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Equity-Indexed Annuities (EIAs): Accounting, Reserving, and Investment Strategy

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Summary: Interest in EIA products has been growing rapidly; however, guidance with respect to reserve methods and accounting treatment has been relatively limited. This interview session addresses tax, statutory, and GAAP accounting topics. Participants also will address investment strategy and cash-flow testing implications with respect to statutory reserve levels.

Mr. Edward L. Robbins: I suspect you've all heard about Equity-Indexed Annuities, how this is the hottest new product to burst on the American insurance environment in years, and that it has been referred to from time to time as "mutual fund with training wheels." This session is devoted to some of the latest developments in financial reporting for this product. Every session that I've personally attended on this topic covers more material than I can digest at a time, therefore with a tremendous attention to detail, I made a special effort to choose a highly-qualified panel. The first speaker will be Jim Greaton from Keyport Life, the premier seller of this product. Jim has been a major contributor of literature on this topic to the AAA Commitee on Life Insurance Financial Reporting. He is a member of Larry Gorski's Illinois group and a member of the AAA Task Force on Equity Indexed Products.

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By the way, the task force has produced a comprehensive paper that covers terms and conditions of various products, GAAP, statutory, and touches on taxation.

The next speaker is Joe Rafson from the Strategies and Acquisitions Division of Allstate Life. He is chairperson of Actuary of the Future Section as well. Joe indicated that one of the major problems of GAAP accounting of this product is that the terms and conditions are varied and it's difficult to come up with a coherent whole, but he's going to try.

Our last speaker is Mark Tenney, president of his own firm, Mathematical Finance. He is a guest speaker of the SOA. Mark will discuss cash-flow testing issues with a good numerical example of the results.

Mr. James P. Greaton: There is a report by the American Academy's Equity Indexed Products Task Force, and many of the topics I'm covering here are covered in more detail in that report. I'd like to encourage you, if you want to get a more detailed understanding of the reserving methods I'm going to be walking through, to get a copy of that report and read it.

For statutory accounting, which is the sole focus of my talk, for EIA, there's some basic guiding principals that we ought to be considering here. One is that we need to comply with the existing statutory requirements. Many of the investments that back equity-indexed products already have existing statutory rules. There are existing statutory rules for some of the liability features. We want to make sure that we're consistent and comply with the existing statutory requirements.

However, there are some choices that you have to make. For example, are you going to value certain assets or liabilities at book or market, or some hybrid method? Therefore, as a second guiding principal, you want to make sure that we're going to have a balance sheet that makes sense, and that those valuations are consistent with each other. In other words, you don't want to use one methodology on one side of the balance sheet and something else on the other side and end up with something that, in total, doesn't make sense. Finally, one of the guiding principals of statutory accounting is that you want to come up with a reserve basis that is reasonably conservative.

For assets, typically, you're going to back the majority of the baseline guarantee for this product with bonds. Bonds are traditionally held at book value, which is amortized cost. That starts out as what you spent for the bond, and then you're going to write it up or write it down to what you're actually going to receive as cash from it as a maturity value.

If you were to back an EIA with stocks, which you conceivably could do, the stocks would be held at market value. Most people aren't doing that because of the adverse risk-based capital (RBC) requirements. If you were to hold stock on your balance sheet to back these products, you'd have an RBC requirement of a third of the value of stocks, which would, of course, drive up your capital cost. Although it's just as valid as a hedging strategy for these products, the RBC requirements would probably kill it.

If you're going to buy either the bonds or the stocks, you're also going to have to buy some options, either to offset the fixed guarantee if you had bought stocks or the equity piece if you bought the bonds. With these options, you have a choice of how you're going to account for them. One is at market value. If you're going to do that, hopefully your liability is going to be set at market value or at one of the hybrid methods. You would also have to hold the options at market value if you elect to treat the options as if they are not hedges. If you do elect to treat the options as hedges, you may hold them at book value, which for options is amortized cost, plus changes in intrinsic value.

Some people use the full intrinsic value, but most people use a discounted intrinsic value. It might be helpful to explain what an intrinsic value is. The intrinsic value is the current value that option would be at if you could cash it in, even though it may not be exercisable for two or three years in the future. If the current value of the index is now $120 with a strike of $100, it would have an intrinsic value of $20. To discount that intrinsic value, if the strike date is a year from now, you just take that $20 and discount it back at interest for a year.

This method is not universally accepted. Some authorities say that options have to be held at market value. However, there's the new statutory codification project in the issue paper on derivative instruments in which you are allowed to account for a derivative with a method that's consistent with the item hedged, if the derivatives are used as a hedge. Therefore, if you designate these options as a hedge, and you are holding the liability at book value, you can hold the derivative at book value.

Consistent methodologies between the asset side and the liability side are important. An inconsistent valuation could distort surplus. That's something you want to avoid. It will also call into question the adequacy of the reserves themselves.

If they dip too low because of some inconsistency, you may not really be picking up the full value of what your asset has done. I view reserves as a call upon the assets. In other words, reserves are the amount of assets you will need in order to mature the obligation. Therefore, if you have a methodology that values the assets in a

certain way, you ought to be consistently valuing the liability because what you're really doing is trying to place a claim on those assets.

With that said, many of the methodologies that are proposed by the equity-indexed product task force are really a hybrid—part book and part market. They have market values embedded in them in some places, and also some book values and book value methodologies. Therefore, there's a danger that they could be inappropriate in some severe cases.

If you have a methodology that's going to take the worst-case scenario, you might end up grabbing the wrong value or getting a reserve that might be wrong since that value will be inconsistent with the asset side valuation. These hybrid methods amplify that danger.

I have asked more questions than I have given answers. The task force is really going into its second phase. In the first phase, what we called phase zero instead of phase one, we tried to come up with some approaches that were going to work in the short term while we tried to develop a final valuation approach. But there are still some open questions that the task force is trying to address. I want you to be aware of what these questions are.

First, statutory valuation should be conservative. We haven't said what level of conservatism that ought to be yet. We haven't defined how we're going to set that or how we're going to test that. But that's something that we are discussing at the moment. Asset adequacy analysis is something that Mark's going to address. The question is what tools are out there for us as actuaries to use right now, and where are the tools to do an asset adequacy analysis on this product?

Once you have the tools, what kind of scenarios are you going to test? Is it going to be some sort of New York 49? Take the 7 interest rate scenarios, overlay 7 equity appreciation scenarios on them, and you get 49 scenarios. Does that work? Do you need more than that? Do you really need a full-blown Monte Carlo-type simulation where you might be running 200 or 300 scenarios? It might be more appropriate.

The setting of persistency assumptions is going to be an issue on this product because lapses are not only driven by interest-rate scenarios and crediting rates, but also by the equity scenarios and product design. What kind of vesting schedule you have in the product, when you can lock in certain equity gains and when you cannot, and what future potential gains you can have should all drive policyholder behavior.

Finally, there are some questions about the qualifications of existing valuation actuaries to test these products. These are new products, with issues that we're not that familiar with. Will you feel comfortable that you've covered all the bases?

The task force is looking at many different issues, not just statutory accounting and statutory reserving, but those are two of the issues that we are looking at. And as I said, if you get a copy of that paper, you'll get a broad view of the many issues that we're dealing with.

One of the criterion that we set up for our initial reserving system is that we wanted it to comply with the Commissioner's Annuity Reserve Valuation Method (CARVM); thereby making it a legal reserving basis. Therefore, we tried to come up with a methodology that was CARVM-compliant. We have considered (and tentatively accepted) six different reserving methodologies. What I'm going to do now is walk you through the six different methods.

Method one is called CARVM with updated option values. This is a traditional CARVM calculation; the difference being that we're going to inject a market value of the equity option into the CARVM calculation. In order to do this, you need to know all the different possible equity options that you have granted your customer, including those upon death.

In other words, if you have a death benefit where you get the full equity appreciation piece upon death, you will need to value that option at each possible valuation date along the CARVM stream. Similarly, you could have an annuitization benefit where, after two or three durations, you could get out and annuitize and lock in the equity gains. You need to know those option values. Once you have all these option values and if you take the fixed values that you know, you're then going to do a traditional CARVM-type calculation. This method, as proposed, would be used with a market value valuation method on the asset side for the options and book value for the bonds.

Table 1 shows the calculation for one duration under this methodology. This has a seven-year point-to-point design. There are a series of option values across the top It's zero at time two because you know what the benefit is at time two. At time 3, $249.98 would be the value if you could get your equity appreciation at that point. Under this product, we're assuming that's available only upon death. And at times four, five, and six, I've shown the option values as of the valuation date, duration two.

TABLE 1
CARVM WITH UPDATED OPTION VALUES, PART 2

t=	2	3	4	5	6	7
Option Values	0.00	249.98	267.45	288.17	308.95	330.79
Guaranteed Value	954.81	983.45	1,012.96	1,043.35	1,074.65	1,106.89
Q(t)	0	0.006839	0.00729	0.007782	0.008338	0.008983
npx	1	0.993161	0.985921	0.978248	0.970092	0.961377
v	1	0.947867	0.898452	0.851614	0.807217	0.765134
Death Benefit	0	1,247.18	1,310.64	1,381.73	1,457.38	1,539.22
Surrender Benefit	954.81	983.45	1,012.96	1,043.35	1,074.65	1,539.22
PVDB (t)	0.00	8.08	8.53	9.03	9.60	10.26
PVDB	0.00	8.08	16.61	25.64	35.23	45.50
PVSB	954.81	932.18	903.87	876.02	848.61	1,142.49
PVB	954.81	940.26	920.48	901.66	883.84	1,187.98
Max (PVB)= Reserve	1,187.98					

You're also going to see the guaranteed value underneath, and that is the 90%, growing at 3% for this product. So if you were to surrender at the time two, you would get $954.81, going up to a value at time 7 of $1,106.89. Next put in some *q*'s and some *npx*'s, and a *v*, which is an interest discounting function, so that you can then calculate the value of what the death benefit would be.

In order to get that death benefit value, you're taking the $983.45 and adding to it the $249.98 increased by 1 year of interest. Remember that option value is the value as of *t* equal to two (the current valuation date). Therefore, if you want to value it as of *t* equal to three, you have to grow it with one year of interest to time three. When you add those two numbers together, you should get the $1,247.18. You do that for all death benefits, and then for all surrender benefits.

For projection dates other than the final maturity date, the reserve is just the guaranteed value. At maturity you have the option value of the $330.79, increasing, once again, with interest. Add this to the guaranteed value of $1,106.89, and that should get you your $1,539.22.

You then have to figure out the present value of the death benefit. This is the probability that you survive and then die. You need to do this for each projected duration. You can calculate the present value of the benefit you're going to receive at each possible duration. That's the preliminary discounted value (PVB) down at the bottom of Table 1. Your CARVM with updated option value result would then would be the highest of any of those six or seven values.

A word of caution. The first line shows how these option values for this product look simple. In some cases they can be calculated with a Black-Scholes method of valuation. It looks simple, but it's more complicated than you think once you get into trying to calculate one of these things. You have to know what the appropriate strike price is, and that's usually the guaranteed value. You have to know the amount of the option that you have to buy that's going to be tied to your participation rate. So it's not a straightforward calculation, but once you nail down all your assumptions, it may not be that complicated.

We probably could have done a separate session on how you get some of those option values at the top of the table, especially if you get into a more complicated product, or a product with a more complicated option design, such as a high watermark option or averaging/Asian option. In these cases, valuing the option becomes an exercise in itself.

The second methodology has been given the acronym market-value reserve methodology (MVRM). It is not a pure market value reserve methodology. As I said before, all of these methodologies have combinations of both market values and book values. Essentially, MVRM yields an interest rate that's going to reproduce the market value of the option. In other words, you're going to try to find a proxy rate that the index is assumed to grow at so that the present value of that growth is equal to the market value of the option you've given to your customer at expiration. I'm going to walk through an example so you can see what that means later.

Once you've obtained this growth rate, you're going to treat it as if the benefits it produced were guaranteed known benefits in your traditional CARVM calculation. MVRM will reset this growth rate at each valuation date. So each time you want to redo a valuation, you have to recalculate this growth rate and redo your valuation. This method, like CARVM with updated options values, is intended to be used with options on the asset side valued at market value and bonds at book value.

Let’s discuss an example of how you get the growth rate. If you just go back to my previous example, you saw that the option at the end value is $1,539.22. Our current account value is $1,198. Our growth rate calculation then takes the option value at expiration divided by the current account value. Take that to the one-fifth, minus one, and you end up with an interest rate of about 5.14%. You then would use the 5.14% in a CARVM calculation as if that was a guaranteed interest rate. You'd do all your traditional CARVM calculations, including those pertaining to Guideline XXXIII.

Please note that if it's the maturity value that's driving the CARVM calculation for CARVM with updated option values, then the reserve value under MVRM and CARVM with updated option values is going to be the same.

A third methodology that's proposed is called the option cost method. It's essentially the same as MVRM. The only difference is you're only going to calculate that growth rate once, at issue, and then you're going to lock it in and use that same growth rate at any point in the future. Once again, everything else is the same as MVRM. You're going to do the same CARVM calculation and Guideline XXXIII compliance. You're going to value your assets the same way as you would under MVRM. The only difference is you're only going to do the calculation of the growth rate once.

The fourth methodology is called the amortized option cost-based method. This is the first one that's going to use a different asset valuation basis. This is going to use the book value of the options and the book value of the bonds, where the option's book value is defined as the amortized cost of the option plus the change in intrinsic value. What this methodology does is calculate the value of that option you granted your customer up front and treat it as if it's a cost. The method then amortizes that cost, or makes you take that cost into account in your CARVM calculation in equal installments over the life of the policy. So in your CARVM calculations you have another cost or benefit that you're giving your customer that's equal to one-seventh, in this case, of the option cost at issue.

The Black-Scholes Projection Method is the next method, but I'm not going to spend much time on it because it's use is limited. The idea behind it is to calculate year by year your option cost and then amortize it over the period that you calculated it for. So it's really taking the amortized cost methodology and applying it on a year-by-year basis as opposed to the life of the product. This is intended to go with the ratchet design product where you're trying to calculate your cost annually.

The final methodology that the committee considered was called the enhanced discounted intrinsic method. It started out being the discounted intrinsic method, but we enhanced it. In this method, you set a base reserve. We'll talk about how you might set it later. You then grow that with interest, and add to that the discounted intrinsic value of the liability. It is similar to the way you're going to calculate an intrinsic value on your option on your asset side; you'd be doing the same thing on the liability side of the product, and for this methodology, you'd add it to the base reserve that you initially set up. The method is to be used with book value options and bonds. Let's run through a quick example so you get a better idea of how it works.

You first must set the initial reserve at a conservative value. Let's say you think that the market value of liability at issue would be $900. Then you would be picking an initial reserve value of, let's say, $950 (or whatever gives you a conservative margin). If your ultimate guarantee was then $1,106.89, (that's 0.9 growing at 1.03 to the seventh power) you then would solve for an interest rate that increased your $950 to that amount. So, take the $1,106.89 divided by $950, raised to the one-seventh power, subtract 1, and you get a rate of 2.21%. If Standard & Poor's (S&P) goes up 22% in the second year (I'm doing the second-year valuation again), with a participation rate of 0.9, you would calculate the discounted intrinsic value by taking your $1,000 times your 0.9 participation rate, times the 22% S&P increase, less the 11.876% (the amount of the strike price of the liability) and divide by 1.015 to the fifth power to get $69.72. You then add that to the base reserve, and the base reserve in the second year, which would be your $950 increased by the 2.21% that you calculated for 2 years. You add the $69.72 to it, and you get a reserve value of $1,062.17.

I just wanted to talk briefly about book versus market. All the reserve methods that the committee considered have elements of both. CARVM with updated option values and MVRM directly incorporate current market values into the calculation. Note that these are the market values that you sold on the liability side, not necessarily what you have invested in on the asset side. That's intentional. You want an independent calculation of the reserves from the assets.

Because both of these methodologies follow a CARVM type of an approach, these current market values, or certainly the market value of the options that you may have purchased, might not be the prime drivers of your reserve values. Therefore, you could get some noise in your calculation under certain circumstances.

The option cost-based method and amortized option cost method freezes the market valuation basis at issue, other than the current index value. Therefore, large swings in interest rates and volatility may have an impact on surplus because they're driving the valuation of the asset side. You would have to have some large swings in interest rates or volatility before you get a material impact.

The Black-Scholes projection method is designed for use with one-year ratchets. In theory, it has some of the same problems as the option cost methods. In practice, it probably won't because you're only looking at something that has a one-year option. You don’t have the large swings you'd get if you had longer term options involved.

The enhanced discounted intrinsic value method would solve some of these problems, but it creates others, such as what is that level of the initial reserve? Are

we going to leave that up to the judgment of somebody? Are we going to set it arbitrarily? It really doesn't follow a CARVM-like methodology in its calculation.

One last item. The current recommendation of the committee is that if you want to use a method other than CARVM with updated option values, you must meet five criteria. Originally, this was called the perfectly hedged criteria, but we cut this short. Having realized that no one was going to perfectly hedge this product, we came up with the criteria that met "hedged as required."

I'd like to discuss some of the criteria here. First you want the equivalence of the asset/liability options, with respect to index, averaging features, option type, strike, and term. Second, the amount of the hedge purchased at issue must be greater than some specified percentage. The intent is to allow you to assume some reasonable lapse rate (like 3%). Third, you have to have a plan for hedging the risk associated with the death benefits and surrenders. Finally, you must have a system to monitor the effectiveness of the hedge, and a stated tolerance for hedge performance.

I'm now going to turn it over to Joe, who will talk about GAAP.

Mr. Joseph M. Rafson: I'm here to talk about GAAP accounting for EIA. GAAP accounting right now is at an interesting juncture. The rules that apply to EIA are not nearly as favorable as certain underlying GAAP principles. This can leave you in a very uncomfortable position, or at least in a position where you should get agreement with your auditors as to how to apply GAAP to this product. The GAAP rules are also under revision (not necessarily with these products in mind), and that will have a profound impact on how to account for these products.

I was with KPMG as recently as a few months ago, so I have audited a number of companies who, for the most part, had recently introduced EIA. They made a lot of arguments for materiality, particularly with regard to deferred acquisition cost (DAC) amortization. Many companies had not set up DAC calculators that were adequate for this product. Later I'll get into why setting up a DAC calculator is not as simple as some of the products we're used to. But then, with EIA, nothing is as simple as it should be.

I'll be covering reserving, asset valuation, paying attention to the derivatives (since I hope we all have a good handle on how to account for bonds), GAAP hedge accounting (which is the area that is undergoing change right now), and some of the difficulties in DAC amortization.

Reserving under *Financial Accounting Standard (FAS) 97* calls for fund value. That seems easy enough. We have a problem. What's the fund value? There are a

number of ways of answering this question. One is to calculate the fund value as if today were a policy anniversary. Most products on the product only recalculate or credit interest annually. They wait until the end of the policy year and then do a calculation. But very rarely, unless you have an extremely aggressive sales force on December 31, will you have that be your valuation point.

What do you do at this interim point? One method is to value the contract as if today were an anniversary. If I sold a product at $1,000, I'm part of the way into the year, and if the market, as it's credited to the policy, is up 5%, I have $1,050 as my account value. That matches well to how we're going to be accounting for our assets. If our assets are held at market, presumably that 5% increase in the account value will be associated with an increase in the asset as well. This may also be made more interesting with regard to hedge accounting (which I'll be getting to).

Another argument can be made, that we simply don't credit interest until the end of the year. So what is the fund value? The fund value does not reset except on anniversaries. If someone dies in the middle of the year, we don't recalculate what it would be. We give them what it was at the beginning of the policy year, and that's our fund value. If that's a choice, it will have a profound impact on your DAC amortization.

One thing, also, that perhaps complicates this whole scheme is averaging. Assume a hypothetical contract that has a quarterly average. It averages based on four quarterly returns. We're in the middle of the third quarter at the valuation date. The first quarter was up 2%, and the second quarter was up 4%. So far, our average is up 3% for the first two quarters. So we could use that.

But if today's value is at 105, we could assume that 5% continues for the third quarter and the fourth quarter, and we'd average 102, 104, 105, and 105 and come up with a 4% increase. There's no clear guidance out there as to how to calculate fund value.

Emerging Issues Task Force (EITF) 86-28 is probably worth referring to, although it clearly was not written for EIA. It was written for CDs that are tied to an index. EITF 86-28 tells you not to assume any further increases in the index.

There's another problem with fund value. However you calculate fund value, you're going to have a problem if your assets are at market value. If you're buying call options, you have something called a Delta, which is the partial derivative of the price of your option with respect to movement in the underlying index. Assuming you have a perfectly matched hedge, if the index that would be credited to your policyholder goes up a dollar, the market value of your option goes up

Delta—assuming interest rates and volatility don't change. Even when an option is far in the money, the Delta value is discounted and will always be less than one.

This gives you a problem with your fund value going up faster than your option even if you're well matched. At the end of the contract period, you'll get there, but in the interim, you may have income discontinuities. This may make you want to go away from account value. The question is, are there other reserving alternatives? And the answer is, under the current rules, maybe not. Under the proposed rules, maybe. I'll get to that when I address hedge accounting.

As I mentioned, I'm assuming you know how GAAP accounts for bonds, *FAS 115* categorization, etc. For derivatives, you really have one option, and that option is market value. Under the proposed hedge accounting and rules for derivatives, you have one option and that is market value. That's the answer on your balance sheet; you may have differences on your income statement.

Under the proposed rules, there are two income statement alternatives. One would send your gains (the unrealized gains and losses on the options) through income; the other one would send them below the line to a component of equity called *other comprehensive income*. If you were sending your unrealized gains and losses to other comprehensive income, you would have to have a secondary calculation of DAC similar to having available-for-sale bonds which have unrealized gains and losses that go below the lines. Normally, the unrealized gains and losses should be going through income. That's what you want because you'll have an increase in your liability.

Let's get to hedge accounting. It was a year ago this month that the FASB released an exposure draft called "Accounting for Derivative and Similar Financial Instruments and for Hedging Activities." It's currently under revision. There was an exposure period ending last fall that generated a tremendous amount of discussion.

Last month, FASB released a 19-page document of revisions to the exposure draft. One of the items in the revisions is that the target date for implementation was pushed back a year.

It is not clear what they will be doing with the exposure draft. There was an FASB newsletter editorial last month that discussed the pros and cons of re-releasing exposure drafts, or parts of exposure drafts, or whether the FASB sometimes just wants to go its own way to release. It's not clear what the FASB will do, and I certainly wouldn't want to predict something like that.

As I mentioned earlier, there are two types of hedges that are discussed. One is a cash-flow hedge, and the other is a fair-value hedge. In either case, for the valuation of derivatives, it's very clear that market value applies.

Cash-flow hedge accounting is not something you will want for these products. It was not built for them, and the accounting can be very unfavorable for EIA because it won't affect the liability. It simply says that if you buy a derivative, the gains and losses to that derivative go to other comprehensive income. They affect equity, not earnings. When the hedged event occurs, you unwind that equity account, and realize the transaction, and the gains and losses go through income at that point. It's a very useful concept for forward purchases of equipment or a forward transaction in a foreign currency. Remember that FASB pronouncements are not specific to the insurance industry or financial services industry. Under cash-flow hedge accounting, your reserve value will rise, but the increase in the value of derivatives will not affect income. This makes the cash-flow hedge unattractive.

A fair-value hedge works differently from statutory hedge accounting, where you might adjust the asset to the way you're accounting for the liability. Under GAAP, you would adjust the liability to how you're accounting for the asset. This gets us away from fund value. You take the change in value of your derivative, which is held at market, and gains and losses go through income. An offsetting change can be reflected in your liability if you meet the hedge criteria. If the derivative I hold goes up $10, my liability associated with that derivative goes up $10.

This fits in nicely with a concept that's introduced called bifurcation. It allows the separation of a contract into its derivative component and its nonderivative component, which is perfect for an EIA. An EIA is a derivative. The pure derivative component can be looked at as the amount above the strike price of the contract.

We have a fixed portion below where a book-value treatment will apply. Above that, we have a derivative. The hedges will need to be monitored closely. Fair value hedges must meet hedging criteria, including offsetting substantially all changes in fair value. The Exposure Draft says, "Substantially all is used to indicate a maximum variance of approximately plus or minus 10% from all of an amount." So you have to be plus or minus 10% to meet the fair-value hedge criteria.

Can we include anticipated lapses in the determination of this test? For instance, if I expect 80% of my initial dollars to be around at the end of a 7-year term, can I hedge 80% of my notional amount? Can I perfectly hedge 80% of my notional amount and meet the fair-value hedge criteria? General GAAP principles would say yes, but you're going to have to monitor this.

As experience deviates from assumptions, you may have to frequently rebalance hedge positions to retain hedge accounting treatment. You're going to have to remain fairly consistent in your methodology. So, again, this is a point where you should work closely with your auditors because ultimately they have to sign off saying that you follow GAAP methodology.

The compliance test for a fair-value hedge has to be met at least every three months. If you think that you can do this at year-end when your auditors come in, think again. There's also a question as to how detailed this test has to be. If I invest in weekly buckets, do I have to meet that test for each bucket? Can I test some weeks together? I don't think any of these issues have really been addressed, but they can be very important. If you lose hedge accounting, you may have some significant negative income statement and balance sheet effects.

Let's move on to DAC amortization. Since these are *FAS 97* products, we have to build a DAC calculator with expected gross profit streams and use these to do DAC amortization. We have some elements that we haven't had with our traditional fixed annuities. For instance, we need to set an index growth rate. How do you do that? You can make an actuarial assumption, say, going up 10% a year.

Alternately, you can calculate an implicit growth rate consistent with the hedges. There's no guidance as to what the choice should be.

As for the discount rate, you should be prepared for a discount rate that swings wildly. The discount rate is set at the credited rate for the policy. At the beginning, it's simple. If I assume I have a 10% index growth rate without dividends, and I ultimately expect that 6.5% will be my expected credited rate, then that's my discount rate. That's easy at issue. What happens the next year when the market goes up 20%? Suddenly, I have a different discount rate in that year. You should be prepared for changes in your discount rate.

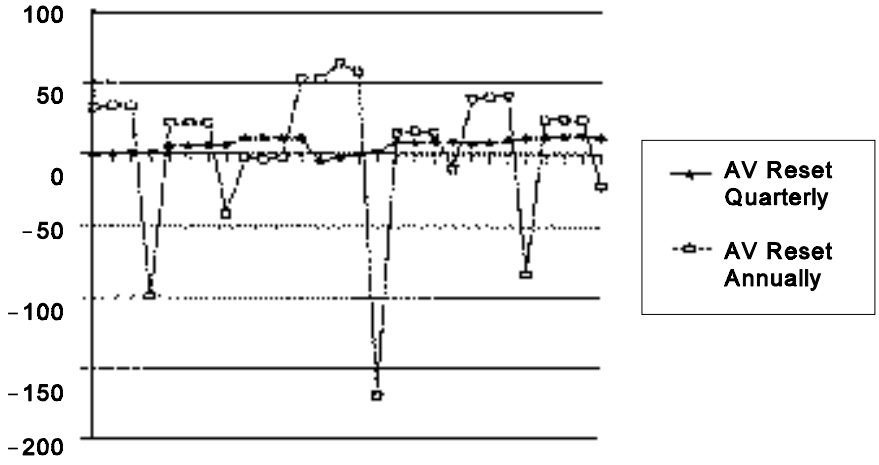
Fair-value hedge accounting will affect your estimated gross profit (EGP) streams if you apply it. The calculation of your liability will change. The interest earned for your EGP stream presents an interesting question. *FAS 97* says we credit interest on our account value. Many companies have assets invested equal to their net GAAP liability. There's a difference there, and what does that difference earn? Does it earn the rate of the fixed-income investments we have, or does it earn a blend of the derivatives and the fixed-income investments? This question remains unanswered. Also, the choice of the account value will have a profound impact on your EGP streams.

A final point. If you are applying hedge accounting or are continuously rebalancing your hedge position, you may have realized gains and losses flowing through your EGP streams. This information may have to be allocated more carefully than other capital gains and losses. You may need a more detailed calculation of EGPs. You may be hedging by week or by month and need to bring gains and losses back to the specific buckets. This can be a very practical issue.

I'd like to finish up with a graph of two sample EGP streams (Chart 1). The only difference is that one line assumes the account value resets annually while the other resets account value continuously. With the annual reset, we have strong earnings in three quarters followed by a large loss in the fourth quarter when the account value is written up. This is just a sample stream to show you how significantly accounting choices will affect your EGP streams.

Mr. Mark Tenney: I think that what we're talking about is very critical for EIA. It is a hot product, but it's also a product with a great deal of risk. Accounting methods have not yet caught up with the risk for reflecting that product, and the work that these gentlemen are doing on these committees is, I think, critical for putting the industry on a firm footing for dealing with this product.

CHART 1
SAMPLE EGP STREAMS



The remarks I'd like to make reflect not merely my own insight, but a great deal of work that has been done at Lincoln National over the last year. We've concentrated on trying to understand the risks of the product. We have actually built two cash-flow testing systems to use stochastic scenarios of both interest rates and the equity market to test the risks of various investment strategies and various different EIA product designs.

My portion of the talk concentrates on risk management applications and the cash-flow testing. What we want to get out of this is to determine the risk and the profitability, decide on what investments to make, particularly the options, decide on how much capital needs to be allocated to the product, and make a reinsurance decision. The other applications of this kind of system are pricing, the features offered, and the value to the customers. We can make the decision whether we want to be in this business or not.

Let's discuss the elements of the cash-flow testing model. I'll begin with the cash-flow model. The actual cash flows are those of the assets and liabilities, given the movements of the second element, the economic scenario generator, which is determining the behavior of the equity index, the interest rates, and so forth. The model is of our assets, our liabilities, and the proper representation of the different accounting treatments.

We also have to take into account our expenses, including commissions, income tax, and DAC tax.

The economic scenario generator is one of the key items of getting this right. In our economic scenario generator, we have to take a great deal of care that we generate scenarios that properly represent the risk of the product and allow us to determine the profitability.

In order to have a good economic scenario generator, it needs to meet some basic criteria. One, that it be arbitrage-free, which means that there are no investment strategies by which you can have zero net investment, no possibility of loss, and some possibility of gain.

The second thing we need to do is distinguish between these two different probability measures. As you deal with an investment bank, they're going to be talking about what's called the risk mutual probability measure. You're probably going to be thinking in terms of the realistic probability measure. One of the speakers commented on this issue, but did not use this terminology. Realistic probabilities are what we think will actually happen.

In the simplest case, you can think of Risk mutual incorporated risk premium as stock. We know that it's expected to return 8–10% a year. But for the purposes of the Black Scholes formula, or other more complicated formulas like it, we use the expected rate of return on the stock as the risk-free organized interest rate, so those are two very different probabilities. We use them for different purposes.

The one use of risk mutual probability is when we want to determine the price of something at time zero by generating cash flow, discounting those cash flows in each scenario with the interest rate in that scenario, averaging all the scenarios, and getting a price. That is the one and only use of this mutual probability. We use the realistic probability for everything else—determining risk and determining profitability.

So within our economic scenario generator, we're going to have to model the stock market movements and the dividend yield, as well as the yield curve. We need to properly reflect the relationship of the bond and stock market. For the stock market, we're going to need not only the index, but all these complicated variations reflecting averaging and so forth.

This for the yield curve model, what do we need yields for within this cash-flow simulation work? We need to take what our guaranteed payment is at maturity and discount that at the applicable remaining term interest rate. We might need that in some variation of a statutory reserve formula, or we might need that to get what we consider to be the market value of the liability or incentive to lapse, which is the second point.

The yield curve model is going to be generating our yield curve performance, and that's going to have a critical impact on our last model because we're going to have scenarios where a moderate fall in the stock market, together with a moderate rise in yields, triggers losses as opposed to having large movements in either one of them.

Finally, we might want to take into account some research that Dave Becker and Steve Crane have done recently on the impact of the slope of the yield curve and expected stock return. This research shows that when the yield curve is flat converted, stock markets tend to do badly. When it's deeply sloped, they tend to do well.

We need to get the proper probabilities for our scenarios in order to make the proper conclusions from our testing. We're going to get some scenarios where we have losses with this product, and we're going to have other scenarios where we have gains, so we have to know the likelihood of those scenarios. If we have

particular scenarios with a great deal of loss, and they are relatively unlikely to occur, then we're going to weigh that less than we otherwise would.

In order to get a grasp on scenario probabilities, we're trying to get to the true probabilities of events happening. We want to match the parameters of our scenario distributions to some historical averages. We want the probability that the ten-year yield, if it is above 10%, would correspond to some historical average once we project far enough down into our scenarios. In order to build this model, we can use qualitative relationships of a criterion for model selection. Those can be things like long rates and short rates that are correlated, but not perfectly. Yield curves can be inverted, and so forth.

We can also look at the frequency of yield curve inversion. That's something that Dave Becker has emphasized in his research. I'll cite that at the end of this presentation. Finally, as we work through this and as we deal with investment bankers and so forth, we have to distinguish which set of probabilities we're talking about. Or are we dealing with risk mutual probabilities? Are we dealing with realistic probabilities?

What if we focus on the traditional sort of lapse model? When people first started to look at this product, they adopted familiar ways of thinking about lapse, which was to think in terms of a table look-up, particularly in terms of an interest rate table look-up as a traditional way of looking at a fixed annuity lapse rate.

We simply say that we have a credited rate of, say, 4%, and if the competitor's rate is 5.5%, we have a higher lapse rate. With 6.5%, it's even higher. If it's below ours, then it's lower, and so forth. We can simply have a table that we look up as interest rates go higher or lower than our current credited rate. One would naturally think of adding an additional dimension for the stock market and saying, OK, now we have this matrix, and, as the stock market goes up, lapses will be less. As the stock market goes down, the lapses will increase.

The problem with such a table is, as we know, there is an incredible profusion of products and designs. This table really doesn't relate to the actual incentives of the customer to stay in or out of the product. If we use this approach, we will get customers who are in the last year or two of something like design or high watermark where they have locked in a great deal of profit because the market went up at an earlier point. Then the market goes down, and our table tells us that's how this whole lapse is, even though we know that would be very foolish because there's a great deal of incentive to remain in the product.

It may seem like I'm making that up, but, in fact, in the early stage of working with this scenario model, one would quite often get tables coming from people that would result in just this happening. This would result in enormous profitability for the product, which was completely baseless. You must have some relationship to the actual features of the product. The table look-up doesn't give you that. It also doesn't give you much difference among the products a European, a high watermark, or one of these ratchet designs. You don't get as much difference with these tables unless you do a great deal of work to try to make them intricate. But you're ultimately going to fail at that exercise.

What do we need in our lapse model? First, we must have a base lapse assumption. What's the lapse rate if markets are unchanged? This is slightly different from the issue of the market going up significantly, so there's a great incentive to remain in the product. That lapse rate, which we can call the minimum lapse rate, can be below the base lapse rate, which is point number two.

When the market falls and there is an incentive to get out, we have to accurately model the lapse rate to what it could be. The way we get at this is to value the remaining option based on the actual features of the product, look at the cash surrender value of our exercise value, and compare this with the value of waiting to maturity based on the remaining options that are embedded in the product at the rest of the payout of the instrument.

I developed, with one of my colleagues at Lincoln, what we call a rational lapse model. It incorporates many of the features that have been discussed already in terms of the statutory valuation methods that are being considered.

We might already know that we're going to get a certain payment at maturity. We take the discounted value of that using the remaining term yield to maturity. Then we calculate the value of the remaining options. We take the sum of those, and then our incentive to lapse is the cash surrender value minus the value of waiting. If the surrender value is larger than the value of waiting, we have a positive incentive to lapse. If it is less, then we have a negative incentive or an incentive to stay. Then, we say that the higher the incentive to lapse, the higher the lapse rate.

Basically, the lapse rate is increasing with the incentive to lapse, and we're going to get some sort of S-shaped curve, which we're familiar with from prepayment analysis or other lapse models. We can also think of the market value of the liability as being the maximum of the value of staying in the instrument and the cash surrender value.

With this approach to the lapse, we can now take that S-shaped curve and keep it the same across product designs. The incentive-to-lapse will then reflect the difference in those different incentive designs, and can also reflect market variables such as the volatility of the stock index because we use something like Black Scholes for the option value or crude approximations. Admittedly, they are crude approximations to some of these other complex options, and we use Black Scholes with a sort of effective volatility.

It can get to the point of reasonably reflecting the features. But then, at some point, you end up making an approximation in order to retain the flexibility of a closed form. But within that approach, you can reasonably represent the incentives to lapse with different product designs.

What do we want to do? We want to determine risk first. Then we want to determine profitability. We want to look at, certainly, the worst loss. We want to know what's the probability of the loss of initial capital. As we go through the process of setting a statutory valuation method and setting a capital requirement, we want perhaps to think in terms such as, "My capital requirement plus my statutory reserve should be sufficient such that my capital doesn't go to zero more than 4% of the time," for example.

Now we may have to have more capital come into the product as we go through. Our statutory valuation formula may lead to, in effect, negative distributed earnings over the horizon, so the parent may have to infuse more capital into this product. What's the probability of losing money? How bad can things be at the worst point in the scenario?

We might have a scenario that works out nicely in the end, but if at two years the losses are so bad that the whole product line has to be closed down and the options sold off, the fact that you might have held onto those options and held onto that product line and made a profit in the end really doesn't matter.

In terms of measures of probabilities, we can look at some traditional measures like discounted value of distributed earnings in each scenario. We take the distributed earnings at each point in time in the scenario and discount those at a constant rate. We can average those across scenarios, and we can also look at the probability distribution of the discounted value of distributed earnings. We can also think in terms of expected return on a year-by-year basis. Obviously, that's going to be variably positioned depending on where we are in the product cycle.

We also have what I call the risk mutual price, which is where we take this liability and pretend it's an asset that's traded on the Wall Street trading desk, and we price

it exactly the same way as they would using risk mutual probabilities. If that value is bigger than our cash flow, the premium less our initial cost, then we know that we're losing money and shouldn't do it.

Then we need to come up with an asset allocation. We need to decide the portion in bonds and options. We have to decide on some custom option from an investment bank. We may want to buy some puts to hedge an immediate lapse. We may want to buy calls or the custom option to hedge intermediate deaths and lapses in years one through whatever. Oftentimes, those calls can't be the same as the custom option, even though the death benefit at each point would be based on the actual features of the EIA; however complicated those might be.

In order to hedge those death benefits on a practical basis, you're not really going to be able to buy the custom option because the amount of a custom option would be so small that an investment bank won't give you a good price, or perhaps will flat-out refuse to sell it to you at all.

The drivers of the asset allocation are the lapse model, the economic scenario generator, and your risk/reward trade-off. The statutory valuation methods are going to feed into this as well because as we evaluate that risk/reward trade-off we're going to be looking at distributed earnings during the horizon and in the scenario. Those distributed earnings are going to be very sensitive to the decisions we made for accounting for both the assets and liabilities.

Let’s discuss the economic scenario generator. As we said before, we have to model both the bond market and the stock market. Volatility is key. Recently, actual experience of volatility has been rather low at 10–12%. If you look at implied volatilities to an investment bank, you're going to see 16–17%, and even as high as 20%.

One thing to bear in mind is that part of this, of course, is price gouging by investment banks. Part of it also reflects the fact that volatility changes over time, so the volatility we've experienced now may, in fact, go up significantly over the course of holding onto the product. That becomes a stochastic parameter. We might want to model the change of volatility, so to speak, or get a handle on that. That is something that I think most people haven't yet implemented. It's something to look at, particularly if you decide to do dynamic hedging as opposed to buying a custom option. And then, of course, we have the obvious interplay of scenarios and lapse models.

What assumptions hide the true risk and return? One is to assume a minimum lapse rate of 3–5% a year. Then you have to hold only 80% or less of the option. As a

consequence, it looks like you don't have so much cost and any real risk from the market going up.

Another assumption people have is that if the stock market, in fact, does do very well, the lapse rate won't fall below this base lapse of 3–5%. That I think is a very poor assumption. Products are experiencing very low lapse rates right now.

When is it rational to lapse? We might have a model that basically doesn't lapse at all. Fourth, we may have people lapsing when they shouldn't be and when they have, in fact, wonderful returns. They might, in fact, be lapsing because our model has some reservation. The market goes down 10%, peopleautomatically lapse even though they have lots of money in the product because we have one of those table lapse models.

The fifth assumption one might sound ridiculous, but there are people who look at a single scenario to evaluate a 15% ROE. I bought some options to hedge 80% of my customers, and I consider that my risk assessment. Then my profitability is a single scenario where the market goes up some 6% a year. This method ignores large losses and adverse scenarios.

Then we have this very long table which goes through the set of assumptions that you need to deal with. We have the participation rate, then expense assumptions, and finally commission assumptions. We have the amount of money we spend on the calls, puts, and interest rate caps. You see that the amount that we end up with in the corporate bond is about 65.

If nothing happens, if the markets don't move at all, and the options don't pay off, you can see that 65 or so in bonds is not going to be enough to pay off the guarantee at maturity. That's going to be a problem with this sort of product. You can't cover all your risks with your options and still cover your guaranteed minimum payout.

For this bond, there's a spread between the bond and the treasury curve reflecting or taking on some credit risk. Then we have the option volatility curve. This is what you get from your investment bank. This reflects pricing as of last fall when the dividend yield was 2.1%. Then you have your accounting assumptions, such as the federal income tax rate of 35%, required capital, and 6% DAC tax. Then you have your mortality corresponding to someone in their 50s, and some statistical assumptions relevant to the model. For the stock market we've taken an expected return of 9.2%. In sensitivity testing, that's probably one of the most important things you can test.

Let me give some conclusions. One is you are exposed to loss if the market goes up a lot and there are low lapses. You can lose money just from the stock market going up. You are exposed to loss if the market goes down and you have large lapses. There's not enough money to fund the guarantee with bonds and then buy options to pay off 100% of the customers staying through to maturity. You just cannot do that with this product.

Finally, whatever hedge you come up with, there are scenarios that are hedge huggers in which your options don't pay off. You end up losing money because you can't pay off the guarantee.

Some conclusions are that most of the design and pricing is not very profitable and can be risky. Sophisticated cash-flow testing is required. Reserves and capital have to be set rigorously. We need a rigorous lapse model and a rigorous economic scenario generator.

There's a trade-off between profitability, the marketability of the product, and the risk of market conduct coming back to bite you, which may not mean that you have an unfair product to your customers, but it may be fair given their very valuable incentive for option to lapse. It may be that they don't understand that the complex averaging that they're receiving is exactly what they're going to get.

If your agents aren't explaining that, you might have a very fine product that gives a reasonable return relative to the risk, but your customers won't understand that. When they don't understand what the market does, they're going to come back and ask why.

Mr. Stephen J. Preston: I'm vice chair of the Equity Index Task Force of the Academy. I just wanted to reiterate what some of the members said about the Academy report. I couldn't urge people enough to get a copy. That can be obtained from the Academy.

Second, I just wanted to mention that the Academy group is also starting to look at life insurance and immediate annuities of an equity-indexed nature. We're also going to be working on a practice note related to cash-flow testing and asset adequacy testing. If people have expertise in the areas of life insurance or asset adequacy testing and modeling, their services would be greatly appreciated.