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## Session 76PD

### STATE-OF-THE-ART PROFIT MEASUREMENT

**Track:** Product Development

**Moderator:** KEVIN J. HOWARD

**Panelists:** ARNOLD A. DICKE  
MARK A. MILTON

*Summary: Traditional profit measures such as profit margin, break-even year and statutory return on investment (ROI) are evolving to measures such as generally accepted accounting principles (GAAP), return on equity (ROE), risk-adjusted return on capital (RAROC), and value-added/embedded value reporting.*

**MR. KEVIN J. HOWARD:** The topic of state-of-the-art profit measurement has been one that, in my professional career, I've always liked. The topic involves the challenge of explaining marketing results to financial people. We have a couple of industry experts that will be doing that for us.

Mark Milton will give us an update on Kansas City Life's value-added analysis process. Mark is a senior vice president and actuary at Kansas City Life and their subsidiaries. His responsibilities include product development, valuation of financial reporting, asset liability management and group insurance. Kansas City Life has been involved in value-added reporting for several years.

Arnold Dicke of ING RE will present risk-adjusted-return on capital (RAROC). As we were discussing this earlier, we were trying to figure out what phase ING Re has on this, but it's a multi phase project. He'll be discussing phases four or five. Arnold is senior vice president and chief actuary of ING Re. ING Re is an international provider of life and health reinsurance and structured financial approaches to institutional risk management. He is a 25-year veteran in the insurance industry

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and participates in the overall management with direct responsibility for actuarial pricing, financial administrative services, and information technology areas.

The product development section, over the last several meetings, has essentially run a series on the state-of-the-art profit measurement without even planning to. Mark and Arnold have both been involved in those sessions. Hopefully, this will be part of a continuing series as we move through the process of looking at profitability of your products in different sorts of ways.

**MR. MARK A. MILTON:** I'm going to discuss my company's implementation of value-added financial analysis. I must admit that when Kevin asked me to speak on this session, I wondered whether value-added analysis still fit in that category of being state of the art. I guess by the attendance, that it really does belong on this agenda.

How many of you in your companies are using some form of value-added analysis? I'd like you to keep your hand up as long as you can as I ask these different questions. I assume everyone is using it in some form of a valuation of lines of business for valuation of companies or business units. How many of you are also using it in strategic planning for your companies? I didn't see many hands go down there. How many of you have really drilled the process down to where your operational managers are really using it? Well, we've lost quite a few there. We've got one still. How many of you have used it to actually change the culture of your company? It looks like we all have a ways to go there.

At Kansas City Life, we are in that process as well; we've been doing value-added analysis for several years and continue to refine our efforts.

I'm going to focus my comments on four aspects of our value-added analysis program. The first is to go over some of the actual calculations and measurements. Then I'm going to talk about moving from value measurement to value creation. Next will be the topic of using value-added analysis. Finally, I'll offer some ideas on getting and maintaining credibility.

At my company, GAAP is still considered the primary financial measure. I'm not going to try and pull the wool over your eyes and say that we've ultimately and finally committed to embedded value, but we do recognize that it has some shortcomings as a management tool and that current GAAP results aren't necessarily the best indicator of what's going to happen in the future. That's true when you're looking at GAAP earnings, either net income or operating earnings, or any of the other measures derived from GAAP results. But we do believe that GAAP fits very well with our GAAP financial analysis. We just think that embedded value calculations better reflect management's best estimate of what's going to happen in the future. We also think it helps facilitate an analysis of variance to better understand the businesses that we're in, the assumptions that we make about that business as well as what's happening with new business as well as business that's

been in force for a long time. We also use it to help assure the recoverability of certain GAAP intangibles such as deferred acquisition cost (DAC) and PDPF.

There are also several other characteristics that qualify value-added analysis as a state-of-the-art profit measure. First and foremost, it accurately measures progress towards increasing shareholder value. It's consistent with corporate strategy, and it's also consistent with pricing. That makes it a very relevant measure for management. If it is done well, it can also have good predictive value of what may happen in the future.

In general and in summary, Kansas City Life implemented value-added analysis because our management wanted to know several things. We wanted to know how much value was created in the last year and then what the trends in value creation were. We wanted to know where our primary value drivers were—what was really causing value to increase and/or decrease. We wanted to know what we could do to increase value to the company and, ultimately, we're still working on this phase. We wanted to know which products and customers are going to be profitable. So those are the primary reasons that drove Kansas City Life to introduce this measure.

I'm only going to briefly discuss the actual measurement and calculations that we do because I think you've all been exposed to a number of sources that go over that. I think we take a very classic approach. We look at the adjusted book value, which would typically involve the statutory capital and surplus that's not assigned to the risk capital for the lines. We would add into those some of the non-admitted assets that we feel are more surplus like, also some liabilities that are really more surplus like that are evident, and we make a market value adjustment on the amount that's left over.

In looking at the value of each in force business line, we look at after tax distributable earnings that are projected and take the present value at a discount rate. The discount rate is one of the areas that we're currently reviewing quite closely. We originally got into the embedded value analysis for our purposes because we wanted this to be a part of an incentive compensation plan. For assets, we wanted the results with as little volatility as possible. So we basically have a fixed rate that we use for a discount rate. That's something that we're looking at modifying for this year and going forward.

We also have a component of the excess expenses. Based on the target return rate, the actual company expenses may actually exceed the levels of expenses used in the base calculations for in-force business and the level of new business assumed. We also have a factor that would deal with that. That's something that management is very interested in. We have several efforts in place to drive that to zero. That's one of the ways where we have identified we can increase the value of the company.

Probably the first thing we look at is the trend in embedded value. We look at that at the consolidated level as well as at each company level, and for lines of business. Trends are probably the most important thing that we're considering at this point. We also do a calculation that's called return on value, and basically we look at the change in embedded value from one year to the next. We add in any shareholder dividends and we subtract any capital infusion, or we would add in any stock if we had a repurchase going, and we divide that total sum by the beginning of the year embedded values to give us a return indicator. We compare that return to our cost of capital where, obviously, if our return is greater than our cost of capital, we're doing a good job in adding value. If it's less than the cost of capital, we've got some work to do. I've seen industry studies done by Stern Stewart and published articles in *Best's Review*. They would indicate that most life insurance companies, according to their methodology, would not be earning a return commensurate with their cost of capital.

One other thing that we look at that I think is very helpful is comparing the market valuation factors to our embedded value. Before I do that, I might mention, as you're all aware, an appraisal value would typically equal an embedded value plus a value for future sales, so keep that in mind. But we tend to compare our embedded value to other types of numbers like market capitalization, GAAP book value and earnings maintenance, which give some valuable insights.

For example, what would it mean if your embedded value was always significantly below market value? That may be typical if you're doing a good job writing new business, you may actually expect that. What if your embedded value was actually higher than your market value? That may mean that you need to do a good job with your stockholders and rating analysts to educate them on why you think the company is worth so much more than the market is giving you credit for. Last but not least, it's kind of a good indication of volatility to compare the volatility of your embedded value calculations to the embedded value if you're a stock company where you have market value or your GAAP book values.

Now some industry analysts are actually doing embedded value calculations on their own. They're not doing it quite as completely as we would do it because they don't have the information. There was a study that was released in December 2000 where they calculated the embedded value for several North American companies and compared it to the price the companies were trading at. I think you heard that at that time there was an average price to embedded value ratio of 140%, and there were some comments that compared it to European insurers who had a significantly higher ratio. So it's a tool that your management needs to look at, if for no other reason than because others are doing that as well.

One of the things that I think is valuable for management to look at is just the embedded value for each line of business. It gives an indication of where your future earnings may come from and, of course, you could compare that right along with the return that was generated in the previous year doing your embedded value

calculations as well. Hopefully your larger lines are producing good returns and your newer lines are producing good returns, and with that, hopefully, all your lines are producing good returns.

Table 1 is a hypothetical example that might show some of the insights we're able to derive from this type of analysis at the line of business level. In this example, I've compared an expected and actual column, so we will discuss the expected column first.

	Expected	Actual
12/31/99 Value	62.0	62.0
12/31/00 Value	58.4	60.6
Increase in Value	-3.6	-1.4
2000 "Earnings"	11.1	10.0
Total Return	7.5	8.6
Return on Value	12.0%	13.9%

I have a value of a line as of December 31, 1999 of \$62 million, and the value of that line as of December 31, 2000 was actually \$58.4 million. So there's been a net decrease in value in the line, but the line had kicked off earnings of \$11.1 million for a total return of \$7.5 million, which just happened to equal a return on value of about 12%. So that's what was expected. It's a cycle to compare what actually happened. On that basis, the value as of December 31, 2000 had actually only dropped to \$60.6 million, which was better than expected. So even though value dropped, it did not drop as far as expected. The earnings that were generated by the line in the year 2000 were only \$10 million as opposed to the expected \$11.1 million. So overall, things are good. We have a total return of \$8.6 million or a return of 13.9% compared to an expected return of only 12%. Well, it's interesting information, but it probably begs more questions than it answers.

If you were to drill down using the analysis we've done and break the business between business that was in force at the beginning of the valuation period as well as business that was actually issued during that valuation period, I think you can get some additional insights.

I'm going to focus on the business that was issued in 2000 first. That business by the end of the year had produced an increase in value, or had a future value of about \$2 million. Unfortunately, in this hypothetical example the earnings for the year were negative \$3 million. So the surplus strain associated with that was more

than the value of the business, and so the total return is a negative \$1 million. Again, in this the example we were expecting of a return of zero for the total business issued during the year.

We've got some problems to address there. In-force business had actually performed quite well. The increase in value was a negative \$3.4 million during the year, had substantial earnings of \$13 million during the year for a total return of \$9.6 million versus the expected of \$7.5 million.

A quick summary of the variance analysis indicated that the problem with the new business line was that commissions were too high by about \$1 million on the line, and that's what was causing problems there. It further indicated that one of the good things that was happening with the in-force business was that we had much more business in force than you had expected and that created a gain due to persistency and retention. So I think this provides a tremendous amount of information for you to understand and manage your business. But in order to get there the company has got to commit a significant amount of resources and a significant amount of effort to actually get to these numbers. This was a contrived example actually based on some things I've seen in real life, but it takes a lot of effort to actually get to the point where you're confident to do that.

Let's move ahead. I'd like to talk a little bit about value creation at this point. Keep in mind that value is created and/or destroyed whenever management makes a decision. Many of you indicated that you are using value-added analysis in some high-level strategic decision-making and, believe it or not, I think that's part of the easiest and most natural place to implement it beyond just doing the basic calculations. It seems like it's easier to use this type of horsepower on larger projects than the smaller ones. But it's obviously a tool of choice, certainly, among actuaries for working on acquisitions. It serves as a basis but it can also be used to ensure that business plans can actually contribute value in helping to evaluate and brainstorm different strategies. I think it's also very useful. On one of the projects we used this on it was a difficult decision to choose to integrate a subsidiary in the Kansas City Life, which had stood on its own for many, many years, but due to competitive pressures we could not offer as competitive a product with the expense structure that they had. So we were able to make that decision. Although it was a business decision, it was aided by a significant amount of embedded value type analysis.

Value-added analysis is also helpful in the business line management. In some of those things I'm sure that you're doing now, whether you know it or not, certainly evaluating product line performance is key. I think many people look at the value drivers or how important persistency is. One of the topics at this meeting has to do with customer relations management (CRM) efforts, retention of client, or retention of business efforts; and many companies, I would imagine, would have done some form of embedded value analysis to determine how much they can spend to make

those programs work. Ideally, a company should embed value-added analysis in their planning and budgeting processes.

In order to do that, you have to come up with some kind of rewards and really help give management incentive to do that. I think that also can be an excellent use of value-added analysis and it can help establish appropriate performance targets, align management's interest with owners and, ultimately, it can actually help facilitate a cultural change where people are actually looking at longer term decisions. I think that's valuable. My company has had an incentive plan based on embedded value analysis. We had a target for the increase in value over a three-year period, and I think it did help. Only the top 5-6 people in the company were on that plan, but I think it did help people pull together and try to think of ideas that would help create value for the company. I would mention that one of the criticisms we're going to get into is the volatility of embedded value calculations. To me, it seems significantly less volatile, at least in the way we have implemented it rather than looking at our stock price.

Now I'd like to discuss credibility. We've done value-added analysis for several years. Back in the late 1980s we were looking at the values of different lines of business. But since 1996, we've been pretty serious about it. We've documented it. That's when the incentive plan that I mentioned had kicked in. I will say, though, that it takes a continual effort to build and to maintain the credibility. We probably don't do enough throughout the year. We have major presentations on it once a year and other meetings on it probably quarterly, but we need to continue the communication process. There are many times I've sat in a meeting with one of the other officers and they'll whisper in my ear, "Yeah, that is value-added analysis. You guys change those assumptions and that's just so volatile. It's just too complicated to get a handle on." That happens about 3-6 months after you've really gone over it well with people. There needs to be a continual effort.

Let's discuss some of the concerns that are typically espoused on value-added analysis. First of all, one is that a change in assumptions would be made to achieve the desired results. How many of you have that concern? Two people have that concern. The rest of you know we can trust actuaries to not do that. I think that is an issue and then, frankly, as someone who is no longer involved in the nuts and bolts of the process, but involved in the high-level working at results and presenting them to the board and things, I worry that we may inadvertently change assumptions. These are highly complex models. You need tools for the people doing the runs to make sure that things haven't happened, and that's another thing that I'll talk about in a moment.

The results may be volatile is another criticism of value-added, and I guess that's a strength and a weakness. If you got things happening that you think are going to materially affect the future of the company, maybe it's good to have a measure that responds and shows a significant change in the results right away.

It takes cost and time to implement. In my opinion, in order to get to where you're really confident in the results, it takes a tremendous effort, and it's not necessarily the actuarial things. I think we've gotten very good at putting a value on an in-force block of business. It's tying in the accounting and it's making sure that we have the right assumptions for business issued during the most recent year, making sure we got the annualized commissions in there right, and we're not missing something or double counting something. So there is a tremendous amount of effort in that regard. One final concern about that was to make sure management knew that the return was less than the hurdle rate, and no one likes good news, I guess. But if it helps facilitate the change in direction before it's too late, I think that's good.

I would like to discuss some of the things that we've done to gain and maintain credibility. We are a fanatic group about documenting results. We spend a tremendous amount of time, have a very formal document that we've refined over the years and that we're very comfortable with, and I think that's helpful. We have a policy for assumption changes, and basically that policy is that we're just not going to change an assumption unless we just absolutely feel that it's appropriate and we can show the results of that and convince non-actuaries that on a business perspective it's time to do that. Obviously, the first year or two you're doing value-added you don't do that because it takes you a while to get the assumptions where you're truly comfortable with them. But what we do instead of changing assumptions, if we'd had, say, fixed annuity surrender rates that have been going up and then, all of a sudden, they're higher than the years before. We would typically show that in our document and show the effect of changing an assumption without actually changing the assumption that year.

When I think back, this year our fixed annuity retention rates are significantly better than they've been in the past and had we been changing our surrender assumptions to keep track with what was actually happening, I think we would have been making these values jump all over the place and we'd have a heck of a time ever getting credibility, at least for non-actuaries. So that's our philosophy. Others may come up with different philosophies as well. Again, we communicate the rationale extensively and tie it into the variance analysis process that we do to really show why we need to make a change in assumptions.

Peer review is very important. We do that internally and externally. For the past several years we've had our auditor review our work and provide a letter to management. It wasn't an audit letter, but it was a letter saying they have reviewed our work and that they've reviewed some of the models. They've asked good questions, and they helped facilitate a lot of comments. I would highly advise that if you're planning on getting in this, especially if you're going to use it for incentive compensation for your boss, that's something you might consider.

This year we really beefed up our peer review process internally. We have a couple of meetings; one at the early stages of the value process. Each person who is responsible for a line of business will come in and show some preliminary results, as



well as analytics and what they're going to be looking at in the model. Then they'll come in for another presentation where they're really going to sell the group on it. They'll come in with their peers. It's kind of a tough group. We've got one guy who's not responsible for doing any of the lines and he's the one that's the toughest. The rest of them, I think, have a secret pact where they're not going to be too hard on each other. But we've got one guy who is very tough and asks tough questions. I'm very pleased with the results we've come up with, and that's something we're going to use to communicate outside the actuarial department as well. I just can't stress communication enough as well as tying to things like statutory statements. If you can do that, I think you're well on your way.

One of the other tools that we use is graphs. I like graphs better than sheets of numbers, but we have all kinds of tools we've developed. We have spreadsheets for our projection models. We'll kick out the spreadsheets and we do all kinds of analytics and have all kind of tests that tells us if it looks like we have something wrong before we even have to look at it, which is nice. Even graphing something as simple as future cash flows can be informative. Typically what we might do is we might graph the projected cash flows from the end of 2000 forward for the current model and then go back to the model from the year before and graph the projected earnings from 2000 forward as well look at patterns. We try to see if they are consistent, are the patterns the same? Or if there's a difference, why are they different? We will look at that on an aggregate basis as well as per units, and they probably have more units now than we've ultimately had. We've automated this so it takes about two minutes for a person to actually do this, and it takes much longer to look at the graphs. I think this has been very helpful in explaining things to management as well and getting them to finally buy off on the idea that maybe we're not really changing assumptions radically unless something is really verified. It's also a good tool for helping to describe the variance analysis and what's going on there.

In summary, our methodologies for doing embedded value are still changing. I know that there's work in a couple of circles underway on actually documenting best practices on embedded value calculations, and we think we will improve those in the future. Overall, we're very pleased. Our president is very supportive. I think he feels good about what we've done, and I think we are helping to align financial goals throughout the whole organization with the concept of value creation. I think, maybe more importantly, it's helping our management understand how to compete in a very competitive marketplace. So we're looking forward to using this as a tool to help our company grow in a proper way in the future.

**MR. ARNOLD A. DICKE:** I'd like to make a couple of comments about my experiences with embedded value before I start down the RAROC path. My company is one that does embedded value. ING is a worldwide company and it's doing it all over the world. In fact, we had a meeting in the Netherlands in December 2000 to discuss a number of actuarial issues, and one of the things that all the people from all the countries were trying to figure out was how exactly to

implement embedded values still. You might ask the question: Do we really manage by embedded value? Well, that question got asked at that session, too. Unfortunately, the actuaries pay a little more attention to it than anyone else except for one group, and that is investment analysts in the U.K. who are enamored of embedded value.

We found out that although we think nobody but the actuaries are watching, when one unit put in an embedded value report that showed a sudden drop of \$60 million, it was immediately picked up by the people who have to talk to the investment analysts. We have to understand this. In fact, there was an assumption problem like Mark was talking about. We got that fixed up, so apparently there is some sensitivity in the firm even though it isn't the thing that we talk about every day there.

Now my actual involvement with embedded value started back in the 1980s when I was on a Society committee that was looking at demutualization before any had happened. It was called the Garbor Committee and they had a subcommittee looking at accounting models. The way we got to embedded value really was we started asking ourselves what is the right accounting model for actuarial work? What really fits and works nicely? In reality, embedded value is just turning pricing inside out. Everything comes out just the way you expect it to. If you want an accounting system where if everything happens just the way the actuaries are predicting it will happen, in other words, that you'll get an 8% rate of return if you price your products to eight percent and realize all your assumptions, that's the model you want. There's no other model that does that perfectly, so it's a beautifully actuarial model.

But these days there are a lot of companies doing this and it's very good. In fact, our company brought it in because we kind of go through a cycle of having people from the insurance side or the banking side running ING. When the insurance side was in power, they brought in embedded value and all the bankers were complaining. They asked, "How do we do this with our banking environment?" They had to try to work on that. But they got their chance. They got empowered next and they said, "Well, you gave us embedded value. We want to give you something that you may find a little more difficult to implement than embedded value, but it simply works great on the banking side." That was RAROC. That's what I am going to discuss and I don't know that if you can say it's the next step after embedded value, but it's another look. It has very particular advantages that I want to discuss with you. I'll also explain what we have been trying to do to implement RAROC in all of ING and, in particular, in the life insurance part.

RAROC is all based on the idea of trying to look as far as possible at the true economic situation that you find yourself in and figure out (1) how much capital do you need on an economic basis to run your business and (2) what is the true rate of return that you're receiving on that capital? That's the RAROC. In order to do this, we discovered this is a very idealistic thing; it may be the perfect thing you'd want

to know, but it's not easy to find. In order to actually come up with answers, we've had to use some practical approximations. I want to talk to you both about the theory and some of the approximations that we've used.

I'll explain the operations in my particular company and probably in any company that's combined banking and insurance operations. Chart 1 is a risk map that includes seven types of risks: credit risk, transfer risk, market risk, business risk, operational risk, life risk, and property and casualty (P&C) risk. These are the seven risks that diversify financial institutions at least one way. There's many ways to cut this pie, but that's the way we slice it in our diversified financial services firm.

You can also see allocations of how important these various risks are for banking, life insurance, P&C insurance and investment activities. So obviously credit risk is very important in banking and quite important in investment activities. Market risk is important in banking and investment activities. The life insurance risks and the P&C risk fall in those businesses.

Chart 2 provides an example. This isn't going to give you any insight on how to calculate things, but gives an example. Supposing that a business unit has 500 monetary units, we think of Euros mostly these days, of available capital. Then, suppose that the profit on the accounting basis is equal to 70. What we mean by return on equity is, of course, the return on an accounting basis divided by the capital on an accounting basis. So that would give us a return on equity of 14. Now let's suppose that on an economic basis that the capital that's required given the risk is only 300 and the economic return is 100. Then if we know what those things mean and we actually calculated them right, the risk-adjusted return on capital would be 33%. Another important fact is that we would have excess capital of about 200 that would be available. So that's more to show what the motivation is for trying to produce RAROC. The return can be quite different and the amount of capital that's tied up can be quite different.

What are the requirements for doing RAROC? Well, first of all, it has to be done on a market value basis. That's important and that's difficult. Market value is easy for assets, it's hard for liabilities. We have to do something about that, and that's one of the things I'm going address. We have to provide for all the risks that the company has and for compliance with all the regulations and particular compliance with a specified target rating. That's what we mean in RAROC. We want to be sure we're holding the right amount of capital to get a target rating. We have to be able to attribute results to businesses and to investment activities. The final thing that we wanted to get is consistency across business lines and, in particular, banking and insurance. We want to also be able to give proper credit for diversification.

As we all know, risks aren't really additive. They really don't add up linearly, but rather there can be situations when risks, only risks that are correlated, add up. If the risks are not correlated, they don't add. There's something in the nature of taking the diagonal like you would in a vector type of diagram to figure out what

two risks are actually causing you to have. If risks are orthogonal to one another, the combined risk is not the sum of the capital for the individual risks. That's an important fact and that is actually being used these days by hedge funds, for example. There are a number of hedge funds that have set up offshore and they're looking for life insurance risks to put in their portfolio because the life insurance risks are orthogonal to the market risks (the risk of fluctuation in stock values or interest rates). That is their primary risk. That allows them to hold less capital to do their business.

Diagrammatically, RAROC is the economic return over the economic capital. The economic return is a change in the market value of the old portfolio plus the market value of new products that have been sold. The economic capital is based on a risk profile rather than on regulatory rules of thumb. In our particular case, we decided to set it consistent with a typical weighted institution. So we were looking to be at a certain risk level that we took to be the Standard & Poor weighted level. Economic capital is going to be based on seven categories of risk. I'm going to go through each one of them with you in a moment, but first let's talk about the economic return, the numerator.

In many ways, this is the trickier part of the RAROC calculation. As I said, it's the change in the market value of the old portfolio plus the market value of new production. Well, in order for us to be able to calculate that, we have to be able to estimate market value, and what is market value. Everybody says, "Well, that's obvious. It's what you buy something for." No, that's a price. Market value is different than a price. When I use the term, market value, I mean some kind of an estimate of price. The thing is that price itself is something that moves very, very rapidly and can change from instant to instant. Market value is probably an estimate of price that is, in some way, from some model that doesn't show quite as much volatility as the actual price does so that you can know if I calculate it now it will still be true in a minute or two.

It's relatively easy to determine if you have what are called complete markets and with observable values. For example, with most types of securities you have this sort of thing. A complete market is one that has all the pieces that can be made up. This isn't the case for insurance. You can't do this with insurance. One of the reasons is there's no secondary market in insurance and that makes it very difficult to take insurance and to take pieces of it. It's possible to have arbitrage in insurance. So you need to be careful about what market values mean.

For life insurance, we take the market value to be the present value of best estimate cash flows plus a market value margin, which I've capitalized because it's a specially defined thing for each one of the risks that we have. So this is really an actuarial proxy of the cash flows and you take the present value of those cash flows. What's being said with market value margin is not an actuarial provision for adverse deviation (PAD). A lot of people get confused on this. It isn't what you think is your estimate of the likely uncertainty, and I don't even know how you would

choose to do that. Every one would probably choose to do it differently, and that's the point. The market value margin is an amount that you find in the marketplace. If you took the best estimates of liability cash flows at a risk-free rate, it would not equal the market value.

There's a margin in the market, but the market, remember, is not caused by two people. It's not caused by a single willing buyer and a single willing seller, no matter how much the Financial Accounting Standards Board (FASB) says it is. It is caused by hundreds or thousands of willing buyers and willing sellers if they're available, and it's the price where the market clears. There are willing buyers and willing sellers. There are willing buyers all along the demand curve and willing sellers all along the supply curve, but there is only one place where the curves cross and that is where the market clears. That's what is meant. The market value margin is what's in there at that point. You could take the best estimate cash flows and discount them at some interest rate and get the market value, but if you want to change and make a transformation of the measure, as they say in the academic world, so that you can have a risk-free interest rate, then you have to put this market value margin in. So that's really, in some ways, the most complicated theoretical thing in RAROC.

The second requirement is that we have comprehensiveness of coverage so we cover all seven of the risks. These risks are not all correlated and consequently, the total economic capital would be less than the sums of the capital for each of the seven risks separately. Let's move ahead and look at each of these risks one by one.

The first risk is credit risk. Most of you know about credit risk. It should be driven by five factors: expected default frequency (issuer or counterparty credit worthiness), the severity that's associated with a credit, with a default and that, of course, would be offset by collateral and that sort of thing, the exposure; the maturity; and correlations that might be involved within the credit risk area. These things all work together to give you a measure of the credit risk. So in calculating the capital, those factors are taken into account.

Next is the transfer risk. This is an unusual one, but one that a multinational company might have more interest in than one that was only in one market. This has to do with the fact that there are situations where capital in certain countries can't be easily repatriated, so this is a situation that faces multinationals. This comes into play in cases where government restrictions get in the way of solvent partners not being able to meet their obligations. So it's not really credit risk because the partners are solvent, but they're not able to actually move the money.

Asset/liability modeling (ALM) risks sometimes can be hedged. They can be hedged and much of the risk can be made to disappear, or the risk can be made to disappear if it can be hedged, or it can be diversified away, but not in every case. For example, in insurance products there are embedded options that can't always

be diversified that can't always be hedged away, and some businesses have long term structures that involve ALM risks that can't be gotten rid of. The hedgeable part of ALM risk is called market risk in our way of doing things, and the unhedgeable part is considered a part of business risk. Let's look at market risk first.

Market risk is defined, as I said, as the hedgeable risk on market prices or rate changes on open positions, so that's the part that's hedgeable of the risks that you take on those securities. We split this apart because the hedgeable part we take to be the responsibility of the investment areas. One of the important things in our RAROC calculations is that we're trying to make clear who has responsibility for the different risks. This one is the responsibility for the investment area.

The next part is business risk. That consists of two parts. First is the residual part of the ALM risk and we call it the ALM business risk. The ALM business risk involves the unhedgeable mismatch risk that's due to product design or the market. So it involves life policies with interest guarantees, with maturities that can't be closed out or hedged in the financial markets and in insurance liabilities sold in emerging markets where there are no securities with the same maturities being traded.

Then there's the non-ALM business risk. That has to do with variations. For example, new business variations from plan would be an example of non-ALM business risk, or existing business variations from plans in cases of insurance like lapses and renewals or expense risk.

Operational risk is a very interesting risk. If any of you had to be involved in running operations or even pricing or any of the places where things can go wrong because a single event occurs, a person makes a mistake. ING managed to buy a bank for one pound because they had a rogue trader down in Southeast Asia. Before they were purchased by ING, the bank blew a whole lot of money. The lack of management control and a person's willingness to double up several times on his bets until he got in too deep to have it cleared, was an extreme example of operational risk. It's the risk due to the risk of loss from one-off events.

More simple examples would include systems failure. There was a lot of concern about that with respect to Y2K that didn't turn out to be. The risk was there, but the loss didn't occur. Various kinds of processing and control failure, and litigation misadvice, would be examples of operational risk. Another example would be that somebody suggests that you not settle on a lawsuit and that turns out to be the wrong answer. Unplanned litigation, which is happening to more and more of us all the time in the U.S., certainly is another example. Litigatory breach, fraud, and external disruption are all examples of operational risks.

The way we determine operational risk is largely what we're trying to prove all the time. It started out with a long questionnaire where we tried to find out how often certain big events would happen. We looked back over the last ten years to

determine if we had events that were big enough to be counted, and we're trying to systematize that more. It's always one of the trickier ones to pick up on, and it also turns out probably, in some cases, to be bigger than some people realize it is.

It can be traded off for lower return. In other words, you can buy protection at a price, essentially a form of insurance. So if you do that, it reduces the amount of capital that has to be provided for operational risk because, obviously, the capital that is being held here is the buffer against these type of risks.

Insurance risks are the final kinds of risks that I will be discussing. Insurance risks include both P&C and life risk. In both cases you can split or subdivide this risk into three parts, and it's convenient to do this for calculating economic capital. You can look at the kind of capital you have to hold for insurance risk as being volatility capital, uncertainty capital and calamity capital. Now volatility capital is there to provide for random fluctuations where the probability of distribution is known. There used to be a part five that we had to worry about it. It was a risk theory section. A lot of that was involved in just assuming that your actuarial tables were right and then what were the various risks and so forth.

I was a four-exam student. I was worried about my company's capital and thought that we didn't we have enough capital. I could see that big fluctuations were possible. So I found a paper that used the gamma function distribution and I actually asked if I could get a hold of the company's claims and do it. I worked really hard and found that it was a trivial part of the capital. The rest of the capital was there for other reasons, which I actually found out about later in days when interest rates soared and policy loans had a fixed rate on them. At that point in time, we needed all the capital we could get our hands on. So it was not volatility capital that was really the problem. This is relatively a small amount.

Uncertainty capital is another thing, and we sometimes call it parameter risk. It's where you don't know the probability distribution so you're estimating that, and that's the situation we're actually all in all the time. I'll be talking about how we do that in the life insurance area.

The calamity capital is there to provide for short-term increases in claims due to extreme conditions, a kind of calamity or an event such as a huge earthquake or a hurricane or whatever. In fact, in the P&C area these things can be talked about. Volatility risks might be due to a windstorm, it would be due to one that's expected, but one that doesn't happen all the time. Your probability distribution says that you can expect this once every three years or something.

The uncertainty risk would be because, obviously, when you're trying to predict things like earthquakes and windstorms and things, you don't really know what the distribution is so there would be a certain mis-estimation of the period between the storms, for example. The calamity risk would be that the windstorm was not a

normal windstorm. It was one that only happens maybe every 2,000 years or something like that.

Now obviously the P&C risk involves things mostly with short-term contracts, although they might have long tails. The life, which is really actually mortality and morbidity risks involve longer-term contracts.

Those are the seven risk types that we cover in our RAROC calculation. You could probably slice and dice it differently, but you're going to want to find pieces of capital. You're going to want to develop the capital for these risks as a starting point.

We need to have some kind of criterion to determine the level of risk that we're trying to cover with economic capital. Obviously, if you want to have enough capital so that you have no risk whatsoever, it would be infinite. You can't do that. You have to make some decision about what residual risk you're willing to accept beyond the amount that capital takes care of. In our case, we wanted to qualify it for an AA rating. It would be nice to have some real ruin theory behind this. That would be the ideal actuarial way to do things, but it's hard. An easier formula for us was to try to look at risks that happen once every 2,000 years, so that was a criterion we used. That seemed to be consistent with the rating standard for AA. For all of these risks, we looked at the amounts that would occur every 2,000 years. This is difficult to do because it's a very long-term thing.

For example, some of the guaranteed minimum death benefit type calculations might have too fat a tail for this to be a real good way of approaching it. In the reinsurance world we run into this in terms of some of our financial reinsurance where we have to be more cautious because all the losses are in the tail. If you don't go out far enough, you seem to think you have no risk at all. But you go out further and you discover the risk. Those are situations where a real risk needs to be used with care. It's probably better to go to a real ruin theory approach.

Before I get into the life insurance area, I want to talk, in particular, about attribution of results. This is an approach we use for splitting the results between the business area and the investment area. Obviously, the investment area is involved in the actual investments and the business area is responsible for the liabilities. Let's take the insurance liabilities for the insurance line of business, for example. The question is: Does this properly take into account the RAROC results? It doesn't exactly. The investments may not be picked to go with the liabilities, and whose fault is that? Was it the fault of the product design? Was it the fault of the investment area? Rather than have that discussion, we decided on the replicating portfolio approach.

The replicating portfolio is a portfolio that contains assets which match the liability cash flows as closely as possible. To some extent where there are choices, you can choose to do it, but then you stick with a particular way of assigning, of trying to match your liabilities. Once we have that portfolio, we assign the performance of



the actual assets—if the performance of the actual assets are better than the replicating portfolio, that's to the credit in the investment area and vice versa, so they're responsible. They can go off and say, "Well, I don't really want to match the replicating portfolio. I'm going to go longer, I'm going to go shorter, I'm going to throw options in, whatever." If they do better, great. If they don't do better, they're the ones that take the responsibility.

On the other hand, the performance of the replicating portfolio versus the liabilities is the responsibility of the business area. So there if you've built in some liabilities, if you put out an single premium deferred annuity (SPDA) product that can't be hedged properly and there's no way to do it, and interest rates tank on you and everybody lapses, that's your problem and not that of the investment people if they upheld whatever the replicating portfolio was supposed to be for that line of business. So that's an idea of trying to put the responsibility in the proper area, and that's what the replicating portfolio is there for. A very important aspect to this, as I mentioned, was the diversification. As I said, risks are not always fully correlated and, therefore, total risk is not the same as the sum of the risk. I mentioned this before. This is diversification and it reduces the economic capital that's needed as a buffer.

In many situations when you're using a 1:2000 criterion, some of the correlations will still be in place. None of these things are fully correlated, but some of them act almost like they're correlated under that type of criterion. There are three diversification levels that we have been able to work at to get some real impact on our economic capital. One is within a risk and within a business unit, and another is within a risk between business units, and the other is between risks and between business units.

Supposing you calculated economic capital at the business unit level, then you have seven sets of capital. The first thing that you do is look at correlations between those risks within a business unit, and that produces another set of reduced capital amounts. They don't look reduced, but there would be smaller numbers. Then at the next point you're going to put together the credit risk between business units, the single risk between business units. So the credit risk is a credit risk that's net from all the business units and the transfer risks similarly and so forth. In the last step you're going to put together all these results into the firm's economic capital. This would say that a big diversified firm like mine would have less need for capital than a smaller firm would, or a group of smaller firms doing these individual functions that ING does.

For example, the banking area has certain risks; credit risks and market risks. The insurance area has less of those risks, the business part has less of those risks and, consequently by putting these things together, the insurance part by itself might have to hold a certain amount of capital. However, when added into the banking area, you don't add that much, so the net result of the overall firm is reduced. That's one of the results we wanted to see. There's a very significant amount, in

some cases. I use the term embedded value. It's really the market value of new production and the change in the value of the old portfolio. You go through the amounts of capital for all the risks and if the hurdle rate is 15%, this would produce the appropriate rate of return.

Now suppose that the numbers are the same. When you actually add the numbers up, you discover that we only get a 14.3% rate of return here, so it's not a satisfactory result. So in this case, inside our company the people on our executive board would start asking, "Is this a business we want to be in if it can't produce the rate of return that we want on a RAROC basis?"

What if we include a diversification impact? If diversification manages to reduce capital by 50,000 monetary units, then the RAROC result gets improved because the capital is less, the denominator is reduced, and the return goes up to 16.6%. We stay in that line of business, so diversification is a powerful part of this. It makes even bigger changes than that.

Let's talk in particular about life insurance, about the life risk factors. What we need is a practical method of determining economic capital for life risk and the life market value margins. Remember those from way back in the beginning of my talk? Last year when these were first being done, they decided the reinsurance area should take a leading role in this because reinsurance has certain advantages for calculating these factors. First of all, the data is from a collection of independent sources, so it's not one company's data, but many companies' data. Another very important factor is that we have knowledge of deals that were done at a price, done in a market so we have a way to estimate market value. That's important for this market value margin. Remember, again, what the market value margin was. It's the amount that you have to add to the best estimate cash flows so that when you discount with a risk-free rate you get the market value. So we are trying to look at the market value margin, but we have to have a market to find that. You can't find it by estimating, by having really, really good actuaries or anything like that because it's not that type of thing, it's a function of the marketplace.

In reinsurance we see a lot of deals where mortality is being traded in the marketplace and you can determine it in the following way. What we do is we take the present values of expected cash flows on two bases and have them tie together. One is with the pricing discount rate and the pricing expected mortality. That means we look at the mortality we think works for a deal, we figure out what kind of discount rate we have to set in order to win that deal, and that gives us the first part. Then we look at it with risk-free discount rates. We ask ourselves, how much would we have to gross up our mortality in order to come up with the same number? That gives us a market value margin. In theory, we should have a different market value margin for every age and sex and underwriting class and so forth, but we're lucky enough to come up with even one number at that level. Let me tell you the number isn't necessarily the kind of margin you would put in GAAP

results, or for GAAP reserving. Maybe you should, but you don't. People don't normally do that.

That's how we got the market value margin. Now what about the various parts of capital? What about the life insurance capital? Well, the volatility capital is easy to calculate. As I told you, there are these gamma functions that we want to be very careful of, or you can do it with standard deviations and so forth on an individual risk model, no big problem there. The uncertainty capital causes a lot of problems. We are in a situation where we have bunches of companies that we priced so we could get some sense of how well we do it by looking back to see how well our actual results came compared to our expected results. So the first thing that we did was we tried to get a sample standard deviation of actual to expected ratios for a collection of client companies. We do that in an unweighted basis. We got a very, very high amount of capital, something like 50%. It was unrealistic and we realized that we probably need some weightings. My first thought was maybe we should weight it by exposure. That came out a lot better, but not really low enough for me to believe it.

I happened to have the chance to discuss this with Harry Panjer who I always believe, and he told me I had it right here this last time. It's very weighted by credibility, some sort of credibility function and discounted for diversification across the ceding companies. So basically, the main thing is to bring in something that weights it by credibility if you want to get it right. We didn't have a way to do that, so we took a different approach. We calculated our sample standard deviation for the actual to expected (A/E) time series for the entire block. That produced a reasonably satisfactory result. We used it in our actual calculations.

For calamity capital, we used two approaches. We had an expert in the Netherlands who wanted to approach it by looking at his view of our history. For example, there was the 1918 influenza epidemic. I don't know if you looked into that, but that was a horrendous thing. There were 500,000 deaths in the U.S.A. There probably would have been more than a million today, and those are actually the low estimates. Today there would probably be more than 20 million deaths worldwide, again, a low estimate. It all happened in slightly more than a year. The real frightening part was it had a W-shaped distribution. That means that rather than most epidemics that kill the young and the elderly, this killed the young and the elderly and the middle-aged. It was really kind of frightening, not everybody the same, but a W.

Since even today we have a nine-month lead time for vaccines, we don't know what would happen if this thing came back. Just recently we were talking about the possibility they might have actually found some of the DNA; they've been hunting it for years. I think they may have found it finally, but they have not really seen this particular virus, although there are lots of influenzas, and they come from the same sort of approach, none of them this virulent.

Our expert in the Netherlands estimated that for a year there would be a 50% increase in mortality. That's a pretty hard number to swallow, but that was what he took it to be. Then the question is, what would be the frequency? The only other thing like this was the Black Plague that came in the 1400s, which, by the way, while it was longer lasting, it was less intense than the influenza epidemic.

So that was one approach, but I also have the Mortality Research Center in Denver filled with a lot of experts. Another approach like the things of this nature is the Delphi approach. We asked all these experts to think about all the risks that they knew about and figure out what they thought the probabilities of probable deaths were from each of them for the United States. Now, in the world in general, they said the most important things, clearly, were earthquakes. There's a lot of risk in earthquakes in areas that don't have earthquake-proof buildings and where the population is very dense. That's a very big risk that's grown in this century because of the growth in population around the world. Infectious diseases are still really important around the world as a source of epidemics and huge fluctuations in death rates. But neither of those really applies much in the United States. The only places that have really big earthquake risks for deaths are in the eastern half of the country where there's very little protection against earthquakes. This is probably the place where you can get big earthquake deaths. They could happen and, in fact, probably will some day give us a big death count in the eastern half of the continent, but that's nothing that we probably want to build into our rates here.

Infectious diseases have not been a big problem. The biggest thing that they thought would be a problem in the United States was actually bioterrorism. That's what my group came up with. But in many cases, mortality increases in any year would be much less than 50%. The guy in Amsterdam won, that's where our owners are, but we want to be conservative, let's put it that way.

The net result of these things is that a relative amount of economic capital from each of these sources is 5% from volatility. The uncertainty risk is the big one, 75%, and the calamity risk with the Netherlands estimate in there was about 20% of the capital, we were told. You can't apply that to your books of business and, furthermore, the diversification impact can be very large. This explains how we get the various pieces of the puzzle to calculate RAROC. You calculate the market values and market value margins at two points in time, the beginning and ending of a year or a period and divide it by the economic capital for the seven risks that I talked about including that life risk. That is where we got to at the end of phase four.

I'm going to give you a little preview of where we're going in phase five. We're considering new approaches. We have a new chief actuary and she's an old colleague of mine, Sue Collins, who's actually, I believe, on the Society board and she's over in the Netherlands. In our old firm, Tillinghast, we use a lot of embedded value work. Sue likes that and wanted to bring it back in here. Furthermore, the biggest problem we had was calculating those market values. That's a non-trivial

thing and for people who think that international accounting is going to revolve around market values, I think you have to wait and see when they try it for a few years to see how well it works out.

But one part was to somehow blend together the RAROC and embedded value approaches. One way to do that would be to just replace the market values with embedded values. That would mean you don't put in a market value margin and the discount rate you would use would be sort of your own cost of capital. The attractive part there is that embedded values are a lot easier to calculate despite what Mark said about models and everything. They're still a lot easier to calculate than these market value calculations because you involve the same models plus this estimate of market value margins.

But the problem with embedded values and something that you should be clear about is they're not market values, so if you mingle them together with things like assets, the embedded value of an asset is not its market value. The embedded value is the discounted rate of your cost of capital of the cash flows you're expecting. That doesn't come out to be the same number as the market value of the asset because the market value of the asset is going to change every day. Mark said he hardly ever changes his assumptions, so that can't be the same number. So you have to be very careful about mingling market values and embedded values. The embedded values here have to be the embedded values of the entire company, not just on the liability side. There are some tricks in using this. Furthermore, taking this thing and dividing it by the economic capital, there's no particular consistency in that approach because the numerator is calculated one way and the denominator is calculated from different considerations.

The market values in economic capital are, presumably, connected to one another. For example, the market value margin is probably related to the economic capital. The way that people estimate how much of a margin they're going to put on the price they're willing to pay is related to how much they think they have to hold in the way of capital when they have that risk on their books, so those things are closely related. These are two things are not related, so doing this creates some theoretical concerns.

There's been some talk about some of the alternatives. I think that another way we could do this is to actually do an embedded value calculation using economic capital in place of the formula required surplus. Most people, when they do embedded value, use distributable earnings. They're using some kind of a formula for required surplus. Normally that formula is either a risk-based capital type of formula or a Standard & Poor's formula, or some multiple of those types of things. Moody's formula is another. There are a number of choices, but they use some kind of required surplus formula.

If you could actually use the economic capital in the embedded value calculation, you get the best of both worlds in many ways. You get all the nice algebra of the embedded value, which means that it's really your pricing formula turned inside

out. It's, like I said before, if you realize all of your pricing assumptions, you get exactly the rate of return of the discount rate that you use at the cost of capital. It also has all those other nice things about those management characteristics that Mark talked about; the ability to see the variations, the source of earnings, and the ability to look at the expense overruns in a rational way to figure out what part of the value adding is not really there and it's due to the fact that your expense is overrunning. There are many good things resulting from this.

So that would be useful, but the problem is to do this, you can't just estimate the economic capital at one year, in the current year. What you really need is the economic capital for all years. You're going have to find some kind of a formula that replicates the economic capital for your company. This is easier said than done for some risks. It is probably not that bad for life insurance risks, but the operational risks could be a little tricky. But I have a feeling that's the way this project may be moving in the future of the idea, trying to find the best estimate of risk-adjusted return on capital.

**MR. CLINTON J. THOMPSON:** (Swiss Re) Mark, could you could you give us some idea of what discount rate is used for embedded value? Is it closer to an earned rate or a cost of capital?

**MR. MILTON:** It would be closer to a cost of capital for an equity component only. It wouldn't be a weighted average cost of capital that would include that, so double digits.

**MR. THOMPSON:** Why did you choose to use that approach? I've been in a number of situations where I've seen a lot of the approaches and sometimes it's that and sometimes it's others. What your reasoning was on that, Mark?

**MR. MILTON:** Well, frankly, I think that's one of the things that we're revisiting at this time. We're probably using a higher rate today than what I would like to see us use going forward. In fact, it's pretty much what we're pricing our products at. It's difficult to explain why, when things go off for new business, we have a zero value-added. When we started this in 1996, we were in a higher interest rate environment and, again, one of our driving purposes was a management incentive program. We didn't want to be creating value for people based on changing the discount rate. That was why we started out with an emphasis on not making any changes.

We've certainly seen a lot of embedded value numbers published from European companies, and I understand some other companies are starting to do that by using discount rates significantly less than that. I think that's one of the key things you look at. I guess there's also a comfort in the fact that the European companies who have been doing it for a long time seem to be across the board, too. Maybe that's not a real good answer, but I think the classic ones are to use a weighted average cost of capital or maybe an optimal weighted average cost of capital. Our company really has no debt to speak of, so maybe that would be one with an optimal level of

debt. Some people would say it ought to be based on the equity capital, which is maybe closer to what we've done. Personally, I think they should be lower, somewhere around the 9-10% range, and possibly lower than that.