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Session 4PD
Economic Capital

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Summary: In light of recent capital market and economic volatility, the concept of economic capital (EC) has received increasing attention from insurers, regulators and rating agencies. The panel will discuss:

- *Current market practices and experience*
- *Calculation of EC*
- *Practical experiences with implementing EC at a life company*

By attending, participants gain an understanding of the issues involved in using EC for their work.

MR. HUBERT B. MUELLER: This session is about EC. My name is Hubert Mueller. I'm with Tillinghast, and I'll be the moderator for your session. Ellen Hall from ING Institutional Markets and Dennis Lauzon from the New York State Insurance Department will be the other speakers.

First, we will give a bit of an update on what a subgroup of the Risk Management Task Force (RMTF), which I'm leading, has been working on in the area of EC. Then, we're going to talk about what we see as current market practices in this area. Ellen is going to give us a case study of how EC is being implemented at ING Institutional Markets, and Dennis is going to provide us with the regulatory perspective on this topic.

So let's start by giving you a brief overview of what's been happening at the Society level on this topic. First of all, EC, and I will define this in a moment, has certainly received a lot of attention in the marketplace for various reasons. If you looked at industry capital and surplus statistics, you would see that over the last five years, because of the capital-market volatility that

we've seen and some other events, capital in the industry has pretty much stagnated while overall business in force has still grown. If it weren't for some injections of capital by some of the parent companies, quite a few companies in the industry would actually be significantly lower in their capital and surplus ratios than they are. Many companies have required additional injections.

Quite a few companies have suffered downgrades in their financial strength ratings over the last six to 12 months. A lot of those happened last November. Some of them are still happening now. There's still credit exposure, and we don't know if the current recovery in the equity markets is really going to persist for the remainder of the year. I have a feeling that quite a few companies actually depend on a fairly healthy stock market happening this year, and that's not good because you can't control it.

So let's talk a little bit about what the subgroup on EC within the RMTF has done. This group, along with many of the other subgroups that are currently in place, was started in the spring of 2002, when the Society called for volunteers on various topics related to risk management. The goals that we set were to research the measurement of economic risk in life insurance companies as practiced in North America, to document techniques and standards that would quantify the risks that are material (threatening insolvency of life companies), and to document techniques for allocating capital as used in pricing, budgeting and financial reporting.

One of the first things we did in the subgroup was an industry survey on current practices related to EC. We tried to keep it fairly brief. I think it was about 12 to 15 questions, and over a period of about six weeks last fall, we had almost 500 respondents to the survey. This was tremendous, because we only sent it to the Financial Reporting, the Investment and the International Sections, which in total, covering overlaps, is about 5,000 people. So we had almost a 10% response rate, and we had people filling out the survey from as far away as Australia and some places in Europe and the Caribbean.

The second and more major piece of work that we've been working on over the last six months is what is called an EC Specialty Guide, which really is designed to be a source of information for practitioners interested in this topic. There are obviously different interpretations of what a specialty guide is supposed to do. One thing that we've decided as part of our work is that the guide should not be about best practices only, because I think the practices are still emerging as we speak. The practices haven't been defined. What are best practices? I think part of showing what best practices are actually has to come out of market experience, such as what's working and what's not working so well. I think these things are still happening with respect to EC. The guide is really supposed to be a source of information.

For people who are interested in the topic, we have various sections included in there. I'm going to point those out later. An update of the specialty guide will be posted to the Web site this week. It has about 50 pages of main content, and then two appendices, each of about 20 pages.

The main section contains a definition of EC, uses of EC in the current marketplace, the tie-in of EC to regulatory/rating agency capital and current approaches to calculating and allocating EC, including case studies and regulatory developments. The appendices include the survey results that we had gathered last fall and a review of literature on the topic that is organized into different sections, such as general discussion of EC, how to calculate EC, how to use it and how to allocate it. Also, the literature review has a Web link, if available, on each of them. So if you're really interested in any one of these articles, you can actually find the Web link and read that in detail yourself. I think the literature review was very well done.

So, what is EC? For whatever risk you're trying to cover, you're developing a distribution of likely outcomes under stochastic sorts of scenarios. At the most basic level, the EC subgroup has been describing EC as "sufficient surplus that would be needed to cover potential losses at a given risk tolerance level, over a specified time horizon."

I think this definition shows you that it's obviously a definition that is flexible and can mean different things to different people. Depending on how your liabilities are structured, this may be a longer time horizon for some than it is for others. In terms of the risk-tolerance level, a continuous tail expectation (CTE) approach is implied here, which would be the average of the n percent worst scenarios. In taking the average of a number of scenarios, does that mean you have included the worst one, or you have not? The Canadian view on this is you really haven't included it because you're not taking the worst, but rather an average. The U.S. view is that you are because it's part of the average. If you think about it, the average over a thousand scenarios includes the worst one, but only at 1/10 of one percent.

I think part of it is that the whole process is emerging and is evolving, and there are a lot of interpretations on what is an appropriate risk tolerance level. The rating agencies have some views on this. The regulators have some views on this. And companies have some views on this as well. I think it's a topic that is receiving increasing attention as we speak. We've noticed that among the international insurance supervisors, there's quite a lot of interest in this topic, and they have taken notice of our work as well as the work of the Casualty Actuarial Society, which is also quite involved in this topic.

Next, I would like to talk about some of the survey results. There were 491 survey participants, and quite a large proportion of survey participants were from multinationals or U.S. companies. Some of them were Canadian, and a few were in both the Canadian and U.S. markets. In addition, quite a large proportion of the

people participating were from larger companies with assets greater than $20 billion. Sixty-eight percent were from stock companies, and roughly one-quarter of participants were consultants.

For the survey, we had defined EC fairly generically, as EC being sufficient surplus capital to meet negative cash flows at a given risk tolerance level. This definition, as compared to the one I gave before, uses the phrase "to meet negative cash flows". I think we've since come to an agreement that it's not just negative cash flows, but any potential losses that would need to be included. So it really would go a little bit further. But it was interesting that out of the 500-or-so participants, 81% agreed either strongly or at least somewhat with that definition, only nine percent disagreed, and 10% didn't know. So there was about a nine-to-one approval ratio, which I think was a pretty good consensus.

In the survey, we did allow for write-ins. If people didn't like the definition, we asked for an alternate definition. We went through 77 or 78 write-ins and actually condensed them down into three practical interpretations of EC (see Chart 1).

1. Risk-based EC is defined as sufficient surplus to meet potential negative cash flows and devaluation of the balance sheet at a given level of risk tolerance, over a specified time.
2. Risk-based EC is defined as the excess of the market value of the assets over the fair value of liabilities required to ensure that obligations can be satisfied at a given level of risk tolerance, over a specified time horizon.
3. EC is defined as sufficient surplus to maintain solvency at a given level of risk tolerance, over a specified time horizon.

You can see here that there are slight variations in how people have defined EC and how companies have applied it. I would say that the first one is pretty close to our initial definition. The second one is really more of a fair value-type interpretation, looking at market values of assets and liabilities. And the third one is more of a solvency view, maybe more the regulatory-type view. There's no one consistent definition applied throughout, at least not yet. Our goal is to contribute to the discussion, but we're certainly open to suggestions.

One of the things that we asked people was: What risks do you think should be covered when you calculate EC? The results (see Chart 2) showed that 96% of respondents agreed that EC should cover interest-rate risk, 93% marked the box for pricing risk, 92% for credit risk, 91% for equity market risk, 86% for liquidity risk, and 79% thought operational risk should be covered. These are fairly high percentages, in my view.

We also asked people if they had actually used the concept of EC in their work. As a result, 45% said they have used EC, and 55% said they have not. Now you can say that half the people have used it so the glass is half full, or half the people haven't so the glass is half empty. I like to look at it as half full, but there are different

interpretations. It shows that it's still a fairly new topic, and it's not as prominent as many of the other subjects that you'll be hearing about at this meeting. And maybe that's one of the reasons why you're trying to learn about it, because it's not a very well developed topic yet.

What companies typically do when they calculate EC is to rank a distribution of present values of outcomes from either individual risks or combinations of risks, and then once the risk tolerance level has been determined, they can work out what their EC is to protect against those losses. Obviously the more stringent the requirements are, the higher the EC requirement. So, for example, if you're an AA-rated company by Standard & Poors (S&P), that determines a much more stringent risk tolerance level than if you're, say, BBB-rated. AA-rated may mean that over a period of 10 years, you have to satisfy losses at the 99th percentile. If you're BBB-rated, it may only be the 95th percentile. If you look at typical outcomes, that four-percent difference in scenarios could be a difference of 10 to one in the level of actual capital.

We also asked companies what risk tolerance measures are typically used when determining EC. Sixty percent said they use some percentile such as 98th, 99th or 95th, whatever it is. About 17% of companies use a multiple of standard deviation, which is more formula-driven. Of the remaining companies, 15% used CTE. The CTE approach will be familiar to those of you who are working in Canada or who have made yourselves a bit more familiar with the new RBC C-3 Phase 2 requirements. Essentially, C-3 Phase 2 capital is defined based on EC methods. There is a big difference between the two. EC really means evaluating risks and the underlying capital relative to your company's risks. Regulatory or rating agency capital, at least so far, has been using more industry averages, or formulas that somebody came up with looking at a large group of companies, rather than something that's company-specific. However, more and more of the large companies are starting to make it company-specific because they feel that they're different from the industry average.

Staying with the sample of people that had used EC, we asked people what their main reasons were for calculating EC. Forty-four percent of them said risk management was the key reason. Another 32% cited performance measurements. So, one is more of a risk-management-driven approach. The other one is more of a performance-measurement-type approach, which looks at the volatility of revenues and the volatility of future earnings. And 59% of them said that they have established a formal framework for the calculation of EC. So it's not just done once and random, but there is a framework in the company for how to do this. In fact, Ellen is going to give us such an example.

When we looked at what the current uses of EC in the industry are, we came up with the following list:

- Determination of company/risk profile,
- Capital budgeting,
- Evaluation of required capital in mergers and acquisitions (M&A) situations,
- Product pricing,
- Setting risk tolerances and constraints,
- Asset/liability management,
- Financial reporting,
- Performance measurement (including embedded value),
- Incentive compensation, and
- Rating agency and regulatory discussions.

Another question for which we allowed multiple answers was: How have you measured EC for various lines of business? "Stochastic methods" was the answer that 43% of respondents gave. There are quite a few people that continue to use formulaic approaches, which ranked at 31%. There are also quite a few companies still using deterministic methods, which ranked at 28%. And the mean variance/covariance methodology came in at 18%.

One of the problems with mean variance/covariance models is you'll need to specify very large correlation matrices. We've seen this in practical cases at some companies, in our work at Tillinghast. I think in one example a company had 500 risk elements. A matrix that is 500 by 500 has 250,000 elements, and the company had to do that at the beginning and at the end of the year. So that's 500,000 decisions where you can be wrong. That's a lot of work, and I'm not sure if the outcome is really worth spending all that time on it, because there's going to be a lot of guessing in terms of what goes in there. So, I'm a little suspicious about mean variance/covariance approaches for EC, because you have to set all those correlation factors. However, if you have a good method to determine them, then maybe you'll come up with the right answers. At least initially, it's quite a bit of work to get to a good answer.

We also asked people if they were aware of the new RBC C-3 requirements. Admittedly, this was last fall, and it's almost a year later now, but only 38% were aware of these new rules, which I thought was an astoundingly low number. I think that number would have grown to maybe 50 or 60% now. I don't think it's where it needs to be, because I see what's happening on this RBC C-3 front as a practical application of EC, but applied in more of a regulatory fashion. In other countries, the same thing is happening, such as in Europe where solvency regulation so far has been purely focused on the liability side.

In the U.K., the regulators have turned the issue of required capital for solvency around. Starting in 2004, they will give you the specifications of how you need to run your models. You run your models and come back to them and tell them how much capital you need. This is a totally different approach for a market that has seen hundreds and hundreds of years of doing the same thing one way. They're changing, and I think it's changing here and in other markets in the world as well.

Finally, we asked respondents if they think EC is going to take on more importance going forward. Over 60% said yes, and only two percent said no. This question was asked of everybody. So, there were a large proportion of people who obviously didn't know the answer.

The next speaker will be Ellen Hall. Let me just give you a little background on Ellen. She has 10 years of experience in the risk management and asset/liability modeling (ALM) area. She's currently working at ING Institutional Markets in Denver, which she joined in 1998 in the risk-management area. Her current role there is the director of risk management for institutional products. During those five years at ING, she has helped implement the EC model that is available through S&P if you use their financial-products model, and Ellen's going to tell us about that. Also, she is very much involved in developing EC for that subdivision of ING's overall business. Before that, she worked at Fortis in the ALM area for about five years in St. Paul, Minn. She has a business degree with an actuarial science emphasis from the Carlson School of Management at the University of Minnesota. She is a Fellow, and she's also a Certified Financial Risk Manager of the Global Association of Risk Professionals (GARP).

MS. ELLEN WOODRUFF HALL: Today I will be talking about three different areas. The first is how ING Institutional Markets currently manages capital. And, as Hubert said, ING Institutional Markets was the first company to work with S&P in implementing the Financial Products Company (FPC) capital model. Secondly, I will talk about how ING is starting to implement a formal EC approach across the various business units within ING. And finally, I will discuss if there is a link between the EC framework and the fair-value framework.

First, I will give you a bit of background on ING Institutional Markets. We are one of the many business units of ING. We happen to be located in Denver. At the end of 2002, we were just under $10 billion. And we are the guaranteed investment contract (GIC) issuers, predominantly the traditional GICs, funding agreements and municipality contracts. Our assets are invested by ING's investment management in Atlanta, and our asset portfolio consists predominantly of corporate bonds, private placements, collateralized mortgage obligations (CMOs), some commercial mortgages, and a fairly extensive book of derivatives to hedge our fixed-rate portfolio to floating, as well as to hedge the negative convexity risk on our CMO portfolio. Even though the assets are traded and managed out of Atlanta, the Denver group is still responsible for the bottom-line-risk-adjusted returns.

Therefore, the primary objective of ING Institutional Markets is to maximize the risk-adjusted returns on capital. In order to achieve and maximize the risk-adjusted return on capital, a business unit needs to understand and quantify all potential risks that it faces, including interest-rate risk, credit risk, liquidity risk, operational risk and business risk, to name a few. The FPC model was developed by S&P nearly three years ago, and this capital model is founded on EC concepts by assigning

capital on company-specific risk rather than industry-driven factors. Furthermore, the FPC model uses market value rather than book value in its calculations.

S&P's FPC model utilizes the EC framework, as Hubert mentioned. As you can see from Chart 3, the higher your company's credit rating, the more capital you need to hold to maintain that credit rating. For example, ING right now has an AA rating. Therefore, we need to hold capital with a 99.5% confidence level, or, said differently, hold capital to cover 199 out of 200 events. The higher that company's desired rating, obviously, the higher the confidence level is and the higher the capital requirements are.

There are some significant differences between the FPC model and the traditional S&P life model, and I look at the FPC model as starting to bridge the gap between the traditional capital models we're all familiar with and the EC framework. The most significant difference is in the interest-rate methodology. The FPC model reflects the actual level of interest-rate risk taken and the traditional model assumes a generic risk level. If a company is using hedging strategies to reduce a duration mismatch or to hedge the negative convexity, you can actually receive credit for that by holding less capital. Where the FPC model differs from the traditional model is that the traditional model was calculating the convexity only on some of the assets, not the entire portfolio and the FPC model is looking at convexity on the assets, liabilities and the derivatives.

So the market-risk capital is broken into three components: delta capital measured with a key-rate duration, convexity capital measured by negative convexity, and if your portfolio exhibits positive convexity, you actually get a capital credit, and also any optionality that is embedded in your liabilities. As far as the credit risk, it still is predominantly factor-driven; although the one biggest difference is that the FPC model is looking at the weighted average life of each individual asset, where the traditional model has assumed all assets have an average life of 10 years. And the last component is the operational risk, which, as Hubert mentioned, is probably the hardest risk to quantify. This is done through a due-diligence process with S&P. S&P will come into your company and look at your processes.

As I stated, I feel that the FPC model has started to bridge the gap between the traditional regulator's capital model and the EC framework that has been used in the banking industry now for several years. The FPC model, much like EC models, is an exposure-based model, looking at the risk exposure of your specific company rather than based on factors on an industry average. And with the market and credit risk it's looking at your entire portfolio, not just subgroups of your assets.

The reason that ING worked with S&P to basically develop this model two years ago was that the FPC methodology was consistent with institutional markets' risk-management practice, and, like EC, the FPC model is much more applicable to setting capital in relation to the actual risks that you're taking within your company.

The FPC model is closer to a true EC model than some of the more traditional capital models.

This leads us to why ING has decided to start implementing an EC framework across all of the business units. Well, the executive board of ING feels that EC allows the board to manage its two primary objectives—capital protection and capital deployment. Managing capital with greater discipline has significant economic benefit as a company tries to maximize risk-adjusted return on required capital. ING, like many other companies, needs to recognize where capital can be put to use most efficiently based on the risks within the entire company. EC also allows being able to utilize diversification effects both across the banking and insurance industry, as well as across different business units within the banking and insurance industry. Lastly, it allows use across the different regional and geographical boundaries. And an important part of looking at EC is it takes into account the diversification you may have both between product lines and business units.

EC, or often risk-adjusted return on capital (RAROC), is becoming the standard for the banking industry, and ING has decided it wants to extend this to cover its entire operation. Within ING, RAROC was initiated for the banking side in the mid-1990s and for the insurance operations in early 1999. Given the complexity of insurance liabilities, which are a little bit different than the banking liabilities, several years of piloting has already taken place on the methodology used for the ING insurance operations. Today I will be briefly discussing the methodology currently being used, although we've had many years of piloting and it's still far from being a final methodology.

Why should a company calculate EC and demonstrate that it manages its use of capital? Well, there's a growing pressure today to demonstrate strong risk management and an understanding of your capital from external parties, the first group being the rating agencies and regulators. They want to know that your company understands its risks and the need for capital. And, second of all, the shareholders and analysts want to know that a company is generating value on the capital entrusted to the company.

Each year of piloting the EC at ING has resulted in methodology changes. Currently we're working on Phase 8, and previously the EC had been calculated on a one-year horizon. For the first time this year the program is using a time horizon set to the average life of the liabilities, and I'll get into why we decided on that in a moment. I will briefly discuss the methodology ING is using for the various risk types, including market, credit, business and operational. The other risk types that I won't discuss will be mortality, morbidity, property and casualty (P&C) and transfer, and those are going to be very specific to your individual business unit.

The calculation of EC is a two-tier approach. The first is a stand-alone approach in which you calculate the capital for each specific risk type for your individual

business unit. The second tier is the diversification, and you can have diversification effects both within your business unit, between the different risk types and across the business units within a company. And quantifying diversification is what makes the EC calculation very challenging.

As most of you know, your market risk is your adverse market value changes because of changes in interest rates. The goal for ING was to run 10,000 stochastic scenarios and hold capital with a 99.95% confidence level. Well, as you can imagine, running 10,000 stochastic scenarios created a bit of a challenge because of system and runtime constraints. Therefore, it was determined that the methodology would be specific to the different business units because each business unit may manage its interest-rate risk very differently. For instance, at ING Institutional Markets we're monitoring and managing our interest-rate risk weekly.

Therefore, we are using the approach where we calculate the 99.95th percentile, or 3.29 sigma event, on a weekly volatility looking at historical interest rates. Currently we've decided to look at historical rates over the last three years and determine what this 3.29 sigma event is on volatility. We then apply this volatility to the current yield curve to determine the up and down shocks. So now we have a base scenario, an upshock and a downshock. You're going to hold capital for your largest market-value loss, whether it is for increasing or decreasing rates. And this would be your capital for a one-week rate change or a one-week value at risk. We then annualize it with a simplified approach, multiplying by the square root of, for a one-year, 52, assuming that your weekly value-at-risk (VAR) is independent, which, of course, is a large assumption.

For credit risk, diversification is key because within your portfolio you can have assets that exhibit diversification, as well as across the different business units. Therefore, the credit EC is currently being calculated by the parent company or ING in Holland, and the KMV credit system is being used to calculate this. KMV is a market-value-approach system based on option pricing that looks at the issuer's debt and equity profile. It is important to note through our findings over the last few years with this EC pilot program that the KMV model is producing higher, and often significantly higher, credit capital numbers than what's coming out of the current rating and regulatory agency capital framework.

The other risk that I'm going to touch on is operational risk. The way we've approached this is to calculate size drivers specific to each business unit so we can calculate the exposure to operational risk. Examples of operational risk are securities failures, fraud, litigation and unauthorized activity. The size drivers used are external money flow, IT expenditures, employees, premium income and the size of your block. For instance, coming from the GIC side of the world our money flow is a very important size driver of potential operational failures because, as you know, your GIC contracts are much larger in size. So, if something goes wrong with one wire transfer, you're looking at millions of dollars. So in our business unit, the

money flow that's going back and forth is a huge driver of potential fraud. Therefore, we need to hold capital for that.

Ways to reduce your operational risk are to maintain clear processes and guidelines for pricing, modeling, reporting and administering the business. The business risk changes because of the volume and mix of business. This year we've taken a fairly simplified approach to business risk in that we increase our expected expenses, as well as increase lapses over the horizon with the appropriate confidence interval.

We've made methodology changes this year in that, as I mentioned, we're no longer assuming a one-year horizon but, rather, a time horizon equal to the average life of the liabilities. This has more relation with the common actuarial techniques that all of us are familiar with, such as cash-flow testing, reserve adequacy and embedded value. And looking at capital over the life of the product is also necessary in determining your source of risk and where capital can be deployed most efficiently.

In summary, EC is calculated as the difference between the required asset base and the market value of liabilities under various scenarios. This leads us to ask the question, is there a link between EC and fair value? And I don't have an answer. I don't think this is a yes-or-no-type question, but there are some distinct similarities and distinct differences or potential disconnects. EC can be defined as the market value of equity or the market value between your assets and your liabilities. You're projecting future cash flows under stressed scenarios or stochastic scenarios. The changes in your assumptions should be reflected in your market value, and you're making assumptions about the future return. Probably the biggest area of disconnect that will produce two very different answers is the discount rate that you're using, and also if your assumptions are consistent between those used to calculate a true market value and those used in your EC process.

Part of EC is the need to calculate the fair value of liabilities, and although this is not the primary objective of EC, it is necessary to determine how the market value of your liabilities changes under different scenarios.

Developing knowledge and experience in how to calculate a market-value change in liabilities is providing a good foundation for the work that will be done in the next few years, which will have to comply with the new International Accounting Standards that will be based on market-value accounting.

And to summarize why a company should manage or measure EC, it allows a company to be able to evaluate the risk and reward tradeoff across a company's entire operations, whether it is between banking and insurance, across business units or across geographical regions. There's an increasing demand to demonstrate to external parties, such as rating agencies and regulators, as well as shareholders and analysts, that a company can manage its use of capital and understand the risk reward in a portfolio. And, now more than ever, most companies are facing a

scarcity of capital, so it's important for business units to demonstrate that they're efficiently managing and using the capital that's entrusted to them.

There is a challenge when an EC model is implemented in that it may give you very different answers between an EC calculation and the capital requirements of rating agencies and regulators. Companies are dealing with these differences right now, and may actually be holding regulatory capital. At ING we feel that you should be pricing for economic risk and using EC in your hurdle ROEs. And we are beginning to see a convergence between regulatory capital models and internal risk models. The FPC capital is a good example of how these two areas are starting to come together, and this work will continue over the next few years.

MR. MUELLER: Next, we're going to have Dennis Lauzon, who is a supervising actuary with the New York State Insurance Department up in Albany. He's been there since 1999, and prior to that, he held several industry positions with a number of companies for 21 years.

When we talk about today's risk-based capital (RBC) model, Dennis was very much involved in developing that. He served on the 1991 Industry Advisory Committee, which recommended the initial life RBC formula, and he chaired the 2001 Academy work on RBC factors for disability income. Currently, he represents New York State on the NAIC's Life & Health Actuarial Task Force, as well as on the Life Risk-Based Capital Working Group (LRBC), where he participates in the development of regulatory capital and reserve standards for life products and is currently focused on variable products with guarantees. So Dennis is involved in some of the more recent guidelines that we've seen come out, like Actuarial Guideline 39 (AG39), as well as some of the ones that are currently in the works in terms of reserving and capital standards.

MR. LAUZON: First let me note that the views and opinions I'll be expressing are my own and not those of the New York State Insurance Department.

My views are derived from my background in the industry and as a regulator. I'll group my comments into four areas. I'll talk about how EC calculations differ from RBC. I'll give two aspects of how the regulatory view differs from a company view. Third, I'll examine how you can manage differences in regulatory RBC and EC. And, finally, I'll examine using EC calculations in an RBC formula.

The first difference to consider in the difference between EC and RBC calculation is the purpose. For EC, the purpose is to determine a probability of ruin, as has already been mentioned. RBC has a different purpose. Its stated purpose is to spot weakly capitalized companies. It also serves to define when regulators can take progressively more control of a company. So, in that sense, it also acts as a minimum-capital standard. The methods for which these capital calculations are done are different. The EC calculation is prospective using realistic assumptions, while the RBC calculation is, for the most part, formulaic.

Admittedly, the factors for the RBC calculation were often calculated using prospective analysis, but the conditions under which those factors were calculated was not necessarily consistent for all the factors in the life RBC model. For instance, many of the health products were calculated based on stationary populations, and many of the life products were calculated based on closed blocks. Current work on the long-term-care products is based on a growing block of business.

Another important aspect about the calculations is the floor. The floor is the balance-sheet requirement at every point in time. For EC calculations you can use various floors. At one extreme, you could decide not to use any floor at all and only assume capital is needed when the assets have run out. That might be very useful if you're running out a closed block of PAR policies or if you're a regulator running off the business of a company that's in liquidation. In both cases, the objective is to run down the assets with the liabilities on some equitable basis without any additional capital infusions.

At the other extreme, calculations may be based on a floor of target-capital requirements. These calculations examine the risk to a capital plan. They help determine a capital reserve given the variability in the target-capital level. On the RBC side, for the most part, the factors are determined on projections where the floor is set at statutory reserves.

The current regulatory review of variable annuities is considering a stochastic analysis, an EC type of analysis, for both reserves and RBC. So there would be a significant problem in flooring the RBC at reserves because that would require stochastic scenarios within stochastic scenarios. So a floor different from statutory reserves is being considered for the RBC analysis.

The final point on the differences between these two kinds of calculations is that an EC calculation can be specific to the company. The calculations are based on the elective choices of the company's customers, their lapse rates, the specifics of the company's products and guarantees and the company's particular experience. In addition, the modeling can be dynamic, reflecting dynamic investment strategies, management practices or other dynamics. RBC, for the most part, is static and based on averages, although there are some parts of the formula that are somewhat dynamic and take into account company experience. For instance, the mortgage-experience-adjustment factor updates the RBC for mortgages based on a company's experience relative to the industry.

My second topic is on two aspects of the regulatory view. The first is the organizational level. For RBC, regulators are focused at the level of the licensed company because they may not have any jurisdiction over affiliates, parents and subsidiaries. In terms of the relationship to affiliates, most of the interest is in controlling the agreements and relationships relative to capital. For instance, there are limits on dividends to parents. There are limits on affiliated investments, and

there are rules on arm-length agreements, reinsurance between affiliates and service agreements.

So, there are various kinds of transactions between a licensed company and the parent group that impact capital. The movement of capital in or out of a licensed company is of interest to regulators, but the correlation, or netting of risk, between affiliates is not meaningful. On the other hand, for a company, rating agencies and investors, capital for the whole group is of interest.

The second way that the regulatory view is different relates to the distribution of results (see Chart 4).

Let me explain Chart 4. The chart is based on a company that targets a 250% RBC level for operations. The probability of results as a percent of RBC over the lifetime of the company's business is graphed. So at the top of Area 1 you have minus 100%. That means all 250% of the RBC is used. Area 1 is the insolvent area. In Area 1, regulators would either be liquidating or rehabilitating the company.

Company management is generally not involved with operations once the company is in Area 1. So management may be looking at the probability of reaching that area but not greatly concerned with results in Area 1. Because regulators are actually going to operate in this area, to them a conditional tail expectation (CTE) approach makes more sense. CTE not only includes the probability of being in Area 1, but it also factors in the expected losses in Area 1. Considering the probability of reaching Area 1 and not looking at the losses in Area 1 would be like buying bonds by looking only at the default rate and ignoring what the recoveries might be.

The C-3 Phase 2 approach to RBC for variable annuities with guarantees is considering two kinds of CTEs. One CTE just averages the results in the tail. The other sets any positive results to zero and is called a modified conditional tail expectation (MCTE). Zeroing out the positive results is a downside-risk measure. So CTE is to MCTE as variance is to semi-variance, where you look at the deviations below a given value. MCTE makes more sense from a regulator's point of view on the capital needed for risks.

Area 2 starts at minus 60%. If you have a 250% RBC, and you lose 60%, you're down to 100% RBC. So, in Area 2 there's a transition from management control to regulatory control. The transition gets more significant as you move from Area 3 to Area 1. There's some regulatory concern that companies are shooting through Area 2 too fast. The NAIC has an ad hoc committee that's looking at this particular problem. There may be some effort to widen Area 2 or to include trend tests for the casualty companies.

In Area 3, company results are adequate to avoid regulatory control but results are not achieving target returns. In Area 3, a company doesn't have adequate returns on capital and is looking to cut expenses or exit poorly performing businesses.

In Area 4 a company is earning more than its cost of capital. So value is being added. These are happy times. In Area 4 a company is trying to grow and take over similar businesses because management thinks they know how to add value and they believe they have the competencies needed for success.

Now let's consider some ways to manage EC and RBC when the relationship between them seems inappropriate. If RBC is too high relative to EC, what can be done to manage the discrepancy? First, RBC at 100% is at most a minimum level of capital.

It's a minimum because below 100% regulatory control begins. A company can't operate at 100% because it's too low for the kind of target ratings needed in marketing plans, and it wouldn't provide any capital cushion in case growth is more or less than expected. There would be no capital reserve for experience fluctuations. So, 100% RBC is a floor but not an operating target.

To determine the appropriate capital level, the concept of economic value added is needed. Let me give a little background on economic value added. A company's capital structure is made up of equity and debt. These have different return requirements. Based on the combination of these components, a cost of capital can be determined. To add economic value, a return on capital is needed that exceeds the cost of capital.

Adding capital per unit of business increases financial strength, which in turn allows wider margins on that business. The wider margins for the additional capital must pay for that additional capital. If the return on the additional capital is less than the cost of that capital, then the marginal economic value added is less than zero. If even more capital per unit is used to support the business, aggregate returns on capital will eventually fall below the cost of capital. In this case, economic value added will be below zero for the entire business.

So how do you determine the optimum capital level? How do you know the amount of capital you have to put into a business is at an optimum? The optimum maximizes the economic value added. To optimize economic value added look at the implied credit rating for each possible level of capital. Next consider the margins that can be achieved with that credit rating and determine the resulting return on capital. From this analysis, determine the credit rating that maximized economic value added. In addition to whatever level of capital is needed to get the optimum credit rating, some capital reserve is needed to absorb fluctuations.

What can be done if the EC needed for the optimum credit rating is very different from the required RBC? If RBC seems high relative to EC, there are several options to reconcile the two.

Depending on why the RBC seems high, it might be possible to get the RBC formula changed. If RBC has factors that apply to what are different risks, then a

recommendation to split the factor into several factors applied to the different risk may help reconcile RBC with EC.

Any proposed change needs to be presented to the LRBC. A company can propose a formula change to the LRBC. Sometimes members of the LRBC recommend reviews of the formula. The Academy often presents recommendations to the LRBC. So, if RBC is high because a single factor applies to distinct risks or the factor itself is wrong, a viable course of action is to get the RBC formula changed.

However, if RBC is high relative to EC because of factors specific to a single company, such as specific competencies or a specific size advantage, but the formula is not flawed for most companies, changing the RBC formula is not appropriate.

An alternate course of action is to prepare a demonstration for the rating agencies that the company's special circumstances result in an RBC that is not appropriate for the company. Demonstrate why the company can operate at a lower multiple of RBC for the same credit rating. Address any rating agencies' questions until they have no arguments against the analysis. Explain the planned capital reduction based on the analysis and what the company intends to do with the freed-up capital. Get the rating agency's feedback on whether the change in capital will impact the company's rating.

Another option to reconcile discrepancies between EC and RBC is financial reinsurance. By financial reinsurance I mean reinsurance where the focus is on the capital requirements of the business. To get the appropriate GAAP and stat accounting, all reinsurance has to have risk transfer, but that would be a secondary motive for financial reinsurance. Financial reinsurance can be a win-win for both the ceding company and the reinsurer. There might be reasons why the reinsurer can operate at a lower RBC level than the ceding company. The reinsurer could be offshore. The reinsurer may have different correlations in the RBC formula. The reinsurer may have economies of scale. The reinsurer may get special recognition from the rating agencies for competency in the risks being reinsured. So the reinsurer can take on that risk more cheaply from a ratings point of view. Finally, the reinsurer may operate at a lower credit rating than the ceding company.

From a regulator's point of view, financial reinsurance can be an indicator of the discrepancies between EC and RBC. When a significant amount of financial reinsurance is occurring, RBC may be too high. On the other hand, if financial reinsurance dries up altogether, as we've seen with variable annuities with guarantees, RBC may be too low.

There are some other reconciliation options, which I will briefly mention. Although codification tried to take out most of the variability in statutory reporting, some companies may still have flexibility in their statutory reporting to change the assets supporting liabilities. Another possibility is to look at the structure of capital and

switch the emphasis from equity to debt to lower the cost of capital. Another possibility to address the concerns of major clients about a low credit rating would be to use parental guarantees. It may be possible to move blocks of business among affiliates to optimize correlations in the RBC formula. Finally, a company may need to exit some businesses to reconcile the discrepancies between EC and RBC.

As I mentioned, the optimum capital to run a business depends on the needs in the marketplace and the margins available at the various credit ratings. A BBB product line in an AA company may have a difficult time meeting the company's return criteria on the capital allocate to the line.

The last consideration on managing the two is the allocation question. Allocation of capital and/or the excess of RBC over EC is not a trivial exercise. There's a recent article in the *North American Actuarial Journal* that talks about some of the allocation issues. One possibility is to allocate the excess RBC as overhead. Another is to allocate it in proportion to EC. If it is known where the excess is coming from, it could be allocated by source. Finally, the excess could be kept in a corporate line that earns a return on assets below target returns on capital. If the corporate line is not going to achieve its cost of capital, then all the business lines will need to achieve somewhat higher targets than the cost of capital.

My last comments are on the use of EC calculations within the RBC formula. There was some move to this with C-3 Phase 1. Certain companies have to use 50 or 12 interest rate scenarios and their own models to determine C-3 risk. With C-3 Phase 2, companies can use their own models and assumptions to determine RBC for variable annuities with guarantees. There are some advantages and disadvantages to using EC within RBC. Let me just go through these quickly.

For the advantages, there is an incentive for the company to manage risk, because the management of risk can be modeled as in an EC calculation and reduce the RBC needed. The modeling can be tailored to the actual risk based on the company’s customers and product designs. Making RBC a better fit to a company will reduce the cost to consumers. A disadvantage of using EC within RBC is that two companies with similar risks managed in similar ways might use different assumptions to come up with different RBC values. So there could be a wider range of variability in the reporting of regulatory capital requirements under an EC-calculation approach. Also, it's obviously going to be more difficult to regulate because it's not formulaic. It's not as simple to review.

Finally, when companies use their own models and stochastic analysis there's a greater need for regulators to look at risk management in a broader context. Do companies have the systems in place and the oversight to provide confidence in their RBC calculation?

MR. STUART F. WASON: I'm with Mercer Oliver Wyman. I'm really pleased to hear this type of active debate in a North American setting about EC because it really is an important topic because capital is a scarce commodity for banking and insurance enterprises, and financial institutions in general. And I think it's really encouraging to see a cooperative discussion between the profession, the industry and regulators on what are the appropriate levels, and what are the differences between EC and regulatory capital requirements and whether there are common approaches that we can use. I guess this discussion is not just happening at the national level, but has an international flavor. The International Association of Insurance Supervisors (IAIS) is looking to develop a global framework or increased global framework for regulatory capital for insurers, and, as a result of that, the International Actuarial Association (IAA) formed a working party about a year ago to develop a global framework that might be used by the IAIS. They'll have their own views on what's appropriate, but that report is in its final stages. It is due to be reported out to the IAIS next week here in Washington. A preliminary report is up on the IAA Web site right now, and those of you who are Fellows can access it directly at www.actuaries.org.

MR. ALASTAIR LONGLEY-COOK: I am with Tillinghast-Towers Perrin. I have a question for Ellen. Can you talk a bit about the success or challenges that ING has had quantifying operational risk? Have you used databases or is it more speculative? How have you grappled with the issue of trying to get your arms around the size of the operational risk exposure?

MS. WOODRUFF HALL: Yes, operational risk is, of the risk types that we're measuring, by far the hardest to quantify. What we're using right now are the size drivers, and, as I mentioned, money flow is a primary measure. Coming from a business unit that has large amounts of money flow, I could argue that it's inappropriate because we're wiring money back and forth with your institutional clients that have very sophisticated operational controls in place, but the measure is what it is. Therefore, right now we have to hold significant capital for that. This year it's very much a work in progress. Operational capital for the last few years has been calculated solely on the size drivers. Right now we have started an operational risk group for North America in our Atlanta office, and they've designed a risk assessment, which is about a six- to 10-page document in which you're answering questions. You're giving any evidence of problems with controls, as well as working very closely with that group to come onsite to do a due diligence process for several days. Furthermore, we're working right now with the internal audit group to take a look at and to define where the operational risk exists, and then taking steps to mitigate that by changing processes.

MR. MUELLER: I think we've seen this in other companies as well. So it's more of an expert-opinion approach where people are being asked, what are your worst operational risks? How likely are they to happen? And what will be the financial impact? The problem is some companies have been calculating operational risk using large databases, but you don't have the Sept. 11, 2001, events in there. So,

really the worst risks that you're trying to protect for are always the ones that you don't really know yet at this point in time, if you look only at large databases. That is one thing that we've seen as a consensus in the industry, too. This is really relying on expert opinion, going to the people that know the risks in your company, asking them how likely they are and what the financial impact would be. That then ultimately drives capital for operational risk. Ellen, can you confirm that?

MS. WOODRUFF HALL: Yes, for right now. This is just such a new area, and it is developing, but we've taken more of a top-down approach. Recent occurrences in the industry have been looked at. We've determined how much ING as a whole should hold in capital for operational risk based on what the industry has seen over several years, and then that is allocated amongst the business units based on the riskiness of the specific business units. But there's also work being done kind of at the bottom up. Just for simplicity this year for our calculation, it has been top-down, but hopefully these will meet in the middle and come up with a process that we can implement.

MR. TOM HINRICHS: I'm with UnumProvident Corporation. You've been talking about the probability of ruin as being one of the thresholds for analyzing the level of capital, and all sorts of business issues are triggered well before that, such as business, operational and financial issues. Do you see companies analyzing their capital levels through stochastic testing relative to those higher levels and setting their capital levels relative to scenarios as to what the probability of getting below these kinds of higher thresholds is?

MR. LAUZON: Well, I haven't seen it, but if I were a chief financial officer (CFO) of a company, I'd be interested in the risks that are in the capital plan. I'd certainly be looking at an analysis of a higher level floor and think about the volatility relative to that floor. This would help me understand the risks to the capital plan based on the target-capital level that the company wants to hold.

MR. MUELLER: I would confirm that, too, and, in fact, we have seen some companies use that methodology. You mentioned the CFO. I think there's an interesting dichotomy here, but certainly there are different perspectives between the horizon of the CFO and the horizon of all the actuaries in the companies. The CFOs are very much held to short-term revenue volatility, with short-term sometimes being three months and sometimes three years, but that kind of horizon would influence their views. So, they're much more concerned about the short-term revenue volatility, whereas, on the actuarial, on the pricing, and on the valuation side, you're much more concerned about achieving profitability over the medium- to long-term. I think that sometimes drives how companies look at how much capital is needed to run the business. CFOs will be much more focused on not getting any hits to those revenues regardless of what the stock market does, and so that may require some hedging in the current market. The actuary tends to look at it more on a holistic basis and says: Here are the various risks. If I put them together, what does that mean in terms of how much capital this product is going

to chew up going forward, and, do I need to curb sales or where do I generate the most value for the capital that we're using?

So we have seen different approaches, but I think what Dennis is saying is that increasingly there is recognition, and that if we had this session five years ago, the content would have been much different. What we've experienced the last three to five years has fundamentally shaped the industry, and how they're now looking at risk management, solvency and capital. The kinds of swings in revenues and earnings that companies have seen probably have been larger in the last three years than in the last three decades. And, in fact, in some markets like the German market, companies have managed to wipe out the industry surplus that's been built up over three decades in just three years, because they used a substantial proportion of equities to back book value liabilities. Companies that were overcapitalized three years ago because they had built up cushions are now with their backs against the wall or, in some cases, are out of business. So, you can have tremendous shakeup in just a few short years. I think it's changed the perspective of many people in the insurance industry on this topic.

I think every market makes mistakes. I think the U.S. market is still underestimating credit risks and still grappling from the equity exposure. In the U.K., they have their problems with their with-profit products, where they have significant equity backing. In the rest of the European continent they used equities to back book value liabilities. Now, we can point to the Japanese and ask: What are you guys doing? But if North America had the interest-rate environment and the equity-market environment that Japan has had the last 15 years, I don't think we would look any better. We can point to them saying, they're in much worse shape, but that's only because we've been lucky. We've not had the lower interest rates.

What is the industry doing? I think we're reacting, rather than trying to anticipate, and we've only been lucky that we haven't had the capital-market scenario that Japan has had the last 15 years. It's also learning by doing. I think every market has to make mistakes. I used to tell the companies in Germany "you can't use equities to back book value liabilities with interest guarantees, because the market is going to go down inevitably," and they'd look at me like I was nuts. They said "everybody's doing it, so it can't be wrong." Well, that's not how it works in reality.

MR. PAUL SAUVE: I'm with ManuLife. I generally support the evolution towards EC and hope that it goes a way towards replacing or working alongside regulatory or rating-agency models, but one of my observations is that we gradually try to identify the risks, model them better, parameterize them, or stochasticize them, whatever the word is, but one of the risks we run into is the pieces that we can't fit in those buckets or we can't model fall to the side. So I foresee that being a trouble, getting us to succeed and getting EC approved as the substitute for regulatory or substitute as rating-agency capital, because people will realistically not believe that we've adequately provided for all the risks that we really have. Even if we say that we've covered all six of these to the 99.5% level, there will be

an honest skepticism whether we've really done that. I think of two things, or the two variations. The first is that you've missed one. And I think of the U.K. as an example where there have been tens of billions of pounds paid out in various misselling and misconduct situations. Or the other one I think of is Sept. 11 where someone would have had catastrophic events on their list, but they probably didn't have that in there.

MR. MUELLER: Right, and I think that's the whole issue. This is what we're talking about with operational risks, trying to anticipate what is really the worst event that you can have and what the likelihood is. This will keep the risk managers employed for many more years.

Chart 1

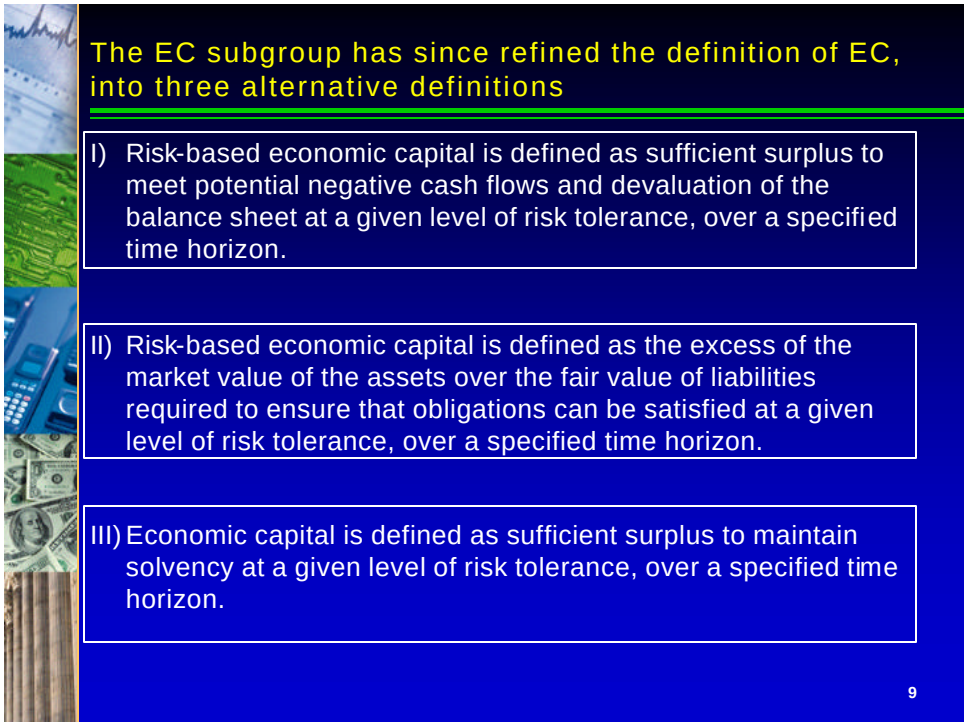

Chart 2

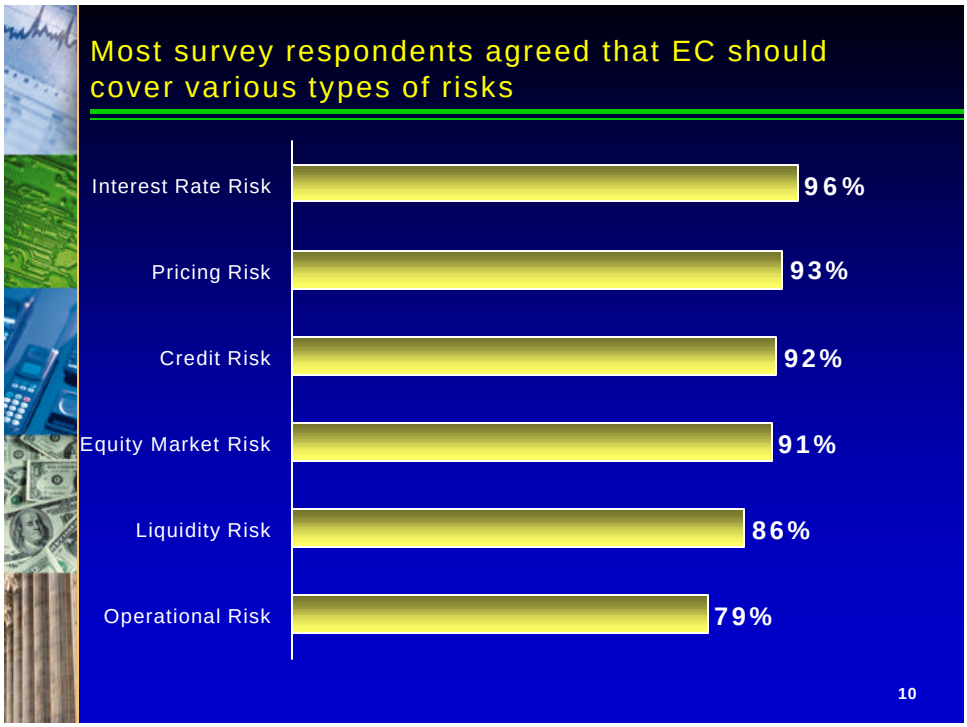

Chart 3

FPC Model Overview

- Applied volatilities and default factors create a statistical level of confidence for losses consistent with the rating category
- The higher the rating category, the greater the statistical level of confidence created, for all risk categories

Rating Category	Std. Deviations	Confidence	Capital Adequacy Ratio	Assessment
AAA	3.00	99.9%	1.75	Extremely Strong
AA	2.57	99.5%	1.50	Very Strong
A	2.14	98.4%	1.25	Strong
BBB	1.71	95.7%	1.00	Good

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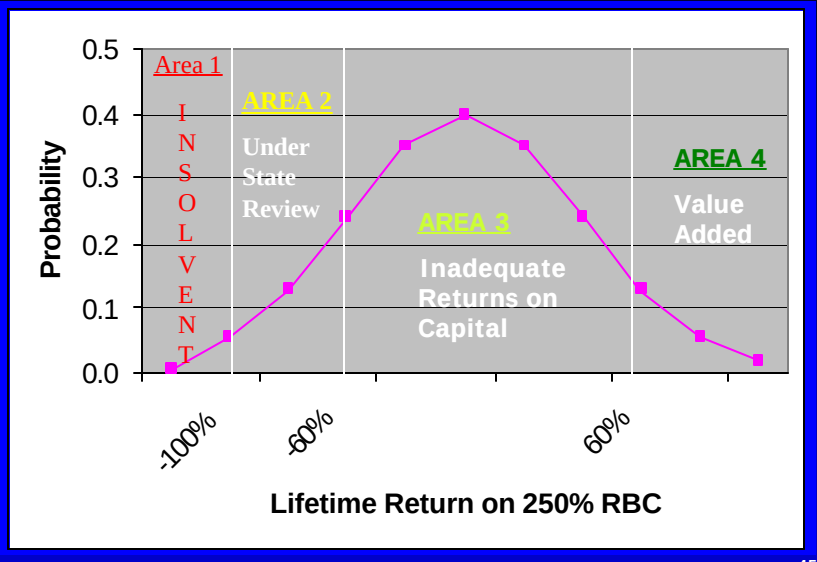
Chart 4

Regulatory View



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