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What's Backing Your Guarantee?

Track: Product Development

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Summary: Individual life insurance and annuity products that are currently being sold may contain many different types of guarantees. Life products may have extended maturity benefits, secondary guarantees, guaranteed instability and other guarantees. Annuity products may have guaranteed minimum death benefits and current rate guarantees. Each of these guarantees has its own risks.

MR. CARL FRIEDRICH: First I will make some introductions. I am a consulting actuary with Milliman. My areas of emphasis in the practice include life, long-term care and annuity product development, as well as reinsurance-related activities. Prior to joining Milliman in 2002, I had been with CNA for over 25 years, most recently as senior financial officer for the life and group operation.

Joining me on our panel today we have Doug Robbins. Doug is a consultant with Tillinghast-Towers Perrin in Atlanta, Ga. He has been there for over nine years and works in product development as well as valuation applications. Doug specializes in newer products and riders, particularly with respect to equity-oriented products.

On my far left, we have John Glynn. John has been with Carsons Glynn & Pickering since 1984. There he primarily does product work, in particular variable life and

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variable annuities (VAs). Most recently John has been developing a paper for the SOA related to today's topic. You will see more about that shortly.

I will first cover life products, the range of guarantees seen on these products and a number of examples that we have seen in the marketplace. As I talk about those different types of guarantees, I would like to evaluate many of those from three dimensions. First is the type of actuarial analysis required to understand these risks. Second is the type of support required, in particular capital support needed for some of these products. That includes reinsurance, letters of credit (LOCs), and most recently securitization. Third are some of the requirements and views of various audiences and accounting systems.

Let us start with some of the more traditional types of guarantees. Going back in time, guaranteed insurability options were one of the common options being offered to policyholders. Another example is term insurance given the guaranteed nature of level premium term, including 10-, 20- or even 30-year designs. There are universal life (UL) basic guarantees that deserve discussion and some of the more recent guaranteed maturity extension provisions on these plans. A hot topic in today's environment is UL secondary guarantees, which I will spend somewhat more time on. Finally I will address variable universal life (VUL) guaranteed benefits.

I will be brief on guarantee insurability and a somewhat related provision, paid-up additions under participating policies. Classic pricing of these provisions has viewed the cost as differentials in point-in-scale mortality reflecting current underwriting versus aged underwriting. That is offset by the lack of underwriting expense relative to the issuance of policies under the option. The real issue is that these can be lapse-sensitive, and there can be significant antiselection involved in these types of provisions. There is a lot of judgment involved in both pricing and reserving for these features.

There are some design approaches that can alleviate some of those concerns. The primary structures to control those risks include scheduling of option dates and use-it-or-lose-it features. There are questions outstanding relative to the appropriate way to reserve for these methods. For most companies, these are not typically a significant concern due to the smaller face amounts involved with these options.

I had mentioned paid-up additions. I think there are some analogies to guaranteed purchase options. The use of guaranteed net single premiums for those purchase amounts alleviates many of the concerns that might otherwise exist.

A more significant issue for the industry is the predominance of level premium term in the market in the 1990s. At the same time we saw the emergence of enhanced underwriting techniques and multiple risk classifications. Regulation XXX addressed flaws in the unitary reserving methods, which were being applied by at least some companies to some of these designs. The good news is that it did allow for

individual company determination of X factors used in deriving deficiency reserves. However, it left basic reserve calculations dependent on an outdated mortality assumption, 1980 CSO. With the adoption of 2001 CSO, we have basic reserve calculations dependent on an updated, outdated mortality standard.

As we think about the support provided for these products, a vast majority of the business is being ceded through either internal or external arrangements. This has triggered in turn a concern on the part of many companies' risk managers relative to the credit risk exposure, as more and more concentration of risk is occurring. In particular, there has been such tremendous consolidation in the reinsurance market. In addition, the increased volumes of ceded business associated with high quota share coinsurance compounds these concerns.

It is also that much more critical to truly understand the terms of your reinsurance treaties. For example, what are your recapture provisions? Are your asset transfer requirements well-defined in the event of recapture? This could be a tremendous issue at some point down the road.

The use of offshore reinsurance, internal or external, has alleviated many of the capital requirements, at least short term, relative to this market. That is true only if the direct writer can take credit for reserves ceded to unauthorized reinsurers. There are three basic ways to achieve that, including LOCs, assets in trust and funds withheld. This, again, is another hot button in the marketplace today, and the demand for LOCs is increasing. Capacity and costs into the future are in question. We have heard a couple of speakers during this meeting indicate that the projected requirements of AXXX are $100 billion over the next five to seven years, and that is contrasted with industry capital in the $200 and $230 billion range. Reinsurers typically have guaranteed their rates to direct writers to parallel the base plan guarantees. In contrast LOCs typically only have a 1-year rate guarantee. We are seeing the emergence of a few multiyear guarantees, but those are quite limited. Increasingly, affiliated offshore reinsurance is utilized as a capital solution. That means the affiliated entity itself is taking on the risk of LOC cost increases and possibly the risk that the capacity of LOCs is constrained or depleted.

The most recent capital solution that is being developed to address these concerns is securitization. I was in a session yesterday where two speakers gave four different definitions of securitization. Here is a fifth. Securitization is a structured solution that isolates a book of business, potentially secures a financial guarantee to wrap the business and secures financing through capital markets to support the reserve requirements of the business. It is pretty clear that there is no single definition. In fact, true securitization is rarely achieved. Many of the structures are variations of this general theme.

The first major term life insurance securitization occurred with First Colony. This has triggered significant activity in the structuring of potential future deals on direct term business. There are a number of these deals in the pipeline. In addition, this

may be an alternative for reinsurers, although they do have somewhat more of a challenge in demonstrating homogeneous claims experience that investors would prefer. Interestingly, in another session yesterday, we heard one reinsurer indicate that it felt that it was, in fact, in a better position to effect some of these transactions, given its overall experience in these markets and scale.

There is also an emerging theory that pooling concepts among smaller writers may allow for some of these capital market solutions to extend to smaller carriers. Typically a securitization requires $300 million or more to justify the fees involved. Those can be significant seven-digit fees up front.

How do we analyze these guarantees on term products? Most pricing is done on a deterministic basis. However, increasingly, understanding the range of potential results is critical in corporate risk management. Even more important, the ability to effect external capital solutions typically demands additional sensitivity testing, if not stochastic analysis. Variables affecting term profits primarily focus on mortality assumptions, but they can include lapse assumptions and interest rates, as well as other factors. Furthermore, rating agencies are making it more and more clear that they expect this type of analysis, in particular stochastic analysis, to be performed to assess the impact for the sponsoring company relative to securitization as well as to assign ratings on the debt itself.

In contrast, the use of traditional reinsurance that does not typically require this type of stochastic analysis because reinsurers have developed their own understanding of the risks involved (particularly the mortality risk). However, they do face their own uncertainties, with respect to the LOC costs into the future, and they conduct their own analyses.

Let me move on to UL and the primary guarantees offered on those products. Those include interest rate guarantees and mortality guarantees. In particular, much of the business written in the 1980s and 1990s was in a high-interest-rate environment. Some of the guarantees out there on existing portfolios are 5 percent or higher, and there is considerable pressure as interest rates have dropped in the past five years or so.

Now there is some ability to offset some of these constraints with other factor changes within UL, but that ability may be somewhat limited. Hedging of investment risks, from my experience, is limited relative to these types of exposures on UL, and the mismatch between current investment returns and guaranteed crediting rates has created some pressures in a few situations with respect to GAAP reserve adequacy. Stochastic analysis is being performed more and more to understand some of these risks and manage these exposures.

I should also segue into a future set of topics, which is that many of the second- and third-generation UL products began to offer short-term guarantees in addition to the primary guarantees. Eventually, and in particular in the past five years,

those have extended to long-term secondary guarantees to the point where we are now seeing a proliferation of lifetime guarantees. Generally the structure of those short-term guarantees was in terms of a required specified premium. In other words, if a policyholder paid a cumulative premium level in excess of a cumulative required and defined premium level, the contract would remain in force regardless of what may be a nonpositive cash value.

I will spend more time on longer-term guarantees in a moment. First let me mention another phenomenon, which is the offering of guaranteed maturity options. This is a response to estate planning concerns, as more and more people are living to age 95 or 100, where some products were intended to mature. The typical design of these provisions is that if the contract is in force at that predefined maturity date, the death benefit protection would be continued free of charge. Normally the cash value grows with interest at that point, and normally there is no explicit charge for this feature, even prior to the maturity date. In analyzing this and pricing this, we find that most companies assume a mortality rate of 100 percent at that maturity date to protect themselves. If they do not, they need to extend their mortality assumptions beyond that maturity age.

With 2001 CSO, we see the extension of the mortality table extended to age 120. This poses the question of whether this will eliminate the need for the feature or make it easier for companies to rationalize offering guaranteed maturity extensions. With secondary death benefit guarantees, this can exacerbate the cost of this particular provision.

Let us move on to what I guess many would say is one of the hot topics of our current environment, and that is longer-term secondary death benefit guarantees on UL. In the past few years with the lower-interest-rate environment, there has been a heightened focus on guarantees. Of course there were XXX implications that extended beyond the term insurance marketplace. In part as a reaction to that, and in part as a reaction to companies' concern that the first-generation structures may not have protected their profitability on their all-premium scenarios, we are seeing a new generation of secondary guarantees, notably featuring shadow account structures. For those who have not worked in that market, shadow accounts are just another mechanism to define the secondary guarantee. They work much like a cash value calculation. However, they have nothing to do with the actual cash values available to policyholders. They are purely a device to determine whether or not a secondary death benefit guarantee is in effect.

With these types of provisions, UL market shares increased 28 percent measured by new premium going from 2002 to 2003. Over a longer-term time frame, 1999 to 2003, it increased by 100 percent. That is $4.1 billion of new UL premiums in 2003.

Guideline AXXX, also called Actuarial Guideline 38, was issued effective January 1, 2003, with respect to most provisions to clarify reserving requirements applicable to various products, including UL with secondary guarantees. This involves a

complex required nine-step calculation. That is used not only for shadow account design, but specified premium structures, as well. The intent is basically for the reserves on these plans to approach net single premiums as the premium requirements under the secondary guarantee provision for lifetime guarantees are met. That is obviously a simplification of the issue.

In slide 16, we provide an example of cash values, Commissioners Reserve Valuation Method (CRVM) reserves and AXXX reserves for a typical UL product with secondary guarantees. These patterns can vary tremendously from plan to plan. I will speak more about that in a second. You have all seen the humpback reserve associated with term insurance under AXXX. It looks quite a bit like this chart. In the early durations it grows and typically peaks 8 to 12 years out. and differentials between XXX reserves and what some call a true economic reserve decline rapidly to zero a few years after the peak. Here, in contrast, with UL with secondary guarantees you can see that the excess reserve requirement is significant and extends for decades.

Where is the support for these types of guarantees? Reinsurance has in fact been limited over the Past couple of years. There were a few reinsurers in this market until about two years ago. In the past two years, only one company was playing in the market, and that was ING Re. No reinsurer is expected to participate going forward. The previous mechanism used by ING and a couple of other companies earlier had been to cede out 80 percent to 90 percent of the net amount of risk to the reinsurer and waive reinsurance charges in the event that the secondary guarantee was triggered. This was a rather elegant solution. It passed on to the reinsurer the economic risk that secondary guarantees might be triggered. It provided mortality risk protection, and associated with the transfer of the economic risk, the excess AXXX reserve was also being taken on by the reinsurer with the commensurate reserve credits to the direct writer. That apparently is history, however, at this point, and we are left to look at internal solutions to support these designs.

There are many similar characteristics to the term insurance marketplace here. Offshore affiliates can be utilized to take advantage of different accounting regimes offshore. That requires that the direct writer and its affiliates then take on the LOC pricing risk. In addition, they are retaining the economic risk, so it is obviously critical to understand the potential exposures that do exist, which are highlighted in particular by a low-interest-rate environment over a long period of time.

Many companies have been creative in studying product design variations. The AXXX formulas are not perfect. The formulaic reserves that can emerge under different product designs can vary tremendously, even though the guaranteed premiums associated with those different designs may be identical. The range of excess AXXX reserves as a result can vary substantially from product to product. In some circumstances, this may even pose an eventual regulatory risk as the structure and the spirit of AXXX are being examined by state insurance department

examiners.

A final option to be considered potentially is securitization. There has been no securitization of these types of structures at this point. Demonstrating to investors that that the risk is a limited risk is a more difficult challenge than for term insurance, as you might expect.

I should talk a little bit about the analysis and regulatory requirements pertaining to these designs. Deterministic assumptions are typically the starting point in design and pricing of these plans. Key assumptions include interest rate assumptions, lapse assumptions and mortality. Many companies have been able to achieve competitive premium levels, in part because they have reduced cash value available under these products. Taken to an extreme, that can create a trap. These products can be somewhat lapse supported. You need to still meet the illustration actuary requirements if the product is to be illustrated.

Most important, one needs to evaluate all potential premium scenarios in the pricing of these designs and consider utilization of options being offered to policyholders. For example, if the secondary guarantee is in the money at a given point in time under your pricing assumptions, it is probably prudent to assume no lapses at that point in time. We have seen many early-generation secondary guarantees that were priced without contemplating those types of issues. We have seen insurers go back and reprice, generating second- and third-generation secondary guarantees.

The GAAP reserves for the product typically involve best estimates. However, clearly provisions for adverse deviation are necessary to contemplate some of the scenarios that may emerge under these structures. Then, finally, there are statutory reserve requirements. For many plans, AXXX clearly produces reserves that are redundant relative to what I will call economic reserves. However, as alluded to earlier, under some designs, strict application of AXXX formulas can produce reserves that at times fall short of those economic reserves. Again, there is no perfect solution with formulaic reserve standards, and we have seen some unusual product designs in the marketplace. We have also seen companies recognize that some of the preliminary reserve calculations do not produce sound results. In fact, they are choosing to hold reserve levels higher than formulaic AXXX reserves.

Slide 20 is somewhat comparable to the earlier chart, but we have added the middle bar, which is CRVM reserves plus the present value of guaranteed costs for this hypothetical product. It represents what I would call an economic reserve. Typically that would fall somewhere between CVRM reserves and AXXX reserves. What this chart does not demonstrate is, under certain designs, that yellow line can pop up in certain durations over the top blue area.

In these situations where companies are choosing to hold higher reserves, it does

beg a couple of questions, the biggest being what is the status of tax reserves under those situations? That is an issue that is by no means resolved, although many would point to the formulaic statutory reserve as a cap.

Finally, rating agency views on these issues can in fact be important. We have seen a Moody's report in the past year expressing concern regarding the pricing of some UL plans of secondary guarantees and their dependency on lapses. I mentioned the lapse-supported nature of some of the designs out there, so one needs to be careful in analyzing that. Similarly during these meetings, I have heard Standard & Poor's (S&P) commentary echoing some of these same considerations and concerns about a combination of aggressive mortality assumptions, lapse assumptions or other factors.

I would like to conclude my comments on UL secondary guarantees with a brief discussion of NAIC Life Health Actuarial Task Force review activities. This group has expressed some concern regarding the potential for the spirit of AXXX to be circumvented under certain designs. There have been active discussions over the past 6 months regarding the potential rewrite of AXXX or a replacement with new standards. In September, in Anchorage, Alaska, there were three different proposals that were discussed, including a rewrite of AXXX as proposed by William B. Carmello Jr. of New York. Also, there was a second proposal from a group of individual carriers that demonstrated what appears to be a growing support for many in the industry for principle-based reserving approach as opposed to a pure formulaic approach. When I say principle-based, I mean a stochastically supported reserving methodology, which really analyzes the range of potential results and captures some of those potential costs, reflecting them in a reserve standard. That is a mouthful, obviously. There is a lot of work involved in making the move along those lines.

Before I get into this next topic, I should mention some recent updates. Last Friday, October 22, 2004, there was another Life Health Actuarial Task Force conference call. At that discussion members voted to expose New York's latest proposal—at this point we are in version four—along with a California amendment to that proposal. That will be discussed on November 19 again, and it is certainly possible that in December this group may vote on such an amendment. There are some significant questions outstanding as to whether or not there will be a short-term fix to some of these issues, or whether this group will delay action and wait for development coming from yet another group, which I am about to cover.

The American Academy of Actuaries has established a working group to review the reserve considerations and structures pertaining to VUL and UL products. In fact, most recently the scope of that group has been expanded to include term reserves. The ACLI concern primarily is related to the tax deductibility of reserves and whether or not that issue can be clarified in any potential move away from pure seriatim formulaic reserves, which is a requirement under IRS code at this point.

Regulators from New York have indicated some concern relative to the fact that regulators simply are not in a position to monitor and keep up with some of the modern stochastic methodologies. That is going to pose some additional challenges for them as well.

As a side note, also in Anchorage, the Emerging Accounting Issues Working Group adopted a tentative consensus regarding the original New York proposal with the knowledge that that well may change. Technically that proposal had been withdrawn by the time they wrote it on that first version. That is yet another wild card.

A lot is going on with respect to these issues, obviously. The Academy working group now has over 25 members. They have established some tentative principles, timetables and subgroups related to the group's charge. Specifically, there is a tentative target date of December 2005 for recommendations that come from the group. There is on-going dialogue with the Life Health Actuarial Task Force relative to developments and perspectives coming out of that group.

I will close quickly with a few brief comments about variable life secondary guarantees. These are much less competitive than those offered under UL in today's environment. However, that gap seems to be narrowing a bit. The reserving requirements are clarified in Actuarial Guideline 37, generally reflecting an attained age reserve methodology. Interestingly, there was a recent proposal on the AXXX front to extend this Guideline 37–type logic to UL with secondary guarantees. However, that proposal was not accepted in the latest Life Health Actuarial Task Force conference call.

Many of these structures feature UL secondary guarantees embedded within the fixed-account and shadow-account structures. It is not clear at all that those were contemplated in the language of Guideline 37. Again, we are seeing much less activity along these lines. The question is, what is coming down the pike? With that, I would like to turn the podium over to Doug, who will speak on the annuity front.

MR. DOUGLAS L. ROBBINS: Thanks Carl. I guess this is part two of Session 117, "What's Backing Your Guarantee? The Annuity Part."

I will probably try to do this the way the syllabus read, the one that you got in your brochure when you signed up. I will do a discussion of what is out there. Then I will follow it with quantitative methods actuaries use right now, methodologies to quantify and measure risk for annuity guarantees. I will discuss the advantages and disadvantages of two key methods and then talk about some things that actuaries are doing to deal with risk on annuity products.

You are going to be making some choices that are going to depend on what your situation is, so let us talk about what those choices are. What is out there for annuities and currently available guarantees? There are fixed-annuity products out

there. You have rate guarantees, long and short—sometimes one year, sometimes five years and maybe 10 years. You have equity index and multibucket products. Those have two kinds of guarantees on them. One is a minimum guaranteed surrender value, which has a long-term interest rate guarantee. That was basically put there to meet the nonforfeiture law. They also have guarantees on equity linked parameters like the cap or the spread or the participation rate. Then you have VA guarantees that we all know about. There is the old, now seemingly kind of stale, guaranteed minimum death benefit (GMDB), followed by the guaranteed minimum income benefit (GMIB), guaranteed minimum accumulation benefit (GMAB), or guaranteed minimum withdrawal benefit (GMWB), the living benefits that are causing such tail risk nowadays.

What drew attention to each one of these risks? In the late 1970s and early 1980s, we had those super high interest rates. People were issuing book value guarantees on their annuities that were sometimes way too high once rates sank. Low interest rates in the 2000s have been a problem for the companies that had a 3 percent guarantee, so maybe those were too high. Then products that were issued before the 1970s and 1980s had disintermediation when the rates first popped up. The late 1970s and the early 1980s were a problem in both directions, depending on when the products were issued.

The equity-indexed annuity (EIA) market drew attention in two phases. The first was the mispricing of equity parameters. Some parameters were priced with the notion that implied volatility, which is what drives option costs, would stay around what the historical rates had always been. When those soared to the 30 percent to 40 percent range in the late 1990s, people realized that that was mispriced. In the 2000s, some people had built their products assuming that while they had this minimum guarantee surrender value for nonforfeiture, it would never actually work. It would never actually go into the money for the policyholder, right? That turned out not to be true after 3 or 4 consecutive years of no gains on the equity front. Those came into the money.

VA guarantees have been hit hard, as we all know, in the 2000s. The market collapse hit everything issued around 2000 and 2001, and in fact, it hit a lot of stuff issued in the 1990s that had an annual ratchet because those all came due sometime in the year 2000 when the market was at its peak. We will deal with these risks in two phases. First I will talk about measuring and quantifying the risks as I said, and we will talk about real-world measurement of risk and risk-neutral measurement. I will say what those are a bit later. Then there is a phase of trying to do something about the risk, to neutralize the risk.

Primary analysis and planning tools for measuring and quantifying risk that I will talk about are stochastic scenario sets. There are several kinds out there. They are out there because people may have first thought of pricing annuities using single scenarios with an average return. Those just do not work from those guarantees because they come up with a zero cost. Stochastic sets provide a means of valuing

options where you did not have that means under that first measurement technique.

There are deterministic stress tests out there that could help that are not a single scenario. I think the most familiar to you would be the New York 7 for fixed annuities for interest rate–sensitive products. Those are good because they look at the extreme possibilities, but they could also seem implausible. Also, you get potential tail results, but not tail probabilities when you look at something like a New York 7. No one has any idea based on just throwing those out there how likely each one of them is. Stochastic sets help you with that.

In the presentation, I will talk about real-world and risk-neutral sets. I will do a whole section on real world analysis.

Real world analysis can mean anything from your own homegrown scenario generator where you say, "I think that equities are going to behave this way, so we will generate stochastically a set that works like that." Another would be something like the C-3 phase 2 scenarios for variable products where the regulators have given you something, and you have to use it. It is still based on history in some way, and that is what a real-world context is.

You create a scenario set in some way based on an historical data set, whether it is the history of the S&P 500 or one of the other international indexes, a bond index or simply the history of movements and treasurer rates. You create a bond fund using those. There are all kinds of possibilities. The regulators used a conservative set to do C-3 phase 2. You run your actuarial model through that set and observe the costs that arise from your guarantees on your annuity products. You use the observed data that come out to estimate the true cost distribution.

What should real-world scenarios look like? You often have created your real-world set by fitting to a historical distribution, a probability distribution that you have taken your historical rate movements and said, "This looks kind of lognormal or kind of something whatever." You fit it and get a goodness-of-fit test, and you like the fit, so you say, "That is my distribution; now I am going to use that to generate my real-world set, my forward-looking set." You try to match the scenario parameters to the distribution parameters.

You also make a key decision, by the way, on how much mean reversion to assume. Some people assume there is a distribution in the short term. However, in the long term, things tend to come back toward an overall average rate. That is a real-world view that is out there.

What you need in your scenario set depends on what product you are looking at. For a fixed annuity, you probably just need interest rates. There are lots of good interest rate generators out there. For an EIA, you need the interest rate plus at least one fund index. I say "at least" one fund index because there are multibucket

products out there where you would need *more than* one fund index. With a VA with guarantees, you need many fund indices and income returns and perhaps also interest rates, depending on what you are doing. In the last example, you also need intercorrelations to get a real-world set that is realistic.

What is the first advantage of a real-world means of measuring and quantifying annuity risk, economic risk? First of all, it is based on some set of historical data, so the scenarios tend to look like those data. That means they will feel plausible to someone else looking at your set. They are going to look like what history looked like. You know you can express the expected results and volatility in terms people are used to hearing. In other words, you know my expected return on equity on the S&P 500 has been nine, and in my real-world set, the expected return is nine. My historical volatility is 17, and in my real-world set the standard deviation of my annual returns is 17. People are used to hearing that. Risk-neutral scenarios are not always plausible in that way.

Advantage number two is you can use it for multiple purposes within one run. Of course, your primary purpose is that you are doing economic testing of an economic guarantee. Most annuity guarantees are economic, and you are projecting the cash shortfalls that occur because you have these guarantees. An intermediate step is often the project policyholder behavior that affects those cash flows. Maybe this is not so much for GMDB, but certainly for living benefits. Especially with GMIB and GMWB, the policyholder has to do something to trigger a cost. You have to decide how your scenarios are going to impact that and when he will decide to use it.

Presumably you base that on experience in good and bad economic times. Maybe for lapse rates, you can do that. Maybe for some living benefits you cannot yet, so you have to use intuition. Then you project real-world scenarios that project behaviors in a way that is based on the same history that you have used to either come up with your intuition or your experience. It is aesthetically pleasing in that way, that it is based on similar means and similar standard deviations of returns. If your scenario does not seem realistic, it is not as obviously true. (It *could* still be true, but might not be.)

Advantage three, which I think is important, is that tail inferences can be drawn directly from the data. You create your scenarios, your real-world scenarios, according to a probability distribution. Say you create 1,000. Each represents a probability of one over 1,000. Each scenario is equally likely in the designer's view. Assume that all your other model assumptions are correct. (That is a big if. When I create a probability distribution from my results, I am assuming that my expense assumptions, my lapse assumptions and my mortality assumptions are all correct, and all I am worried about is the distribution of the economy overtime.) Assuming that is correct, I can make direct probability-related statements.

For example, I run 1,000 scenarios because I have a new multiyear interest rate

guarantee, and I want to see how many of them I failed and end up with a product that is unprofitable. My assets appear to cover my liability cost in 960 scenarios. Can I make a probability statement about the true probability of covering at least 95 percent? In other words, I have run 1,000 scenarios, but I have not run an infinite number. In the world of infinity out there, how likely am I to cover at least 95 percent if in my 1,000 I get 960? You can work it out. If your true probability of failure were 5 percent, what is the chance of one failure and one trial? It is 5 percent, of course.

The chance of exactly 40 in 1,000 you can work out to 2.08 percent; exactly 39, 1.65 percent; and so on. I sum up all those probabilities and get 8.06 percent. Let me back up and say that if you wanted 95 percent confidence, you would fail because you have a probability of eight. If you wanted 90 percent confidence, you would pass, in other words. In any case, I can make this statement, and there are some applications that I will discuss later where you cannot.

There are some corresponding disadvantages; this first one is universal, no matter what you are doing. This is always true. You cannot observe anything to demonstrate correctness. You are replicating stuff that happened in the past, but how do you know this is the state of the economy in the future? You cannot know.

That exacerbates the fact that history is often a small sample space. In other words, look at a 14-year GMWB. I guarantee if you take 7 percent a year out of an annuity, you will get your premium back as long as you do not take more than 7 percent in any year. It is a 14-year period, and how many independent 14-year periods do we have on a large-cap stock fund? There are not many. We have a lot of overlapping periods, but few independent ones. We do not have a good sample for what the future looks like, even if it is the same as the past, and what if it is not? This is a little extra point and you can peruse that one.

One other disadvantage specific to asset/liability modeling work is this: What if you are modeling assets to back a liability guarantee, but the match is not perfect? The most common set of assumptions that I have looked at for pricing product development where this has happened is for EIAs. With the prices on EIAs, even though they know decrements are going to reduce the amount they have to hedge, some companies go ahead and model hedging 100 percent of the people who buy the product just in case. What happens if I have real-world scenarios with call premiums? In other words, an expected equity return of 9 percent or so, but my option by definition only assumed 1 percent, 2 percent or 3 percent, whatever the 1-year return is. On all these excess options that I have, I will get extra profit, and it is *a lot* of extra profit. The return on those options is going to be 100 percent, as opposed to the return on your fixed assets of maybe 6 percent. It is a huge difference.

What happens is your pricing runs pick up these profits that are just speculation. You are just buying excess call options. If that is true, and if you believe that is a

good source of profit, why not take all your surplus and go out and buy call options with it? Of course, you should not do that, and you should not do this, either. What you should do to avoid that is try to model as close as possible to a perfect match when you are doing pricing in that situation. Then it does not matter what your scenarios look like in terms of profit. If you want a real-world look at where your fund values are going to wind up, modeling real-world scenarios is fine, but don't model speculation in options.

Still, despite the disadvantages, a real-world set can help a lot in measuring risk. It can tell us, assuming the future is much like the past, what our tail results would look like. If you cannot mitigate tail risk, you definitely want to measure it.

What do I calculate as the guarantee cost on this basis? Clearly, you do not want to just look at the mean cost. There is no provision for adverse deviation and no compensation to you for bearing the risk. You might choose a tail percentile to beat or you might look at your cost as the mean cost, plus a cost of holding capital to cover the tail. A lot of people do that. You have to think about what discount rate to use in that instance. An important point is you could end up with a lot of runs if you do stochastic-on-stochastic runs to evaluate what the capital is.

It is probably also a good idea to estimate how hard your surplus could be hit by a guarantee anyway. Let us look at an example. I have a 1-year annuity selling for $19.30 per unit, based on a security with a year-end value equal to three times the role of two dice. We know the most likely outcome and the mean and the mode and all that if this is a seven on the two dice. You will get a 21 more often than any other result, and it is also your average result. You stand to make $1.70 on average, but you could lose a lot or you could gain a lot.

A put option on that security, I will tell you, costs $3.30 in the market. However, you will charge your policyholder some fee instead in addition to his premium, which comes out of his pocket in January and July. After half a year, he will find out the results of one of the dice, and he can lapse for an equitable fund payoff. Maybe assume a three and a half on the second dice, but no option payoff. This is just like most of your VA riders: if you lapse the contract, the rider is gone, too. Obviously the policyholder has some optionality there that a put-holder on the same security does not have, again like most VA riders.

Slide 47 shows the probabilities. You can see the average ending security price is $2.92, if you sum up the probability times the security ending price. You can see the put payoffs. The real-world mean cost is $2.92, clearly not enough to compensate you for the risks. You will want to charge the policyholder more than that. However, the 95th percentile cost was $12.00, the 85th percentile is $9.00, and probably both of those feel like too much to charge him. The thing you want to do is use results like that to establish what your capital would be. Charge yourself a cost of that capital, discount, and come up with the cost that you want to charge your policyholder. The discounted answer probably will not be $3.30, so this is not

a market-consistent valuation. (We know it is not.) But after the first die result comes out, you will probably want to look again and see where are we likely to end up and reestablish capital at that point. That is the real world.

How does the risk-neutral world work? How do we measure risks in a risk-neutral context? We create a scenario set that has nothing to do with history but instead replicates the current market prices of all the options and other derivatives that we know about. Average future asset returns and appropriate discount rates are all based on the initial forward risk-free curve, which may seem unrealistic (because it *is*). We run the model through that scenario set and observe the costs on each scenario, and the mean result is the guarantee "cost," by definition. This is how the scenarios work.

What should they look like? It is hard to generalize. It depends on the shape of the forward rate curve and on implied volatilities. If implied volatilities are high, you can get funny-looking scenarios.

The first advantage I can give you in a risk-neutral set is objectivity. The result is what it is. There is much less judgment in creating your scenario set because you have to match and calibrate to all your known option costs. You can demonstrate correctness directly by saying, "We match all of the known option costs and security prices." When the runs are complete, given the correctness of all your other assumptions again, you have the cost. It is just the mean result.

Advantage two is that it could be a better first step because if risk-neutral analysis is what the reinsurer or the markets are using, and you will use it to get your hedges, this could be a better indicator of what you will end up paying to hedge the benefit or to reinsure the benefit.

The first disadvantage is a lack of intuitive appeal. The scenarios do not look normal. If you have a high implied volatility, you could have just about half of your equity scenario still negative after a 10-year holding period. That (a negative return on a 10-year hold in large cap) has never happened, even during the Great Depression. That is balanced by some wildly positive scenarios in that instance that cause the overall mean return to be the risk-free rate because they are even more positive then the bad ones are negative.

In today's environment, we should think about how implausible things could look. Let us say with a 1 percent or so 1-year rate, the average 1-year return for cash would be 1 percent. The average 1-year return for equities would be 1 percent, which seems odd. The average 1-year return for a 10-year Treasury with a coupon over 4 percent per year would still be 1 percent, which means you have to assume that the Treasuries are going to lose money in their first year on the basis of the Treasury index, which is an odd assumption. It has to be true for risk-neutral pricing. The only difference in the three would be the volatility. The mean return has to be the same.

There is a section on how can things possibly work like that, but I will not talk to it in the interest of time. What I have done is try to put together an example of why things work the way they do based on someone who is in the option business just to trade and to set up trading partners. All he wants to do is make money on the call spread. It just demonstrates the things that have to be true, that the risk-free rate of return is the basis for all your option pricing, and therefore, for your risk-neutral scenarios. I will skip through those slides.

To get onto disadvantage two, this is the lack of statistical meaning. You have a set that in the aggregate, if you look at mean returns and mean outcomes, gives you option costs. They are not directly based on a probability distribution. Therefore the tails (or for that matter any subset of scenarios) have no statistical meaning. You cannot look at the 95th percentile or the 99th percentile and infer anything. The only inference is on the mean cost. Only the mean matters.

Disadvantage three is working at cross purposes. The risk-neutral set value securities whose value is certain to be realized at expiry. It is based, in other words, on put options, call options, futures, et cetera that are all traded and sold at issue, and then they are going to be around until they expire. Somebody is going to own them at expiry. You could sell them midterm, but somebody else is then going to own them until they are gone, and then they will either have a value or not. With these annuity guarantees that we are looking at, the value can be utilized only if the policyholder held on to the annuity product. Otherwise, they are cancelled, and there is no market for that. Even though we are using put options to calibrate our risk-neutral scenario, we are then using the scenarios to value benefits that are not the same as those put options because they can disappear on you in the middle of the projection.

Furthermore, some guarantees also have values based on policyholder utilization. We talked about that before. If that is true, it cannot possibly be true that they match anything out there in the market because all of the options in the market just are used immediately on expiry. We are kind of mixing apples and oranges. Look at our dice example, and say the 1-year rate is 1 percent. By definition my probability-weighted year-end results with my scenario set to value this annuity must come to $3.33. One way I can do that, since my real world probabilities give me $2.92 for a mean result, is to alter my scenarios.

I will take one of the two dice at random and change any five or a six that I get to a four and leave the other outcome natural. Does everyone understand what I am saying? One of them is at random, 50/50. I remove the risk premium from my distribution, essentially. If I do that insofar as the option cost and the security cost, I have a theoretically correct risk-neutral set. How does it look now? Basically what I have done by changing any six or five on one of the dice to a four, I have gotten rid of any chance of getting an 11 or a 12. I have increased my chance of getting a five or a six, and that gives me a put payoff equal to $3.33.

Are these probabilities realistic? No. Are they right? No. You know the probabilities of the possible results from rolling two dice, and these are not them. These probabilities have nothing to do with correctness in the real world. However, they are correct insofar as they produce the option cost that we are trying to replicate to. Here is the situation with policyholder behavior. Remember at midyear, the policyholder gets to see one of the dice and makes a decision either to lapse the annuity or to pay another half premium and stay until the end of the year.

Logically if he sees a six, he not be thrilled with the put option he is paying for. If he lapses he will get a nine and a half on his base annuity, and he may well lapse to get out of paying the second rider charge since it is worthless. He would love a one from the standpoint of the put (although he will not be happy about his base annuity). He will be thrilled that he bought this rider, and he will almost certainly stay around. Therefore, your intuitively built behavior assumption based on the real world will be somewhere between those two for all the other rolls on the dice.

How do we come up with an appropriate risk-neutral behavior function? Remember if there were a market for this benefit, it would come up with a price that contains some provision for lapse risk, but there is no such market. There is just a market for the put option, which is certain to last the whole year. Basically the policyholder is going to see one die and may, 50/50, see the loaded die and make a decision based on that as the bottom line. It is hard to say where you are. You as the actuary have to come up with a behavior function. Maybe it is the same one you would use for real world scenarios and maybe it is not. You have to decide what the market would do here.

Still, if we have a well-constructed risk-neutral set, it can help a great deal with guarantee costing because we can justify our answer as being observable. You know it is based on observable market costs. Maybe the behavior functions are exactly right, and maybe they are not, but maybe they are at least defensible. On the basis of those scenarios, the calculated cost is "the cost." You do not have to build in a provision for capital because this cost assumes you are hedging away all the tails, so there is no capital requirement. For any of a few reasons, the answer could be closer to the amount it cost to back the guarantee in the market than a real-world solution.

In the previous example, we could buy a $3.30 put option per policyholder. We have hedged all risk if we do that. The only risk left is that we bought too much put and now it will expire worthless, with a lot of policyholders out of the contract not paying us back for it (because they lapse). This is a risk, but it is not nearly the tail risk that we did have.

How do we manage annuity risk once we have quantified it using one of these two methods? There are a few methods out there, such as running the risk naked, minimizing the guaranteed features, and/or manipulating the characteristics of potential scenarios. Also, one can quantify the risk and control exposure. Or, one

could try to get reinsurance or conduct a hedging program of some kind, either static or dynamic.

If we run the risk naked, the object is not just to throw our hands up and say, "We don't know what to do, so we're just going to run it naked." You do something to try to control your risk levels. One possibility is to choose relatively less rich features then some of your competitors might offer. If you can do that and sell the product, that is great. In our dice example, just guarantee 12, not 21. That is a lot less rich. It will cost you a lot less, and if you can still sell the base annuity, great!

Another possibility in the dice example that is similar to something you might do in the market is limit the expensive guarantees to certain fund types or insist that the policyholder diversify to get the guarantee. You have to have some stock, some bond, some cash. That would be the same as making someone use six dice instead of two dice and pay only one times the total. The result is a lot more diverse. In the first example you can get a six, and the probability is one in 36. If you make them roll six dice, the chance of getting all six ones and ending up with the result of six is something on the order of 10 to the negative five. You can basically assume, in other words, that a six is just not going to happen.

You want to do a quantification of the risk if you are running it naked. Probably it should be real-world to get a feel for the tails. That will help you know how much you can sell before you might actually need to do something.

We talked to reinsurance on VA guarantees a little bit. Early plans bore all the risks for a basis point charge, and this is ideal risk transfer. You pay a charge, and the reinsurer covers everything: decrement risk, economic risk, it does not matter. Newer plans typically that we see right now are missing tail coverage. They will cover the first $10 million, say, of losses on a given plan, but nothing over that. That does not help you as far as capital because the tail is still there. It is just further out, which could conceivably be worse for capital.

This is as if you bought reinsurance in our dice example that covered only losses caused by rolls of four to six but left you with the three and the two. That would not help you at all as far as capital, although it would eliminate a lot of the cost. That makes reinsurance less of a solution nowadays, and part of the problem has been the market for reinsurance has reached its capacity. What market still has capacity? The capital markets!

The capital markets have been talked about already at this meeting. In terms of a hedging program, you could have a static program. Many people have done that for fixed annuities. They bought swaps and things like that, swaptions. A lot of people did this for EIAs, as well. In our example $3.30 would be a static hedge for the dice.

A static program could be infeasible for long dated options. For those, decrements

are hard to estimate. Longer options can be also relatively more expensive. More people nowadays are doing a dynamic hedging program, and I think John is going to talk to that a little bit. They try to estimate the Greeks—delta, gamma, rho, et cetera. They purchase assets, not options, but other assets with like features and try day-to-day to keep their portfolio hedged so that they are immune to big market moves. This has got to be set up using risk-neutral scenarios, but you may want to test it using a real-world setting and see how well it works for risk-based capital purposes.

Now I will talk a bit about interline hedging. This is basically another way of saying risk management through product balancing. I can show, for example, single-premium deferred annuities (SPDAs) on one hand and single-premium immediate annuities on another. No matter which way interest rates move, I can be hedged if the mix is right. For UL with secondary guarantees versus SPDAs, if rates go down, the SPDAs are happy; if rates go up, the UL is happy. You are kind of hedged. For equity risk, underhedged EIAs versus VAs, if the market goes up, the VAs are happy; if it goes down, the underhedged EIAs are happy. Again you get a hedge between product lines.

The key is to find the balance that works and make adjustments using dynamic hedging, if there are any adjustments to be made. The advantage over hedging just on the asset side is you get to keep the expected profit margins on both products if you sell both, while the tail risks are balanced away.

I will go to the EIA-VA example in terms of internal rate of return from a previous presentation. You can see that you have a problem with your VA, especially if it has death or living benefits, but selling on hedged EIAs along with that mitigates the problem quite a bit on the lower tail.

For a summary of my key points, actuaries most often measure annuity guarantee risk using either risk-neutral or real-world scenarios. The use of which depends on the situation. Each has its own advantages and disadvantages that we talked through. Having measured the risk, the actuary could attempt to mitigate it by limiting the value of the guarantee in some way, procuring effective reinsurance coverage if there is any out there, or setting up and testing a hedging program. My presentation is now over, and I will turn the mike over to John.

MR. JOHN GLYNN: I will cover two areas by commenting on the slides you see on the screen.

Before and after pricing is a headline overview of other aspects or tools that the product actuary may use to control the level of risk involved in these products.

Corporate-wide risk management and control is about first taking account of the environment in which you may find yourself pricing. More and more, we are moving toward a corporate risk management effort. Therefore, the parameters that you

price to and the reports that you make may be affected by the environment in which you find yourself. I think the terms on the slide are obvious.

Corporate strategies are strategies you might use that we refer to in varying degrees. Given the time and other factors, I am using headlines here. Some risks you can hedge. Reinsurance has been discussed at some length. The product balancing part and diversification are obvious. Securitizations are a possibility, but as Carl mentioned, they can be expensive even if available. Indemnification is also a possibility, especially if there are sister companies who can offer such indemnifications, and you can get through the other hurdles that may apply. With new business growth restrictions, I think not so much in terms of restrictions on sales but of restrictions in the availability of products under different conditions. Maybe this is a tool that you would use to mitigate the risk you take on while selling a product that you need to sell. Another category is nonlife company support for guarantees.

By the way, there is a tremendous amount of literature on the subject of risk in the past five years. As I think as Carl mentioned, my partner and I are in the process of writing a paper due about the end of the year. One of the most important parts of the paper probably will be the literature section because there is a tremendous amount of information.

Regarding management of existing blocks of business, with existing blocks of business, the question is how much flexibility do you have to change charges or benefits, and how willing are you to exercise that flexibility in the light of other factors such as relationships to marketing, policy owners, et cetera? For integration with existing blocks of business, you may have to update when you come out with a particular new option. You may have to update existing business; you may have to update existing programs and be concerned about internal rollovers of business.

There are different ways of offering benefits. Different ways of offering benefits obviously may impact the product presentation, especially from a marketing viewpoint. There may be a list or menu of choices, especially choices within a contract, for example two, or three or four years of a death benefit. You may offer benefits embedded in the contract. Offer them as a rider or in some cases as a stand-alone product. Letters of understanding are also possibilities. Contingent guarantees are an aspect of controlling the risk.

How do you structure charges? Obviously there should ideally be correlation between revenue and expense. That there is not is often a problem. For instance, in a lot of VA guarantees, where the revenues are fund-based, the expense may have no or an inverse correlation to the size of the fund. The allocation of a charge may affect how it is viewed up the corporate line. How you label it also is a matter of how it will be perceived. Timing refers to front expense end versus rear end charges, for example.

Corporate issues include ratings, reputation, et cetera. I will just go through the rest of these quickly, given the time constraints.

There are secondary markets as we are all aware. Life settlements, now annuity settlements, especially if there is a GMDB involved, are factors to consider.

Is your company playing in a level playing field? Obviously your business capacity, your market standing and your financial capacity are factors here.

My business partner believes that patenting is an important emerging issue. Tom Bakos wrote a very interesting article on this, I think about 6 months to a year ago, and you may wish to read it. Our survey indicates that 12 percent of respondents are concerned with patenting.

Tax issues obviously are always something you must be aware of in the process.

Now for our survey results. We only have begun to get the data back in the past 2 or 3 weeks, so what you see is preliminary. We have not looked closely enough at the raw data or some anomalies, so we may not be able to give you satisfactory answers. That many experienced lower profits than expected is not a big surprise.

Are companies intending to cut back on guarantees? Eighty-nine percent are not expecting to cut back on VA guarantees. I guess that means 11 percent are, which is probably of greater interest than the 89 percent who are not. Similarly, 83 percent are not expected to cut UL/VUL.

What are the future unpredictable changes? Potential reserve changes are not a surprising source of concern. This, after all, is the survey of actuaries. There is significant concern about litigation. Life settlement activities certainly would be a source of antiselection in this area.

What are the emerging trends? Fourteen percent are seeking or have patents related to the guaranteed features. This surprises me personally. It does not surprise my business partner. Twelve percent have created products, which serve as hedges to each other. I am not sure whether they have intentionally created these products or whether they just feel that the hedges work.

Thirty-four percent use reinsurance. If I understand what Doug and Carl have been saying, that is an historical phenomenon. Twenty-nine percent use offshore resources.

Forty-four percent say they hedge primarily to reduce volatility and to cap losses, and secondarily to minimize surplus and reserve requirements, which I would expect would become a larger factor in the future. Hedging to maintain ratings is given as a secondary reason.

All hedgers use delta hedging, which is dynamic hedging, and which is essentially trying to purchase futures to match the volatility of the underlying equity risk. This is similar to duration hedging on the fixed side.

Fifty-five percent hedge for rho and vega. This surprised me. I have not had a chance to look at the data to find out why. Thirty-six percent use gamma, which is sort of a secondary level of volatility risk, a second difference convexity type hedging, and usually expensive to do.

The reasons for not hedging include small size of the block and lack of resources. Possibly there are other reasons, but those are the ones given.

Most companies use more than one profit measure. I think all of us as product actuaries know we should not become too enamored of one particular profit measure.

What are the risk measures? Required capital is the primary method of measuring and allocating risk and viewing risk. Some are using value of risk or embedded value of risk.

How is risk incorporated into pricing? Most incorporate added margins to the assumptions. There's conservatism as usual. Some also set a higher capital allocation. In many cases this is a way of charging a higher price.

What about stochastic modeling? Sixty percent use models that were developed internally. Personally this surprises me, the internal development. I do not know what type of models they are, but we presumably will have a chance to give you a better background on some of this stuff when we have analyzed the data. Forty percent use outside models.

In regard to evaluations of stochastic output, conditional tail expectations, mean or variance analysis, worse-case scenario analysis and percentile distributions are how people use stochastic output. There are also some applications such as value of risk and what have you.

What are the sources for assumptions? Most use internal sources for assumptions. This is not surprising. Very few use external sources. A few companies use some external data for lapse assumptions. Again, I am not yet familiar with what these specific companies use for external sources.

MR. FRIEDRICH: Thanks, John and Doug. We have a few minutes for questions.

MR. EDWARD L. ROBBINS: Mr. Friedrich, I just want to elaborate on one of the issues that you presented. The attained age level reserve method, in other words, the migration of Guideline 37 over to UL with secondary guarantees, was not rejected on its merits. It was rejected because of its newness of the proposal. It

seemed logical to us that a variable life contract, a VUL contract that is invested in fixed funds or invested fully in the general account, has a secondary guarantee formula that is already built in, and you have a product that is virtually identical to UL with secondary guarantees with a different type of reserve requirement. Anyway, it was rejected at the time, but it is being put forth to the Universal Life Working Group that has been formed.

MR FRIEDRICH: Good point. I do understand. I did not mean to imply that the proposal did not have merit. I would agree with your assessment that the Life Health Actuarial Task Force was simply trying to address some short-term issues in that last call.

MR. HENRY B. RAMSEY: I have a question for Carl also. When you said that you think of the secondary guarantee as in the money, what does that mean? Does that mean guaranteed for life or some shorter period? I would have thought any premium payment would have left a secondary guarantee being in the money for some period of time.

MR. FRIEDRICH: The question was, what did I mean when I referenced secondary guarantees being in the money? I was discussing a particular point in time under a projection when cash values are projected to expire, but the secondary guarantee terms are still being met. That is what I call being in the money. Again, the point was that in those circumstances, it is prudent for companies to assume that the policyholders are going to take advantage of that situation and utilize that option. In other words, they should be expected to keep the coverage in force by paying that minimal premium, which typically is inadequate compared to the cost of the death benefit protection being provided at that time.

MR. CHARLES WINSTON WISEHART: I have Another question for you, Carl. One of the problems with the GMDB product was that at the time that the benefit went into the money, the premiums dropped. You had a situation where the more the benefit grew, the less money you received to offset that risk. With the UL secondary guarantee, however, it is my understanding that most product designs have a scheduled premium that continues and does not change, even if the product is in the money. It seems to me that is a less risky proposition on its face. I would like you to comment on that, but I want to say one other thing about your assumption that there are no lapses. One of the experiences of our clients has been that even though the GMDB was in the money in many cases, and maybe substantially in the money, there were substantial lapses because people just wanted to get out based on their equity values.

MR. FRIEDRICH: That is a good point, and my comment was I think it is prudent to assume that no lapses occur. That is an extreme assumption, obviously, and policyholders have a variety of reasons for different types of actions other then those implied by the mathematics of a situation. I would agree with your assessment of GMDB risk relative to UL and secondary guarantees. In addition,

there is much less of a short-term concern relative to the nature of UL long-term secondary guarantees. With respect to the question about the premium requirements, again, I would just highlight the fact that typically with most of these designs, the specified premium that is required or implied by a shadow-account structure is still a small premium compared to the true cost of the coverage being provided.

MR. ROBBINS: Just anecdotally, I would say the same thing about annuities. When people have a death benefit that is in the money, they are usually angrier about losing their fund value to get out than they are happy about having this option that is in the money. Living benefits, though, do not work that way, from what I have seen.

MR. RAMSEY: I have another question for Carl. On your slide that had the nice graph of reserves, you showed a reserve described as CRVM plus guaranteed cost. Could you elaborate on what you meant at that point by guaranteed cost?

MR. FRIEDRICH: Some of my colleagues and I put together a paper, which soon will be available, covering the topic of assessing the costs of secondary guarantees. In that paper and its embedded methodology, we analyzed the cost of some of these options, basically by examining the range of scenarios largely driven by different interest rate environments. We assessed the present value of the tail cost of secondary guarantees. We quantified situations where the secondary guarantee was in the money. In essence free or close to free coverage was being provided. All of those values were discounted back to the current duration and added to standard CRVM reserve to derive what we view as a representation of an economic type of reserve. I can provide more details to you later if you have a follow-up question.