have a rather sophisticated C-1 charge for default risk or credit risk and an unsophisticated charge for C-3 risk, it's pretty easy to point out the people making bets in a certain direction. One of my concerns is that the nature of the formula is encouraging bet-taking on the C-3 side. The idea I had a couple years ago was to balance that out. In the long run, I don't think it's going to increase risk-based capital to a level that is inappropriate.

MR. SANDBERG: I think it's important to remember that C-3 risk is one of those risks that you can manage. If this had been in place last year or this year-end, there are companies that might have higher risk-based capital charges. It's also very easy for them to make those adjustments. The idea is that if you realize you'd be measured on it, you would then take appropriate action. By the time it's implemented, it might mean that there is a lower risk-based capital charge if the companies are acting appropriately. It makes sense that if they aren't acting appropriately, and want to take that risk, then it's being properly identified.

MR. GORSKI: In that same vein, it probably will bring into the risk-based capital formula proper recognition of derivative instruments used for hedging purposes. Right now for risk-based capital you don't see any positive impact from hedging, and if you use hedges correctly, these calculations should reflect that and also be a boon to you.

MR. SANDBERG: Well, I'm going to ask for a quick show of hands. If the final proposal included a list of standardized assumptions that you should test, in addition to your cash-flow testing, would that be the more effective route to travel down because you basically have a spectrum from zero to one? You can say there's no standardized assumptions at all. I think the group would agree that there needs to be some, such as a standardized random set of scenarios. The next step has to do with whether there should be a standardized set of option costs? In other words, the lapse function is driving the option cost to the C-3 risk driver on that liability side. Should you have a standardized assumption set there? What about equity-indexed products? Should you have some standardized assumptions that are used there? The reason I raise this question is because I think, as a profession, we are in the midst of some larger discussions about how much reliance the actuary can and should have in order to evaluate risk. Do you need a standardized set of assumptions that you just apply? Are you basically the calculator that adds up the numbers or are you the one that needs to say, no, this is the way the assumption should be set? Let's start with a full set of standard assumptions, lapses, and mortality.

Who thinks that a full set of standard assumptions would be a better way to go? One vote in the back. How about no assumptions at all other than a standardized set of random scenarios? There's about five hands. We must have a broad range in the middle. What things should be standardized, besides interest rate scenarios?

Let's vote on whether prepayments should be standardized? About six people said yes. Let's vote on whether lapse assumptions should be standardized.

Someone commented that maybe you should standardize it by distribution channel. Who should put that information together and then be responsible for saying it's the right standardized set?

The regulators don't want to have the responsibility of creating 1,000 assumptions and constantly have every company argue about how that assumption is not appropriate.

MR. JAMES F. REISKYTL: We have talked to the major actuarial consulting firms. We've talked to just about any Society committee and Academy committee. There are people who, for annuities or universal life, have taken an approach in which they have developed a standard. We're looking at that.

There was a presentation made at the Hawaii Spring meeting on a form of standardization. Many of you have heard me say that I think there's a strength in RBC being a formula. Others prefer the individual actuary's judgment. We're not suggesting that we will standardize every assumption. That would be foolhardy. But I think we're trying to focus on the most sensitive assumptions. As David described, what the C-3 group did was try to figure out what they are, which leads to these 20 or 50 scenarios, or whatever we end up with. If you had a chance to think about it a bit, you would conclude that the area we should standardize is the most sensitive area. Who can say that the most sensitive area is by product? That's fairly easy in the traditional products. But there should be a lot of give and take on this, and we'll see where we go. Just because you have standardized assumptions, it doesn't necessarily mean that's your RBC factor. You could still use individual judgment where you'd only look at your outliers. If the standard produced 100, and your number was zero or four million, you might want to take a look at it, or, as a regulator, you might want to take a look at what those results were. If your results came in at 80 or 90 or whatever your tolerance level was, you'd say that looks good. It's a means of walking into this and making some progress or recognizing individual differences but still maintaining standardization. If you have any input or if you have some tables, you're welcome to send them to Dave or I or anyone on the committee.

MR. DANIEL EDWARD WINSLOW: Standardization should be implemented for things that are economy-wide or that are common across all insurance companies. I'd suggest interest rate movements and prices of A-rated or AA-rated bonds or something that is identical across all insurance companies. We're all in the same market. I think one of the reasons you're hearing hesitancy about lapses is because they are very specific. Even within a single insurance company, we have tremendous variations across distribution channels and product lines. Setting a lapse rate

without examining the data for that specific distribution channel in that specific product line would be somewhat foolhardy. We wouldn't want to say that a general agent system has a lapse rate without looking at our particular company and our particular distribution or our relationships.

MR. SANDBERG: There are eight members on the group, and I think there are two members that prefer that only the interest scenarios be standardized. As you said, there are economy-wide assumptions. There are four groups of two that go across the spectrum. It also depends on how you view the RBC measure. If it's meant as an early warning tool, then maybe the standardization is meant for the sensitivity testing. Then the regulator would have the ability to see what would happen if this were different or what impact it would have. If RBC is seen as something that's really a takeover tool where the company is going to be taken over and run by regulators, then maybe there would be a desire to keep the actuary out of the hot seat and decide that his company is going to be taken over by a regulator.

MR. GEORGE: What if, when you do standardize the more sensitive assumptions, you give a company an out? Can the company produce credible evidence that shows, for their own business, the standardized assumptions aren't valid? If you can produce an actuarial study that says this assumption isn't correct for my business, can you give them an out?

FROM THE FLOOR: I think that's a pretty reasonable idea, but I think the problem is the way in which risk-based capital is disclosed to the world through the annual statement. There is not enough information given to be able to understand a lot about the risk-based capital profile of a company. Let's say the amount of information disclosed through the statement was cut back, and yet that information was still filed to the insurance department in another way. Then, for those cases where there would be an action level event based on the standardized assumptions, you'd come in and be able to explain that away on your customized assumptions—maybe that would work. I think one of the big concerns is that, on a standardized basis, you're going to look bad, and that's going to be disclosed to everyone. Somehow that issue has to be addressed.

MR. SANDBERG: The other complication is that you'd like to say that the risk-based capital testing is the testing done for asset adequacy. So if you're using your best-estimate assumptions as the reality of your business, and if you do asset adequacy testing and then turn around and put in a set of standardized assumptions, that will be more work.

MR. JAMES W. DALLAS: I have two or three questions. Mike, how long has National Life been using risk-based surplus? Has there been a consistent pattern or multiple of NAIC RBC that you've seen over the years? David, how has the reformulation of the C-3 calculation taken into account reinsurance programs and particular programs where the assets and liabilities stay on the ceding company's books?

MR. HAMBRO: We've been using RBS since about 1991, and over the years, we've updated certain factors, and others have become rather obsolete, especially in the C-3 area. In 1997 we started doing a complete refresh. If I could have applied consistent resources, it probably would have been done by now. But, being a medium-sized company that does many different things, it stretched out a bit. We hope to have it done by early next year.

As far as the multiple of RBC, I don't think that's going to work with standardization. I'll give you a couple of good examples. Many companies have been able to transfer C-1 risk to C-3 risk by buying certain assets. For example, there are catastrophic bonds, which is not yet a huge asset class for life insurers. Let's say you buy a bond. If you have a protected traunche that's guaranteed to pay the principal, and if the hurricane triggers the bond to become a zero-coupon bond, you get about 50% of the value of the bond, because you are going to get a principal payment in 10 years. You've lost 50%, but you're still allowed to carry this on the books as an NAIC 1.

The other example is structured notes. Let's say you buy S&P performance, and it's principal-protected. You've bought an equity plus a zero-coupon bond, and you're going to get the NAIC 1 equivalent to a straight coupon-paying bond for that. There are so many situations like this in which

companies can effectively avoid the intention of the RBC formula. I think a multiple of the RBC formula is going to be difficult, for that and other reasons, as an appropriate measure of a company's risk across different product lines.

MR. SANDBERG: One other idea I should have expressed a little more clearly is to take all the assets that the company has. You're assigning assets to a set of liabilities. If you're a company that has ceded away assets and liabilities, then that's not considered in the cash-flow testing. However, at the end of the day, you should have been able to account for all the assets, and the assets backing the liabilities are measured against how well they fit the liabilities. Then, you would want to look at your free surplus to see how much is left over to determine if there is any risk in these assets. As Mike said, some of those concerns should be diminished through that process.

FROM THE FLOOR: Does that address the issue of Mod-Co Insurance?

MR. SANDBERG: We did not look at any modified co-insurance situations per se, but whomever has the investment risk should do the C-3 quantification. The other party has only credit risk. We have to think about that.

FROM THE FLOOR: One of the projects at the NAIC is the Unified Valuation System proposal.

Some have strongly suggested it would be an advantage from the standpoint of making things administratively easier for companies to get rid of a lot of detail and give regulators information that's more risk related. Alastair and Mike, what would your reaction be to a regulator who would ask to see your value-at-risk type work or your RBS type work? Is it something that you would deny having produced or would you share it somewhat willingly?

MR. LONGLEY-COOK: Up until now I've viewed the risk management process as being totally management oriented. In order to make it as effective as it can be, in my opinion, it ought to stay that way. I think once you're doing it with the idea that a regulator is going to look at it, it might affect your assumptions and your methodologies. Having said that, I don't think that means you

can't use any of it outside the company. I think the way that regulators and rating agencies evaluate the risk of a complex organization, like an insurance company, has been improving. I think concepts such as value-at-risk can be useful. For instance, when we have our discussions with the rating agencies, I describe the risk management process and talk in terms of what we've learned from it. I certainly don't disclose the entire risk profile for each of our lines of business. At this point, I view it as somewhat experimental and proprietary. Over time, I think some of these concepts can be useful to regulators and rating agencies.

There are various SEC disclosure requirements that a company's senior management knows of—that being certain risk exposure. That kind of puts you in a Catch-22 when doing this analysis, and then sitting down with senior management and pointing out a risk exposure. Keeping the discussion informal and not placing too much credibility on an analysis that relies on many assumptions is one way to deal with it. Mike, do you want to add to that?

MR. HAMBRO: I pretty much agree with that. I think we'd be doing this for internal purposes right now. If it is required for regulatory reasons, we'll do a good job and supply the regulators with whatever is needed to allow us to conduct business in that state.

FROM THE FLOOR: I have a question for Alastair which ties back to the response for Larry. What then do you share with your board or with external parties? Is what you present to the board a version of this? Is it totally separate? What type of risk management do you present to them?

MR. LONGLEY-COOK: As I say, a lot of this is still experimental or evolutionary, and I'd say we're not ready for "prime time." I do present a roll-up for all Aetna's operations because you have these risk profiles developed for each business area I present to the CEO and to the Chief Financial Officer. That particular profile with all the numbers in it and the rest of it does not go to the board at this point. At some point it might. I think we need to deal with this issue of disclosure before you start doing that. At the moment, the board is aware of our process, knows what we're doing, what we're seeking to do, and is very supportive of it. They don't necessarily need to see every detail. As I say, I think this has to be very open and aboveboard. You should be able to express concerns

to the CEO or CFO without necessarily going to the board right away. Much of this analysis is very dependent upon assumptions and methodology. As we all know, both of those can change overnight. The question is, do you overreact and cause a problem for the company in terms of disclosure, or do you underreact and, in fact, not do the job you're trying to do of getting management reaction? I view the product or goal of all of this as: Does it influence management decisions with regard to risk exposures? It's not a disclosure goal at this point. Does it lead to the chief investment officer or the asset/liability management committee or the CFO to say, "I see what you're saying here. I think we need to cut back in this area." Or "I see what you're saying here. I think we can increase our risk a bit in this area?" If it's leading to that kind of further discussion and analysis, then I think it's beneficial.