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Session 27 Seminar

## Stochastic Embedded Value (EV) and Its Use in Risk Measurement and Financial Management, Part 1

**Track:** Risk Management, Financial Reporting

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*Summary: Recently, there has been increasing interest in the subject of integrated financial and risk management in the United States and in Europe. This half-day seminar explores the use of stochastic EV in financial management and risk measurement. Topics addressed in this two-part seminar include the definitions of stochastic EV and using stochastic EV as a risk measure. We also will discuss the recent introduction of European embedded value principles (EEV) and their application to proper costing of options and guarantees. The first session will provide an overview of recent trends with EV in North America and the implications of EEV on North American EV reporting. We then will provide a case study showing how the implementation of EEV can be used toward a better risk-management analysis by performing proper costing of options and guarantees embedded in life and annuity products.*

**MR. HUBERT B. MUELLER:** Why do we care about EV? If you're not the subsidiary of a multinational company that's reporting EV and you're not doing that kind of work, why should you care? Here are many reasons why you should care. Most of them came to me from an analyst that covers the industry.

More and more, U.S. companies are using EV for performance-measurement purposes, whether they report it externally or use it internally. If they report it externally, they are a subsidiary for a multinational company, more likely than not.

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There are roughly about a dozen primarily larger companies in the United States and about half-a-dozen companies in Canada currently analyzing EVs as part of worldwide reporting. There are also many more companies who don't report EVs externally, but they use it internally for performance measurement.

If you compare EV to U.S. GAAP, you will note that U.S. GAAP does not give you a meaningful value for new business. EV will give you a value for new business. You can see where you're creating value. In fact, the financial analysts that cover the industry like EV, because it gives them an early indication of where GAAP earnings are going. You don't see that from the GAAP statement, but you can see if a company has positive EV earnings and is showing a positive value-added from new business. You generally have a good idea that the GAAP earnings will increase over time, because they're adding profitable business.

In general, even in the United States, it's important to stay on top of what's going on not only in Canada, but probably more importantly in Europe. We had a speaker from Standard & Poor's (S&P) this morning who talked about harmonizing what S&P does on a worldwide basis in terms of how they treat capital adequacy. S&P currently is giving a 50 percent credit toward required capital for companies in Europe that publish EVs. I've been trying to get S&P to do the same over here. They're not quite ready for that yet, but they are at least contemplating it.

If you've ever done an acquisition or a divestiture, you know that the buyers and sellers in this market use EV methodologies to come up with appraisal values, because the difference is just the value of future new business. There's currently an Actuarial Standard of Practice No. 19 that provides some guidance on this. It is in the process of being revised. There's a new version that's supposed to come out in the fall.

I'll be commenting on traditional EV, EEV and market-consistent EV. Essentially traditional EV measures the economic performance of a life insurer over a period of time. It's not so much the beginning and the ending value, but it's the change in value that gives you the most information. EV consists of two major components; the value of the in-force and the adjusted net worth. The value of the in-force is the present value of statutory book profits after tax, adjusted for the cost of capital. If you're discounting your future profits at a rate that exceeds the after-tax earned rate on capital, you are going to incur a cost of that capital for holding that capital today, because the release over time is worth less than what you're discounting at over the face value today.

Adjusted net worth is a statutory balance-sheet analysis of assets, less liabilities. The only major adjustment is that assets-backing-required surplus typically would be measured at book, because your required surplus is at book. Free surplus is surplus that exceeds the assets required. Required surplus will be at-market, because, theoretically, you could sell it in a marketplace today. Of course, you would have to tax that if you were to sell it. And the big sort of bang for the buck is

the changing EV. The major components are the expected return on opening value, the value from new business, any variances in any capital movements, dividends paid out, capital contributions paid in, or if you acquire or divest of blocks of business.

New business results are typically reported with EV. When companies report EV they also show the value of this year's new business, which tends to be a major component of the variance and the movement in value. Is the business written in the year profitable? If the company is using a risk-discount rate of 8 percent and the value from the business is negative, it tells you that on an aggregate basis they didn't achieve an 8 percent return. There are EV disclosures at times where the value from the business is negative—not so much in North America, but we're certainly seeing it in various European markets. It allows you to assess trends and profitability, where the company is going if you look at new business one year versus the next. Generally, companies will show EV, at least in aggregate. Sometimes, they'll even show it by line of business, so you can assess if the annuity line relative to new business sales did better or not as well as last year. There's a lot of information that's hidden.

Risk-discount rate is an important element of EV. Typically, not always, the risk-discount rate is set as a risk-free rate plus what's called an equity-risk premium, which is defined as how much equities historically should outperform fixed-income investments. That differential tends to be in the 3 to 4 percent range.

Increasingly, some companies have used a weighted-average, cost-of-capital approach instead, saying that that is the capital that's backing their surplus. If the surplus is backing the capital, they show the cost for that surplus. If you had 20 percent or 25 percent in debt, then your cost of capital becomes a weighted average between the 75 percent in equity and the 25 percent in debt, which could be a different rate. In many cases, the difference between the two approaches of setting the risk-discount rate tends to be fairly small, within the range of 1 percent or less.

If any of you are following the recent disclosures of EV for U.S.-based businesses of multinationals or for Hartford Life, which is one of the only companies that publishes EV for a big part of the U.S. business, then you would have seen that the risk-discount rates were anywhere between 6.8 percent at the low end and 9.25 on the high end. At the high end is Hartford Life, which only calculates the EV for its variable annuity business. For those of you who are interested, if you go to the supplementary financials on Hartford Life's Web site, that's where that information is hidden.

Hartford Life has done rather well with that, because they use it as an instrument for discussing variable annuities with analysts. Ever since they published quarterly EVs two years ago, the analysts are asking fewer questions regarding the variable-annuity business. Before, 75 percent of the questions referred to variable annuities.

Now it's one question, usually. So it's done the job for them.

Increasingly, companies are looking at varying the risk-discount rate not just by region (which is a natural thing to do, because the risk-free rate would be different by region), but also by line of business, to reflect the underlying risk of the business. This is consistent with saying that rather than using a level 12 percent for the rate of return for all products across the board, companies have started differentiating the required returns by the risk of the product.

So what you see in comparison, is that a term product has only mortality risk to evaluate, less capital-market risk. Guaranteed minimum death benefit on the variable annuity has a mortality risk and capital-market risk. Companies have to differentiate it by saying that rather than using a 12 or 13 percent level hurdle rate for all products across the board, they'll use a lower rate for term and use a higher rate for variable annuities, because you have more volatile results.

In a typical variance analysis, if you look at the results of one period, you have a starting number on the left. You have an ending number on the right. And then you have the components. Some of them are obvious. You've changed your model. Maybe you've added something that you didn't model last year. You have a new system.

Assumption changes are the expected return, which is simply the opening value multiplied by the risk-discount rate. It is the value from the business sold. And if there was a shareholder dividend, that gives you the ending value.

In Canada, companies have been publishing EV for a number of years. But since it was only done on an annual basis, the analysts were not very happy with them. Having said that, the analysts that follow public companies like quarterly disclosure of data. They like to see things every quarter. Canadian companies have started publishing what they call quarterly source-of-earnings analysis since the end of 2003.

If you look at the elements of the source-of-earnings analysis, it looks very much like a quarterly variance analysis for an EV. The only thing that you don't have is the impact of current changes and assumptions on future profits, because it only looks at the current quarter. But it does look at expected profit from the in-force. It does look at the value of new business or the impact of new business, which is mainly a strain in this quarter. And it does look at the changes in assumptions. The Canadian analysts have taken to heart this methodology. I wouldn't be surprised if we see some of this coming into the U.S. marketplace over time.

I talked about the internal use of EV commonly being considered for performance measurement for incentive-compensation plans. Typically, we see that for a short-term plan, like an annual incentive plan, companies will use the value of this year's new business as a measure, which is much better than the new premiums or the

commissions or anything else that companies might be using instead. And for long-term, rather than using a point-to-point estimate of EVs over a long-term period, they might use a rolling average. They might use a three- or five-year rolling average if it's a three- or five-year plan.

Let's take a look at what happened in Europe over the last year. First of all, Europe doesn't have a U.S. GAAP paradigm. That's the biggest difference in the marketplace. They don't have to calculate U.S. GAAP, unless they're listed on the New York Stock Exchange. So in Europe, automatically, EV becomes the second metric next to their statutory reporting. Everybody recognizes that statutes are all basically for solvency. They are very conservative. It doesn't tell you anything regarding how the company's doing. It just tells you what they're looking at on a statutory-solvency basis.

In Europe, EVs have been used for more than 20 years, because companies recognize that this doesn't tell them anything about how they're doing. They're using EVs and, if you look at 20 of the 21 largest European companies, they all publish EVs. One of the last ones to join the list was AEGON a year ago. That company was a holdout for a long time. The company calculated internally, but hadn't published information, until finally the pressure from the analysts got so intense that they just had to publish it. Almost every company is doing it in Europe.

The way that companies report EVs varies by region. In the United Kingdom, there are laws that allow U.K. banks and some continental European companies to put the EV directly in the balance sheet as an asset. Some of the banks do that—like Lloyd's, TSB and HBOS. Some companies in the United Kingdom and other parts of the world publish EV as supplementary information. These companies include Prudential (U.K.), Aviva (U.K.) and Zurich FS (CH).

Most companies—and this is the biggest group, including Allianz—disclose EV in either stand-alone presentations or as part of an overall presentation of their annual results to the analysts. And then, very often, EVs are used in public merger and acquisition (M&A) transactions. What's been happening, though, is that there has been a lack of consistent standards across the board. Different regions have applied it differently. Sometimes, it has an external sign off; sometimes, it doesn't. So the analysts have gotten pretty frustrated.

There are some examples in the market, like Skandia and a few others, for which the results of a more volatile equity market didn't show up until after the fact. This led to some criticism of traditional EVs. Sign off typically applies to methodology and assumptions, maybe the reasonableness of results. It doesn't always mean that you have to do a very detailed review of results. Even an external sign off doesn't mean that there can't be anything that's 100 percent correct, because you can only do so much work from the outside.

The reason this criticism has come about is that there are certain risk factors in our

business that may or may not be allowed for properly if you're using a primarily deterministic framework. This is what this session is all about. Why should you do stochastic EV? It is more work. I'm not trying to fool anybody. It makes sense because there are certain risks (like equity risk, credit risk, interest-rate risk) and a whole area of options and guarantees (secondary guarantees, living benefits, death benefits) that may not have been included properly or costed in the EV numbers that have been published.

Traditionally, the way that this has been incorporated is that for the typical asset/liability mismatch, you use a risk-discount rate that is higher than the risk-free rate. And for options and guarantees, you include a cost-of-capital component. Maybe you could do a separate calculation on a stochastic basis and bring that cost into your deterministic model. Again, it depends on how well companies have done this. It came to a head when interest rates were falling and the markets became volatile in the last two or three years, which is something that we haven't had in a while, and so the results that came out got the analysts to question and challenge a lot of the assumptions being used.

The areas that got the most attention were guaranteed or semi-guaranteed liabilities that were backed by higher-risk assets. If you look at the U.S. credit-risk-backing fixed annuities, interest rate risks, you see the risk/profit products. Equitable Life went down because of the failure to match the assets properly with the liabilities on the risk/profit products. Similarly, if you have a variable annuity block of business and you have living and death benefits or equity-index annuities, it's important to properly measure the cost of options and guarantees.

About a year ago, a group of 19 European chief financial officers (CFOs) got together and established what they call the European EV principles with 12 key principles and a total of 65 areas of guidance. The Web site address is [www.cfoforum.nl](http://www.cfoforum.nl). There you can find lots of details on the principles.

The key improvements that these European EV principles introduce encompass the codification of areas of best practice, including disclosure on how you calculate your EV and what assumptions you use. This is where stochastic EV comes into place: the requirement for a stochastic evaluation of options and guarantees. Notice that the guidelines do not claim to be market-consistent. So stochastic, again, has some play between the real-world and risk-neutral. And the application varies by company, by market and by region.

The European CFOs were not quite ready to embrace market-consistent valuation of options and guarantees on a risk-neutral basis wholeheartedly, yet a lot of them actually are calculating the risk-neutral numbers already. They're publishing real-world numbers. They're calculating risk-neutral results, and it's anticipated that in the next two or three years, risk-neutral market-consistent numbers will be published.

Other items that were covered include the suggestion to use company-specific economic-capital requirements. Rather than using a rating-agency factor, it was suggested that companies use their own internal-capital models with some disclosure as to how they calculated it. This is tied into solvency, too. This is a big issue in Europe—economic capital and the disclosure of certain standard sensitivities in analysis of movement.

Now I will discuss the 12 principles at a summary level. EV is a measure of consolidated shareholder value, which drives some of the thinking. EV is growing-concern analysis, which is important, if you think about this. Even though you're not reflecting profits from future new business, you are modeling your current in-force as if you were continuing to sell new business. That's important. It's not a run-off projection, which has different expense assumptions.

The business coverage should be clearly identified and disclosed. That might include asset-management businesses. Increasingly, companies are publishing the values of their mutual-fund business. You can calculate mutual-fund EV on almost the same basis that you're calculating the EV for life and annuity business. It's a different set of assumptions that you deal with. For example, Sun Life has published the value of their MFS mutual fund business for years now. There's no special science to it. If you can do one, you can do the other. The key is to get appropriate assumptions.

The EV is the present value of distributable earnings allowing for the risks in the business. So it does exclude the value of future new business, but it is on a growing-concern assumption. Free surplus should be measured at market value. Those assets not required to back capital should be marked to market and then taxed for the difference. EV should allow for the cost of holding capital, and the value of the in-force should make allowance for the cost of options and guarantees.

Interestingly enough, guidelines did not require that this also should be used for new business. So some companies have calculated and published values for the new business, which included a cost of capital or the cost of options and guarantees, but not all companies have done this. Allianz is one of the companies that has done it. The basis was not specified, so most companies are still using real-world assumptions for publication purposes, but they are calibrating risk-neutral.

Of course, the cost of option is a concern. The guarantee should be based on a full stochastic model, consistent with the EV methodology and assumptions. Essentially, what's important is that the EV results should be disclosed at the consolidated group level, so that there's no overlap (companies that have pronounced different values that don't add up in total because of the holding-company structure).

I would say that the suggested methodology for companies to calculate the cost of options and guarantees on a real-world basis is to consider the cost of options and guarantees being the difference between a deterministic EV, a single scenario, your

best-estimate scenario and the mean of a stochastic set of scenarios. And that's how a lot of companies are doing it today. You probably can argue that there might be different ways to do it, but this seems to be the most common methodology in use for calculating options and guarantees on a real-world basis.

This is required for the in-force. It's not required for new business, but some companies are doing it. Typically, companies will run at least 1,000 scenarios to do it, but not all of them. If your deterministic, present benefit/future profit for the in-force is \$1,200, and the mean of your stochastic is \$1,050, then the cost of options and guarantees is a \$150, even though your 90<sup>th</sup> percentile, for example, is above the deterministic EV. So there is truly a cost, because you're measuring deterministic minus the mean of a set of stochastic scenarios.

These EV principles were published sometime last year. Last year-end was really the first full calendar year-end for which companies were supposed to comply with these principles, or at least had voluntarily agreed to comply. The first company to publish this information was Aviva in January. Aviva has no U.S. business. The company had some and then sold it at one point.

The risk-discount rate did not vary by country. They used the same ones throughout. They had a rather detailed analysis of movement and used an internal model for capital and a fairly detailed sensitivity analysis. So it was a good start for something that was done in January. You might ask how they did it in January. Well, of course, they didn't use year-end numbers. I think that they used nine-month or 10-month numbers and projected them forward. That's the only way that they could publish results in January. I haven't seen many companies that can publish EV results truly on year-end in January.

ING was next in February. This is a company that has a lot of business in the United States. About one-third of their value of in-force is from U.S. business. Their published EV results included a full valuation of the cost of options and guarantees, but they got flack from analysts. If you read the meeting notes for that call, there was a huge discussion. The European analysts were not happy with what they had done in the United States, because the valuation of the U.S. business was, for the cost of options and guarantees, somewhat simplistic. And ING was struggling a bit to explain exactly what it had done and promised to do better next time.

The risk-discount rate varied by country for ING. The company assumed an increase in its money yields, which is interesting, too, as long as you disclose it. What some companies have done in EVs is claim that, right now, rates might be only at 4.25 percent, 4 percent long-term rate. But if you look at forward rates, you can come to a higher level, 4.5 percent, 4.75 percent, 5 percent. So some companies have assumed the projected increase in new money yields over two or three years. But then they typically show a sensitivity that takes that increase out. and the effect can be significant if you have spread business. It can be very significant if you take away some of the spread compression because rates go up. They did have a pretty

good analysis of movement and sensitivity analysis.

The next one to publish was Allianz. For Allianz, about 20 percent of the value of the in-force is from U.S. business. They included a full valuation of the cost of options and guarantees, both on the in-force and on new business. If you go to Allianz.com, you will find a presentation from March that has about 20 pages on EV in detail.

The risk-discount rate varied by country. Allianz was using an internal capital model and showed from the total breakdown how much of the capital was due to different risks. It's one of the first companies that I've seen do that. The company said that a certain amount was in required capital, so this much is due to market risk, this much is due to pricing risk, this much is due to liquidity risk, etc. They had a fairly detailed sensitivity analysis. We signed off on this. We held them to certain standards, but that's an aside.

RAS is an Allianz company in Italy that's still fairly independent. It has no U.S. business. It is not a member of the CFO forum, but it complied with the European EV principles. The company did something different on the risk-discount rate. It used the bottom-up approach. The company diverted risk premiums for each line of business by modeling tail risk. They did a bottom-up analysis for each line, which was more intensive. Maybe that's why it took them longer, but they came out with good numbers. However, the valuation of the options and guarantees was on a real-world basis. And it showed a breakdown of risk capital by risk factors. The company told you that, of the total risk capital, these are the different risks.

So let's talk about going from European EV to market-consistent. Some of the issues that have been identified with the European EV principles include the difficulty in selecting the appropriate risk-discount rate. It becomes somewhat subjective as to what you think the right rate is. Even though you disclose the sensitivity, there are always arguments that can be made that it should be higher or lower. Also, the use of a single, company-wide risk-discount rate in a given market may give misleading product information.

Using one rate across the board for products with different risks does not give you the full picture of the value for each of those product lines. So the point was made, especially by the analysts, that different risk-discount rates should be used for different products and that the risk-discount rate may have to vary with the investment policy—which is a new concept here, but in Europe it's being discussed quite heavily.

The last issue that I will discuss is probably the most important one. Calculating options and guarantees on a real-world basis is really not capital-market consistent. If I look at how companies price in this market, I would agree. Everybody prices these days on a risk-neutral basis. So the question is, if we do it in pricing, how come we don't do it in valuations. It's just the next step.

When we talk about market-consistent EV, there are three major advancements from European EV or from traditional EV: how you set the risk-discount rate, how you allow for the cost of options and guarantees, and how you allow for the cost of holding capital.

On risk-discount rates, you want to reflect the risk inherent in the individual cash flows and any asset/liability mismatches. Options and guarantees should be valued explicitly, consistent with capital-market prices. If you go back to the discussion this morning, you don't create value by investing in a junk bond, compared to a Treasury Bond. The value will emerge over time. If you've done the right thing, then you get a higher return. But you're going to have higher volatility. If you make a decision today to put your money into IBM stock or in a Treasury Bond, you have not done anything except made a decision in how you're going to invest. You haven't created any value. Yet, in some traditional thinking, you would have, because your expectation for the equity return minus the default allowance of the volatility is built in. So you've already created value by doing that. But the value only will emerge over time.

Lastly, cost of capital in a market-consistent EV framework actually comes down. You don't need the cost of capital to be as high as it is right now. That becomes more like a risk-free rate. Your only frictional cost for that becomes a tax rate, because you are earning an after-tax rate on capital, yet you are discounting at a pre-tax rate. So your cost-of-capital element goes down because you've allowed for the risk really used off of different risk-discount rate. You are shifting things. So in a simplified fashion, you could say that market-consistent EV is equal to the market value of the assets less market-consistent value for liability. That's the frictional cost of capital.

We are all going to have to deal with International Financial Reporting Standards (IFRS) framework, phase two, in the next three to five years. So in a way, you can almost say that calculating EVs on a stochastic basis and capital-market-consistent is essentially what you need to do in a future, combined, financial-management framework that we're all going to be in, in one way or another.

We're moving from a traditional EV world. We're somewhere between stage one and stage two. We can do real-world assessment really well by running lots of scenarios, but it doesn't give us all of the right answers yet. We need to move toward a risk-neutral assessment. The last step is to adjust the cost of capital. Your cost of capital might go down from 5 percent (if you're discounting at 8 percent and you're earning 3 percent after-tax) to maybe 1 percent, just the tax on that risk-free rate.

Interestingly enough, a few major insurance groups already have said publicly that they are adopting market-consistent EV as their main internal performance measure. Cost of capital is assessed at the agency cost. They do measure options and guarantees on a risk-neutral basis, and the risk-discount rate varies by product. Some of those companies include AMP, in Australia, China Life, in China, HHG,

which is part of AMP U.K., RAS in Italy and Royal & Sun Alliance, in the United Kingdom. The idea was that if you know what you think market-consistent EV would be, what risk-discount rate would you have to use in a real-world EEV to come up with the right answer? We calculated market-consistent and then we solved for the risk-discount rate that gave us the same answer, backing into it. So the first four results related to variable annuities with various types of guaranteed-living benefits.

The first calculation that we did was no guaranteed living benefit. That's the risk-discount rate of 5.2 percent. I think that the risk-free rate was 4 percent, so it was higher than before, but not that much higher. We added on the living benefit. It's "out of the money." I think that the number was 10 percent or 20 percent out of the money. This discount rate goes up from 5.2 percent to 6.4 percent. Now, we're putting it "at the money," guarantee equal to fund value when we start projecting. This discount rate goes to 6.7 percent. Then we move to 10 percent "in the money." This discount rate goes to 8 percent. So you can play that game and do that forever. The more you go into the money the higher the risk-discount rate that gets you to the equivalent answer.

The same thing is true with an immediate annuity. If the product is profitable, it actually comes out to be that the risks and the assets are matched basically, theoretically risk-free. Now, if it's a very competitive product with lots of risks and mismatching to get to higher returns, the risk-discount rate went to 17 percent. That's a huge difference.

So the conclusions are that market-consistent EV does attempt to give you a robust answer to an allowance for market risk. We think that the use of a single risk-discount rate across the board might not be appropriate, even across the board in the same market, because of the different risks of the products. And it ensures that your options and guarantees are priced in a way that is consistent with the financial markets. If an investment bank would value your business, that's how they would value it also. And the cost of capital can be reduced to just a frictional cost, the cost of holding capital plus taxes. It could provide a degree of consistency and transparency.

I'm not saying that this is the only way to do it, but I think that even in this marketplace over the next five, maybe eight years we are going to move toward that framework, because the rest of the world is going to be ahead of us. Do we catch up or will we allow arbitrage in our market? There's already some of that happening in areas where the business is not valued properly. I think that the market reality will catch up.

Why does calculating EV on a stochastic basis make sense? It allows you to calculate both real-world and risk-neutral costs. It provides a tie-in to pending regulatory changes. If your capital is based on a stochastic model, it's difficult to be consistent in an EV if your EV is based on a deterministic model. That doesn't allow

that for downside risk. And really, if you think about the advances that we've made in run time, good computing and distributive processing—we don't have the excuses anymore that we had three or five years ago. If you can calculate a hedging analysis on pricing a new guarantee, then you also can do an EV model on a stochastic basis.

So with that, I'm going to turn it over to Michael Spurbeck and let him talk about his experience at Allianz on this topic. Mr. Spurbeck is the vice president and senior risk officer at Allianz Life. One of his responsibilities is to calculate market-consistent EV. He's been with the company since 1995 and has had a variety of roles, from product pricing to financial reporting and risk management.

**MR. MICHAEL P. SPURBECK:** I want to talk about our experience with EV at Allianz Life over the past four or five years—what we have learned from it as well as what have we struggled with over the years. Hopefully, you can avoid some pitfalls.

I will give a brief background in terms of EV at Allianz Life. For those of you that don't know, Allianz Life is owned by a German company, Allianz AG. Back in early 2000, we were given a request to calculate EV. A memo told us that we had two weeks to do it. That was about it. Because we had such little time and information, we used our year-end or 930 cash-flow testing models to come up with the value of our business. We probably spent a total of two days on that.

The next year, the folks that put together EV guidelines gave us 40 or 50 pages in addition to the guidelines, with information on how exactly we needed to do it. We also had to fill out a movement analysis, not just a year-end value. That movement analysis is what really takes the time.

By 2001, the guidelines were updated a little bit. At the last minute, we found out that some consultants were going to review our results, because they wanted to present those numbers to analysts. It stayed that way for 2002.

In 2003, they upped the ante on the external review. No longer did it involve simply reviewing assumptions and high-level checks, but it got into more detailed model checks, sensitivities, and a wide variety of other things.

In 2004, the European EV Guidelines kicked in. The biggest change was that we had to calculate the values of the options and guarantees. In 2003, we actually calculated those values, as well. But they never were released to the public.

Prior to 2004 and all the stochastic work, the year-end EV calculation was a relatively basic calculation. We used deterministic projections for fixed life, which was mostly universal life (UL) for us. At one point, we had a reinsurance block—fixed annuities, including equity-indexed annuities and long-term care insurance with the reinvestment assumption based on what our economic environment was at the end of the year. Now that has a big impact on certain lines of business, such as

long-term care.

In terms of assumptions, our best-estimate policyholder behavior would become the assumptions. We always link that to whatever our assumptions are in our financial accounting standard 97 models. We presented all of the scenarios that we ran as our present value/future profits. And for us, the risk-discount rate was set equal to our cost-of-capital rate. We used capital based on our S&P rating-agency-driven capital. That is what we want to hold.

Now, 2004 results were driven by the EEV Guidelines. Allianz is a member of that CFO Forum. Because of these guidelines, we needed to calculate the values of the options and guarantees using real-world scenarios. In addition to calculating them, we had more reporting to do. In addition to those changes, the risk-discount rate was changed. Our previous risk-discount rate was based on a long-term view of risk-free rates of the 5 percent risk-free rate plus risk premium. Because we did not think that, that satisfied the European EV Guidelines, we based that risk-free rate on the risk-free rate at the end of the year. That lowered our risk-discount rate by about 80 basis points. In addition to lowering the risk-discount rate, it lowered the expected-equity-return assumption.

In place of using our S&P capital calculation, we shifted to our internal economic-capital model. And for any of you that have calculated economic capital based on your own internal risk, it's not something that's very easy to project. It's hard enough just to calculate at one point in time.

Our Allianz group analyst presentation highlights where we stand in terms of complying with the EEV guidelines. Companies did not have to comply with everything at the end of 2004. But at the end of 2005, companies will have to comply. Allianz was rather close in complying with everything. We have some asset-management business that we didn't take into account. Note that the time value of options and guarantees really means that we did not have to go back and restate our 2003 EV to take into account the options and guarantees. We just put that adjustment in at the end of 2004 and let it roll forward that way.

If you look at what some companies present in terms of disclosures, we did not have nearly as full disclosures as other companies. That will be changed next year.

What challenges did we face in 2004? Our biggest one was having models that run fast enough. Throughout 2004, we had been converting our task models into MoSes. Anybody familiar with Allianz Life products knows that they're fairly complicated products. Basically, the corporate asset/liability model (ALM) got done in December/early January. So there wasn't a whole lot of training time for the people using the models or enough time to debug everything.

Another thing that we ran into was run time. Because the models just had been completed, they really weren't as efficient as they needed to be in order to do all of

this work. We know that that's one of the things that we have to work on going forward. For us, the run time really is created by the fact that once you start trying to project your future hedging activity, that slows things down quite a bit.

Another challenge that we faced was the increased expectations from our parent company. In previous years, we probably had to finish the results by mid-March, end of March, somewhere in there. But since a lot of the other European companies were presenting results to analysts earlier, they wanted to present results earlier, as well. So that pushed up timelines on that front. In addition to that, I mentioned that we had additional reports to fill in for options and guarantees.

What sort of resources did we use for EV? Because of the model run-time issues that we were having, we purchased 12 very high-end computers, lined them up in a row and let them run distributor processing, the whole thing. Actual resources—for 2004, we had about nine people working on EV for a month and a half. This represents probably two or three people that were responsible for each line of business. In addition to that, we had three people in our modeling area whose sole responsibility was to make sure that the models run correctly. Since our models just had been completed, they spent a lot of time fixing bugs as people found them, as well as answering a lot of questions from people that hadn't used those corporate models before.

This may seem like a lot of resources to throw at an EV calculation, because if all you're doing is projecting out your expected profits and future discounting, that can't be that hard. But in the end, it's not the end-of-the-year value that really matters. It matters, yes, but that's not where you gain the benefit. You're really getting the benefits from understanding why the value changed the way that it did. And when you take a look at the detailed reports that we have to present, I think our movement analysis probably has a total of 50 or 60 lines in it. I mean, it gets into exactly why everything changed in nine or 10 different areas. There is a lot of work to get that to make sense. Obviously, we have to make some significant strides going forward in order to make ourselves more efficient and to provide information in a quicker timeframe.

What was the impact of stochastic EV for us this year? More time was required to do it. We have stochastic projections versus deterministic. After you run so many hundred scenarios, or so, and you find an error in everything, fixing that is not quite as easy as when you're running one deterministic scenario.

We have a fairly high number of sensitivities that we have to do at Allianz. For us, we had to do three or four on a stochastic basis. Not only did we have to do the base EV calculation, but there were also stochastic sensitivities. And the general movement analysis of why the value moves from one year to the next was a little less easy to understand if we were dealing with averages of scenarios, as opposed to one single scenario for which we would know exactly what was going on.

Because of the stochastic EV, we saw a small decrease to our fixed-life annuity business. That's not because the business is worth less now than it was last year. That's strictly because, in previous years, we just had the one deterministic scenario. Now we're doing an average of stochastic scenarios, so those guarantees start paying off a little bit more. That did decrease the value of our fixed-life annuity business a little bit. It had no impact on our long-term care business. It had no impact on our variable line of business.

In previous years, since we were already using stochastic scenarios, the value didn't change because of options and guarantees. It did change some geography. In previous years, we had one column for present value/future profits. Now we have a separate column for the value of options and guarantees. It's increasing the present value of future profits and putting that increase into options and guarantees. But they offset each other, so there's really no net impact.

What steps did we go through in terms of the EV calculations in options and guarantees? First of all, we had to identify all of the options and guarantees that we had. This includes the normal culprits, the guarantee credit rates, the guarantees on variable products, the guaranteed death benefits on UL contracts, the secondary guarantees, as well as bringing in whatever dynamic policyholder behavior that might occur.

Step two was determination of the materiality. AG gave us guidelines in terms of what was material, what we had to calculate and what we didn't have to calculate in options and guarantees. It was a 10 million-euro-for-individual option and guarantee rate. Total options and guarantees didn't have to be valued if they were less than 1 percent of your total EV. For some of these guarantees, the values are difficult to calculate. You might not have a lot of experience on it. I always thought that it was interesting that in order to determine if it was material, you have to measure it. That kind of defeats the purpose. In the end, we had to make what we thought was a sound judgment in terms of what we felt was really material at that point in time.

The next step was to calculate the cost of the options and guarantees. The cost of the options and guarantees is really made up of two parts. First of all, there is the intrinsic value; that's really the value of those options and guarantees that was already built in the present value/future profits. For instance, you might have a fixed annuity that's already at the guaranteed rate; it's already at compressed spreads, so your present value/future profits already have been decreased due to that guarantee.

One of the things that our parent company told us was that we could calculate the intrinsic value by running projections with no guarantees and taking the difference between the projections without the guarantees and the one with the guarantees. The difference would be the intrinsic value.

The time value of money reflects the reduction of the margins in the future, due to the various scenarios that are being run. For us, that's what we presented as the value of the options and guarantees. The options and guarantees reduce the present value of future profits for the fixed-life and annuity business by 9.4 percent, and the variable annuities by 27 percent.

For variable annuities, we did not incorporate any of the hedging activity that we do on our variable annuities. If we did that, we would be allowed to reduce the cost of those options and guarantees. At the same time, that would reduce our present value/future profits. So that, again, is somewhat of a geography issue. Actually, for variable annuities, we do a slightly different calculation for those options and guarantees. As opposed to taking the difference between the deterministic present value/future profits and the average of the stochastic, for our variable annuities we keep track of the guaranteed benefits actually paid in each scenario and average those benefits across all scenarios. So it might give you a slightly different answer, but it should be in the ballpark.

For a fixed-annuity in-force block, generally, those bad scenarios are where most of those costs of the options and guarantees come into play. I made a ratio of the numbers to make the deterministic present value/future profits exactly \$100,000. The average present value/future profits is \$92,500, making the cost of the options and guarantees about \$7,500.

In the first couple of years, just given the time that we spent calculating EV, I probably put a little less credence in the numbers that resulted from Allianz Life's EV. But over the course of the years, I think that the results create the picture that your management wants to see or shareholders want to see. They want to see that EV going up over the course of the years. I've made a couple of notes down below in terms of why you might see a big increase one year, a decrease another year, for a certain reason.

How is EV actually used at Allianz Life? It's not something that strictly is used because our parent company says we have to do it. It's not something that we do just to keep actuaries busy. The number-one thing that we use EV for at Allianz Life is incentive compensation.

It's used for incentive compensation for a couple of reasons. No. 1, it's good. It's a good tool to measure how well management is taking care of the business. We have a large block of fixed annuities. Now if we are out there not managing credit rates, the full spreads, or something like that, you would see the value of that in-force block drop or be less than what we expected at the end of the year. If you see that surrender is a lot higher than you expected, that's going to hurt the value of the block of business. You might think that you have an operational issue and that you have to get on-the-phone teams and have them give a different story to people when they call in a surrender.

The biggest driver in EV increase is new business. The value of new business is important. You really don't want to compensate people strictly on production, because you're going to have some people that just are going to want to buy business. Well, if you take a look at EV, the value of new business, that not only takes a look at how much business is sold, but also at how profitable you expect that business to be. Especially in a fixed-annuity line of business, let's say your spread is 200 basis points, if you're out selling business at a 100-basis-point spread, just because you want to get more market share, and you do an EV calculation on that new business, it's not going to look very good. We just don't feel that we should be compensated based on selling unprofitable business.

EV also can be used to help management make decisions: taking a look at various investment strategies, how much of a duration mismatch do you want to have that's going to impact your EV. It's possible to take a look at some hedging strategies, as well.

What can be learned from stochastic EV? As I just mentioned, the impact of investment decisions, the better ALM match you have, the better off that EV is going to be over a wide range of scenarios. It also provides good feedback on management performance. Is management selling good business? Are they managing the business? Are they doing what they're getting paid to do, managing the business that it's in force? And the one that always comes up for us is: Are we living within our expenses allowable? Are the expenses projected forward consistent with pricing? Are they higher than pricing? That's something that comes up every year.

Calculating the base EV is not the only important thing. Sensitivity tests also provide a great deal of information. What happens to the value if the yield curve drops 100 basis points or goes up 100 basis points? What happens if the average equity-return assumption drops? It gives sensitivities to actuarial assumptions, lapses, mortality and expenses. So using EV sensitivity can give you an idea of what would happen to the value of your company if some of those things happened.

Keys to successful implementation—I think that I've done EV every year that we've done it since 2000. I have a pretty good idea of what it takes to be successful at it. First of all, set your assumptions as early as possible. If you're doing EV using year-end information and you have to provide numbers by the end of February, you probably don't want to set assumptions in late January. One of the options is to tie your assumption, any assumption changes from year to year, on your unlocking decisions that have happened during the course of the year.

Second, it's very important to have a strong actuarial modeling platform—not only to make it very efficient from a run-time standpoint because of all the stochastic work that's required nowadays, but you want accurate results so you don't spend all of your time second-guessing whether or not they're right. You want a system that's very well validated and used for multiple purposes.

Resources—it takes a lot of work in January and February if you decide to publish year-end numbers. Obviously, that's a busy time of year for a lot of actuaries. You have financial reporting going on year-end. You have cash-flow testing. You need to decide what area is best suited to EVs. Is it financial reporting? Is it another area? In Allianz Life, it's not the financial-reporting area that does it. We have a third section of corporate actuarial that does it. I think that one of the key things is that it really needs to be supported and understood by management. I say that because if it's not supported, then, essentially, it's a bunch of actuaries doing a calculation that never gets used and that doesn't benefit anybody. If the management supports it and understands it and uses it, then it really does add value to the company.

I have just a brief note on the future of Allianz Life in EV—we are moving forward with market-consistent EV calculations. I haven't seen the results yet. But that's something that we've been working on with outside consultants for a couple of years now. But at least the change in that value is not quite as intuitive as traditional EV, just because the traditional EV takes a look at profits more like we expect them to come through from year to year. So that's a challenge that we have ahead of us. Our parent company strongly supports that. A lot of European companies do, as well.

**FROM THE FLOOR:** Can you discuss how you generate the equity scenarios for the stochastic? Would you use regime switching or some other type of algorithm to get these scenarios? Do you select bad ones purposely? And how many do you actually use?

**MR. SPURBECK:** In past years, we used the regime-switching method. Starting with the 2004 numbers, our parent company purchased a scenario generator from a U.K. company. This year, they generated all of those equity and interest-rate scenarios for us. I know it's not a regime-switching methodology, and off the top of my head, I can't provide you any great detail there.

**MR. MUELLER:** The number of scenarios varies anywhere from probably 100 or 200 on the low end, to thousands of scenarios on the high end. It depends a little bit on how often the companies run the scenarios. Sometimes companies do the analysis once. They'll pick 1,000 or 2,000 scenarios, run it for a block of business, and then figure out which 100 or 200 give them a representative picture and use the methodology of representative scenarios to allocate and cluster the scenarios so that you have to run less, but you get the same spread of answers. That's one way to do it. Some companies use brute force and will run 2,000 in whatever time it takes them, or 5,000 or 10,000.

**FROM THE FLOOR:** And when you choose the 100 or 200 to represent, is there a bias for conservatism or do you honestly try to get the 100 or 200 that represent the 1,000?

**MR. MUELLER:** Since you're not doing a specific tail-risk analysis, it tends to be

more like trying to represent the whole spectrum of scenarios. I mean, that's what I've seen, typically.

**MR SPURBECK:** We try to take the stratified sample that represents the entire set of scenarios.

**MR. MUELLER:** It's a little different than doing an economic-capital analysis, for which you're focusing on tail risk. This is trying to get a good picture of the value of a block of business, your best-estimate value. You want to have the whole spread.

**MR. SPURBECK:** We are supposed to run 1,000 scenarios for our EV calculation. We did not this year, just because we might still be running them if we had tried. Given where we were with the modeling and the inefficiencies that we had at that point in time, we just could not afford to run 1,000 scenarios from a time standpoint.

**MR. MUELLER:** And in terms of consistency, you asked the question about how you pick the assumptions. The assumptions should be consistent with your overall EV model. So if you are calculating the cost of options and guarantees on a real-world basis, for example, you want to have a set of equity scenarios for which your mean equity return and volatility are consistent with what you would consider a best-estimate real-world model.

You shouldn't be coming up with an equity return of 11 or 12 percent, just because that's the historic average. It should be based off of where the risk-free rates are today, where equity-risk premiums ought to be, and where you expect rates to be. For example, if you look at the re-calibrated scenarios for C-3, Phase 2, those returns are in about the 8.5 to 9 percent range for equities with a volatility that's in the 16 to 20 percent range for the different equity-asset classes. It should be consistent with your traditional EV model of equity-return assumption. It's a big question, and it's an ever-increasing part if you want to get options and guarantees right.

**FROM THE FLOOR:** I have two questions. Sometimes we look at other metrics like internal rates of return (IRRs), on new business in particular. Over the stochastic scenarios, what would you say would be the best way of looking at IRRs?

And my second question is, in looking at analysis of movement, especially with the variable annuities, how do you go about trying to figure out where your separate account-experience variance is?

**MR. SPURBECK:** In terms of separate account experience variances, obviously, those variances can be driven from a number of things, whether it's persistency-related or return-related. Let's just make the assumption that our average equity-return assumption is 8 percent for the year. Based on the average EV, how much account value do you expect to have in force at the end of the year? And based off

of that, if the separate account performance is only 4 percent for the year, then you lose. Your present value/future profits are going to reflect the fact that you've lost a certain amount of mortality and expense going forward. I don't know if that answers your question. When you're dealing with averages of scenarios, it's a little more complicated in terms of variance analysis.

**MR. MUELLER:** You try to take apart the impact that comes from a change in the decrements to the change in the market performance. Part of it is going to be an impact on this year's profits, because the expected return is going to be different. And you're always going to have that separate account, even more so than the fixed-income business. You're always going to have a difference between what you expect in equities or the separate account overall on a weighted-average basis to do versus what it actually does. It would be an absolute miracle if it had exactly your assumption. It will never do that.

How much was the impact on this year's profits? How much is the impact on the future because your ending basis at the end of the year is different than what you projected it to be at the beginning? You have to delineate the change in lapse performance from that. If you think about trying to figure out changes in decrements and investment performance, you have to do at least three runs, probably more.

You run it with the new lapse assumptions and with the old one to get that difference, the impact on lapses and split it into this year and into the future. And then, you run it with the new and old investment-return assumptions to get the impact this year and into the future. It's not uncommon, if you do a typical variance analysis, that you might have to do about 25 or 30 different runs for a block of business or for the entire business to get to all of the different elements.

There's a suggested way to do it. If you've actually done it, you figure out that there's a certain way to do a variance analysis that will make it a little bit easier. But I'm not going to go through all of it in detail because of time restrictions. So it's not a five-minute explanation, but there is a way to do it if you think about how the business flows and how the results kick in. If you want to have the major variance items separated out, lapses in investment performance and expenses probably tend to be the ones that you do when you show separately.

In fact, that's one thing that we haven't really talked about too much. One of the key benefits that every company that does EV for the very first time gets is a true verification of their pricing assumptions in terms of how the pricing expense assumptions match up to reality.

Of course, you can always say that you sold a lot less or a lot more this year than you thought. But you tend to see the same patterns year after year. If your pricing assumptions were set five years ago, they're probably not up-to-date anymore. The EV will make that very clear. Because if you put in your maintenance assumptions

and acquisition assumptions for new business, and a half-year of maintenance for new business, assuming it comes in the middle of the year, in total, that should match up to your expenses, at least to all of your expected ongoing expenses.

You can have one-off expenses like litigation claims or a tsunami claim or something like that, that you wouldn't expect to happen every year. But in general, you should hit your projected ongoing expenses if you put in in-force and new business. And in most cases, when companies do that for the first time, I find that the expense allowances built into pricing only cover maybe 80 to 90 percent of that. There's always an overhead that's not allocated.

If you knowingly price new business on that basis, that's fine. But then if you're saying that you are targeting 12 and you're not fully allocating, you must target 15 or 14 to get back to the 12 after allocating all expenses. I don't see a lot of companies do that. So this is one of the benefits. EV will make it very clear to you as to how much of the expenses your current in-force plus new business is not covering. You have a dollar number at the end of the year. I think that's one of the benefits. We hadn't mentioned that, and I just wanted to bring that up. That was a good question, though. Are there any other questions on this?

**FROM THE FLOOR:** When you're looking at internal rates of return (IRRs) for new business over 1,000, say, stochastic scenarios, how would you do it? Would you calculate an IRR for each of the 1,000, take the average, or average out the cash flows, and then do an IRR?

**MR. MUELLER:** What you find is that when you do stochastic scenarios, IRRs very often become a meaningless thing, depending on the type of business. I see this often with variable annuities. The strain might be so small that very small changes in the strain in the profits could have huge implications on your IRRs. So in a stochastic world, you should never look at IRRs completely on their own. Typically, companies will use maybe the IRR for the median scenario as a gauge, but they'll also look at the present profit margin, present value of distributable profits divided by the single premium or the present value of the expected premiums as one measure.

When you do stochastic EVs or even stochastic pricing, for that matter, I find that the IRRs become very sensitive to small changes and you get 30 percent numbers at the higher percentiles. They don't mean anything, because there's no real strain. So using that in a vacuum is sort of a fallacy. If you're pricing on a GAAP basis, it might make more sense, because you're levelizing the number. But if you do a stat IRR, a typical IRR measure, it doesn't. It fluctuates a lot in a stochastic world. So you might want to use the median. This is a good benchmark. But never look at it just on its own. Always look at other profitability measures alongside it.

**MR. SPURBECK:** We use IRRs, but we generally look at the average IRR. We also take a look at a certain percentile scenario. Does that cover our cost of capital? So

like the 10th or the 15th percentile, does that cover our cost of capital?

**MR. MUELLER:** In other words, you've moved from a median to, say, an 80th or 85th or 90th. You look at the turn at that level, and you could see more of a strain at that level, too. Although, again, don't forget that if you have a strain at issue and then you have another loss in the future, there's no unique solution anymore to your IRR because now you have two sign changes. You might look at a number that's become meaningless. Maybe Excel solves it, but it doesn't mean anything. So do not rely only on the system to give you a number that means anything.