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Session 62PD
ZZZ and ZZZZ Update

Track: Financial Reporting/Product Development

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Summary: This session discusses recent developments within the American Academy of Actuaries and the National Association of Insurance Commissioners with regard to reserving requirements for equity-indexed annuities and life insurance. Draft Guideline ZZZ (now Actuarial Guideline 35) covers equity-indexed annuities and has now been in-force for over a year. ZZZZ covers equity-indexed life insurance, but has not yet been adopted.

Issues addressed include:
1. *How others calculate the option values required for Commissioner's Annuity Reserve Valuation Method-Updated Market Values*
2. *Using Enhanced Discounted Intrinsic Method*
3. *Is the hedged-as-required criteria holding up?*
4. *Is this an extreme burden?*
5. *How is ZZZZ shaping up?*

Mr. James P. Greaton: This discussion is billed as an update on Actuarial Guidelines ZZZ and ZZZZ or, as I like to call it, the "sleeper session." Actuarial Guideline ZZZ is now officially Actuarial Guideline 35 and ZZZZ is now Actuarial Guideline 36. We have a panel consisting of Brian Kavanagh and Alan Downey, who are going to talk about Actuarial Guideline 35, which was the old ZZZ. Marty Goldman is going to talk about ZZZZ, which is now going to be Actuarial Guideline 36.

First up is Brian Kavanagh. Brian is the president of Integrated Actuarial Resources, a software consulting firm out of Chicago. He was on Larry Gorksi's committee that first starting looking at equity-indexed annuities (EIAs) and then on the Academy's Committee that helped develop Actuarial Guideline 35. He was the inventor of the market value reserve method (MVRM), and he's going to talk about

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implementing MVRM or the Commissioner's Annuity Reserve Valuation Method-Updated Market Value (CARVM-UMV) under Actuarial Guideline 35.

Mr. Brian Kavanagh: I will be talking about the two market value methods—UMV and MVRM methods as referred to in Actuarial Guideline 35. I'll concentrate on how the calculations are carried out to determine the reserves.

For the first time in reserve methodology a new concept has been introduced which requires valuing call options which would exactly provide payouts to cover any additional amounts needed by a company for benefits no matter where a future equity index might be.

The guideline refers to market values. However, unless a company has a small amount of EIA business, it may be impractical to base reserves on actual market values since a broker may not be prepared to quote a lot of values which would not be purchased in practice or for options where available methodology does not apply. Fair values can be computer-generated and these are used in the examples. Of course, if liabilities are determined using fair values, any assets should then be valued in a similar manner.

In UMV, a different call option value is needed for each benefit for each future policy year-end. For example, in a 7-year point-to-point design with death, surrender, and annuitization benefits, it would be necessary to determine 21 values for any valuation in the first policy year.

Each option value is accumulated to the appropriate policy year-end at the valuation interest rate and added to nonequity benefit amount specified in the policy to determine the total benefit subject to any minimum guarantees contained in the contract. CARVM is then applied to the resulting benefits.

MVRM introduces the concept of a dominant benefit or benefits, which will or most likely will be paid out or annuitized. Option values are only needed for these payouts. For example in a 7-year, point-to-point design, usually only the option value for the maturity value assuming surrender would be needed.

An index is determined for each dominant benefit, which would produce the option value accumulated at the valuation interest rate as a payout. Indexes for policy year-ends where there are no dominant benefits are obtained by assuming compound growth of the index between the index at valuation and indexes established for dominant benefits. Using the projected indexes for each policy year-end, benefits can be determined and CARVM applied.

Note that MVRM uses indexes to determine benefits while UMV adds accumulated values of call options to determine benefits.
The parameters needed for option value depend on (1) policy design, i.e., amount of a call option, exercise (strike) price, and contract period; (2) investment information, i.e., risk-free interest rates and current index level; and (3) projected information, i.e., dividends and volatility.

And if index appreciation is based on averages, the historical information is derived from the date averaging started, the frequency of sampling, e.g., the end of each month, and the average index-to-option value date

Volatility is the standard deviation of a projected distribution of index levels. If the projection is expected to be within narrow limits, the standard deviation will be low or high if the limits are wide. Historically, volatility for the Standard & Poor's (S&P) 500 index expressed as an annual percentage has been between 10% and 40%.

The manner in which the marketplace subjectively assesses volatility can have a dramatic effect on an option's value. It will fluctuate day to day and hour to hour. It will even vary by broker. There is no accepted single figure. For reserve valuation, it may be acceptable to use the volatility published by one of the major Wall Street services for the end of the date of valuation. Some companies use average volatility, but this would appear to be inconsistent with the guideline.

Determination of Exercise Price & Option Amount. The formulas are given in Table 1 but it may be more understandable to assume the index rises, say 50% over a 5-year period, and, based on policy provisions, determine what the exercise price and option amount should be. Figures are also shown assuming that the index rises 30.297%. Obviously both will give the same result. The results for the 30.297% are shown because they tie into the fifth-year cash-value results.

Note that the exercise price is not the guaranteed cash value although, depending on the policy design, it could be.

TABLE 1
EQUITY INDEXED ANNUITIES
MARKET VALUE METHODS

Determination of Strike Price and Option Purchase Amount		
Index at issue	1,000	
At end of policy year	5	5
Index at End of Five Years	1,500.00	1,302.97
Vested Participation Rate	45.00%	45.00%
Surrender Charge	3.00%	3.00%
100% of Appreciation	500.00	302.97
Participation	225.00	136.33
Equity Account Value	1225.00	1136.33
Surrender Charge	36.75	34.09
Equity Surrender Value	1,188.25	1,102.24
Guar. CV=.900*1.03^5	1,043.35	1,043.35
Required Equity Addition	144.90	58.90
Option Purchase Amount	43.65%	43.65%
Required Equity Appreciation	331.97	134.93
Strike Price	1,168.03	1,168.03

CARVM-UMV Death Benefits. Based on the participation rates for the death benefit, the purchase amount is 70% of an option, which would pay 100% of the appreciation. The options values are accumulated by the valuation rates and added to the guaranteed value specified in the policy, i.e., the premium consideration. The present values are obtained by discounting for mortality and the valuation interest rate.

CARVM-UMV Cash Values. The participation rates vary by policy year. The guaranteed values are 90% of the premium consideration accumulated at 3%.

Note that the fair values are different from those used for death benefits because they are based on different exercise prices and purchase amounts according to the policy provisions which vary depending on the benefit.

CARVM-UMV Annuitization Benefits. The guaranteed annuitization rate is the consideration accumulated at 3%. It is assumed that the present value of the annuity payments is 91% of the amount used to purchase the annuity.

CARVM-UMV Reserve. Under CARVM, the reserves are the highest present value of all scenarios.

MVRM Cash Values, The full seventh-year fair value is accumulated at the valuation interest rate to determine the addition to the exercise price to arrive at the index at the end of policy year seven. The maturity value is assumed to be the dominant benefit. If, however, there was a very good annuitization option and the company projected a large percentage using this option, it could be the dominant benefit.

Also note that the full seventh-year fair value is used to determine the index.

MVRM: Projected Benefits. Based on the projected index assuming compound growth, the benefits are determined according to the policy provisions.

Note that the fifth-year cash value and index tie into the figures given in the determination of exercise price and option amount.

MVRM: Present Value of Benefits. The present values of the annuity payments at time of annuitizations are assumed to be 91% of the amount available for annuitizations.

MVRM: Reserves. Note that the reserves of 931.21 are close to the UMV reserve of 931.63. However, the reserves for the first-year benefits are 893.79 (in practice many companies would hold the surrender value of 900 at issue) compared to 921.58 in UMV.

In conclusion, (1) The MVRM is less dependent on volatility and produces a more even profit emergence; (2) Under UMV, favorable annuitization rates can produce significantly higher reserves in the policy year-end after valuation; (3).A lot more option values are needed for UMV; (4) MVRM can be used for design where UMV

cannot readily be used, such as annual ratchet or payout annuities. This is due to limitations in the available methodologies for determining values. Since MVRM projects indexes, a projected index can be used for subsequent policy years to determine option values, which depend on future indexes as a starting point; (4) In situations where policy provisions do not fit into available option pricing methodology, MVRM can use the closest fit and determine indexes. The actual policy provisions can then be applied using these indexes; and (5) Which market value method is the better to use? My advice would be to use MVRM, if you can. In certain situations, you may have to use the UMV based on your interpretation of the guideline.

Mr. Greaton: Thank you, Brian. Our next topic is EDIM, the third reserve methodology mentioned in the actuarial guideline. It's the book-value method that requires you to sign up for "hedged-as-required."

Our person to address this topic is Alan Downey. Alan is the assistant vice president and valuation actuary at Keyport Life Insurance Company, a company I'm somewhat familiar with. Alan has done a number of presentations on Actuarial Guideline 35, and on EDIM in particular.

Mr. Alan R. Downey: I've been asked to discuss the general mechanics and practical implementation issues of the EDIM. I've arranged my comments into four main sections.

First, I'm going to give a very brief overview of the EDIM method. Next, I'll describe the EDIM reserve calculation, using a very simplified example. After that, I'll spend some time discussing the various issues and aspects pertaining to the hedged-as-required criteria. And, finally, I'll briefly summarize and touch upon a few considerations in deciding whether to use the EDIM method or perhaps one of the market value methods.

EDIM is a book-value accounting method, or Type One method as specified in Actuarial Guideline 35. However, the use of one of the market value methods, or one of the so-called Type 2 methods, which Brian described earlier, is required to derive the initial reserve or the so-called fixed component of EDIM at issue.

The hedged-as-required criteria specified in the guidelines must be met in order to use the EDIM method. In addition, the valuation actuary must certify that the hedged-as-required criteria are, in fact, being met, and that the assumptions utilized for the market value method that's being used to derive the initial reserve are, in fact, reasonable.

The reserve calculation consists of two components: a fixed component and an equity component. The two are summed to produce the reserve. The fixed component calculation involves four steps.

First, it involves the derivation of the initial reserve, which is calculated using one of the market value methods—either CARVM-UMV or the MVRM method.

The second step is the derivation of the fixed component at the end of the term, based on the floor of the benefit being hedged. Then, the internal rate of return (IRR) is derived, which gets you from the initial reserve to the reserve or the fixed component at the end of the term.

Then, finally, the calculation of the fixed component on the valuation date is presented in formula form both in terms of retrospective and prospective.

The equity component involves the derivation of the intrinsic value of the liability call options on the valuation date, assuming that the equity index does not change for the remainder of the policy term.

The intrinsic value has been discounted at the statutory valuation rate as defined in the standard valuation law from the end of the term back to the valuation date.

I put together a sample calculation of the EDIM reserve for a five-year point-to-point design. Withdrawals of any kind are not permitted before the end of the term, so this is a very simple design that hopefully drives home the general basics of the EDIM calculation.

The assumptions pertain to the in-force valuation and participation rates and the equity index level. I'm not going to spend much time on that. The first step is to calculate the fixed component at issue using CARVM-UMV, and I've made this a very simple CARVM-UMV calculation.

Step one involves the calculation of a fixed component using CARVM-UMV. You can also use the MVRM method as well.

Under CARVM-UMV, I've derived the option value at issue and projected it forward at the valuation rate to the end of the term. The fixed component at the end of the term is then added to, in this case, the projected guaranteed value at the end of the term. Then the sum of the two items is discounted back to issue to derive the initial reserve, or the fixed component at issue.

The second step involves the calculation of the IRR and the derivation of the fixed component as of the valuation date.

The third step involves the derivation of the strike index. This index is based on the floor guarantee.

The intrinsic value in the liability option is then calculated on the valuation date, and assuming that the index remains constant from the valuation date on, you would have the same intrinsic value at the end of the term.

Finally, this end-of-term intrinsic value is discounted to the valuation date to derive the equity component. The final step simply combines the fixed component and the equity component to derive the EDIM reserve on the valuation date.

I'd like to move on to the hedged-as-required criteria. There are two sets of criteria. First, the basic criteria, which essentially requires exact or nearly exact hedging. The second criteria apply to optional replication, which permits dynamic hedging of an aggregation of policyholder liabilities.

Guideline 35 specifies 5 basic criteria. The equivalence of the asset and liability option characteristics is the first criteria.

The second Actuarial Guideline 35 criterion is that at or near issue, the hedge that is purchased exceeds the account value times a specified percentage, which permits an assumption of up to 3% per year of elective benefit decrements. Although it's not specified in the guideline, my interpretation is that the account value should also be multiplied by the participation rate in order to reflect the proper hedge.

The other three criteria are that the company must have a specific plan for hedging various decrement risks. You must also have a system for monitoring the effectiveness of the hedge. And, finally, a stated maximum tolerance must be established by the company in terms of comparison between the actual and the expected performance of the hedge.

The options replication criteria are similar in structure to the basic criteria, with the wording changed, essentially, to reflect a dynamic total portfolio hedging strategy.

The other main difference between the basic and optional replication criteria pertains to the requirement of a compliance evaluation test, in addition to the stated maximum tolerance test, which the company defines on its own. This compliance evaluation test is a retrospective correlation test, which is performed quarterly using data no less frequently than weekly.

The dollar difference in the change of the market value of the asset options, less the corresponding change in the liability options, may not exceed 10% of the beginning of the quarter market value of the liability options.

It's my interpretation that this test is really meant to be applied in cases where there's an underhedge, and that underhedge is getting worse, or greater, depending on which way you want to look at it over time.

The guideline really doesn't make a statement, however, in terms of whether this underhedge is becoming more or less significant.

The additional reporting requirements that are mandated if the compliance evaluation test percentage exceeds 10% are as follows: If it exceeds 10% more than once in a quarter, then the commissioners in all states in which a company is licensed need to be notified, and the EDIM reserve needs to be disclosed. If this difference exceeds 25% at any time during the quarter, then the company, in addition to the notification process, must also disclose what the CARVM-UMV reserve would be. And then, finally, if this difference exceeds 35% at any time

during the quarter, the company is now deemed to be out of compliance with the hedged-as-required criteria.

If a company is out of compliance with hedged-as-required, the company has one quarter to correct the situation. If it's not corrected, the company is then mandated by the guideline to revert to one of the market value methods.

I've made a statement here regarding the revaluation of assets not being required by the guideline. In fact, I think that statement is not correct. If you literally read the guideline, there is a section regarding the reasonableness and consistency of assumptions that the appointed actuary must certify.

And if you read that particular section of the guideline, it essentially mandates that if you go to a Type 2 method that, for all intents and purposes, you must value the assets at market.

Guideline 35 is essentially silent about failure if the change difference is less than 35%. However, I think the guideline implies that you are out of compliance if your internal tolerance isn't met, depending upon what you define as that internal tolerance.

I've prepared a brief illustration of the compliance evaluation test. It's not specifically stated here, but I'm using the same five-year point-to-point design that I described earlier. These particular assumptions are the valuation and economic assumptions.

- Additional reporting requirements if difference >10%
- If >10% twice in one quarter
  Must notify all Commissioners
  Must disclose EDIM reserve on liabilities hedged
- If >25% at any time during quarter
  Also must disclose CARVM-UMV reserve
- If >35% at any time during quarter
  All of the above, and deemed out of compliance

- If out of compliance, have one quarter to correct
- If not corrected, must revert to Type 2 (MV) method
- Presumably should revalue asset options to MV, but not required
- AG 35 silent about "failure" if change difference <35%
- Out of compliance if internal tolerance not met

This is the asset option portfolio. I'm assuming that all of the options being purchased are 4-year European options with a notional amount of $4,250.00. Note here that the length of call options is actually a year shorter than that of the liability option.

Here are the in-force assumptions with respect to the liabilities. And you'll note that the notional amounts are equivalent to that of the asset portfolio.

Sample Illustrations: Option Replication Assumptions

- **Valuation Assumptions**
  Initial Valuation Date: 12/31/1999
  Effective Annual Yield Curve: 4.50% + .0075 x $t^{.3}$
  Option Valuation Method: Black-Scholes-Merton
  Implied Dividend Yield (continuous): 2.50%
  Implied Volatility (continuous): 16.00%
- **Initial Asset Option Portfolio**
  Call Options Purchased: 4 year European
  Notional Amount: 4,250.00
  Strike Index: 1,366.29
  Strike Index to exactly hedge liability: 1,366.29
- **Inforce Assumptions - Liabilities**
  Number of Policies : 5
  Premium per policy: 1,000.00
  Notional Amount: 4,250.00

I present two cases for comparison. The first case values the asset and liability options based on the assumptions I've just described. And in the second case, the asset option actually shortens to one year, and implied volatility bumps from 16–31% halfway through the first reporting quarter. It then bumps up again another 20% halfway through the second reporting quarter.

Case 1

Valuation Date	Asset Option Value	Liability Option Value	Change in Difference	Diff From Beg of Qtr	% Change From Beg of Qtr
12/31/1999	520,816	598,430	(77,614)		
01/07/2000	519,347	597,121	(77,774)	160	0.03%
01/14/2000	517,624	595,583	(77,959)	345	0.06%
01/21/2000	515,897	594,043	(78,145)	531	0.09%
01/28/2000	514,173	592,507	(78,334)	720	0.12%
02/04/2000	512,685	591,180	(78,494)	880	0.15%
02/11/2000	510,948	589,631	(78,683)	1,069	0.18%
02/18/2000	509,207	588,079	(78,872)	1,258	0.21%
02/25/2000	507,462	586,525	(79,063)	1,448	0.24%
03/03/2000	505,459	584,740	(79,280)	1,666	0.28%
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Valuation Date	Asset Option Value	Liability Option Value	Change in Difference	Diff From Beg of Qtr	% Change From Beg of Qtr
03/31/2000	498,420	578,473	(80,053)		
04/07/2000	496,903	577,123	(80,220)	167	0.03%
04/14/2000	495,132	575,549	(80,417)	364	0.06%
04/21/2000	493,351	573,964	(80,613)	560	0.10%
04/28/2000	491,567	572,376	(80,810)	757	0.13%
05/05/2000	489,784	570,793	(81,009)	956	0.17%
05/12/2000	487,991	569,199	(81,208)	1,155	0.20%
05/19/2000	486,195	567,602	(81,408)	1,355	0.23%
05/26/2000	484,394	566,003	(81,608)	1,556	0.27%
06/02/2000	482,851	564,633	(81,782)	1,730	0.30%
06/09/2000	481,043	563,028	(81,985)	1,932	0.33%
06/16/2000	479,231	561,420	(82,189)	2,136	0.37%
06/23/2000	477,410	559,802	(82,392)	2,339	0.41%
06/30/2000	475,332	557,960	(82,628)	2,575	0.45%

Case 1 Continued

Valuation Date	Asset Option Value	Liability Option Value	Change in Difference	Diff From Beg of Qtr	% Change From Beg of Qtr
09/30/2003	53,853	218,172	(164,319)		
10/07/2003	50,050	215,819	(165,769)	1,450	0.67%
10/14/2003	45,535	213,054	(167,519)	3,199	1.48%
10/21/2003	40,935	210,267	(169,331)	5,012	2.32%
10/28/2003	36,248	207,455	(171,207)	6,888	3.19%
11/04/2003	32,161	205,024	(172,862)	8,543	3.96%
11/11/2003	27,319	202,159	(174,840)	10,521	4.87%
11/19/2003	21,705	199,215	(177,510)	13,191	6.11%
11/26/2003	16,759	196,268	(179,509)	15,190	7.04%
12/03/2003	11,860	193,269	(181,409)	17,090	7.92%
12/10/2003	7,167	190,196	(183,029)	18,710	8.67%
12/17/2003	3,051	187,010	(183,959)	19,639	9.10%
12/24/2003	391	183,591	(183,200)	18,881	8.75%
12/31/2003	0	177,383	(177,383)	13,064	6.05%

Case 2

Valuation Date	Asset Option Value	Liability Option Value	Change in Difference	Diff From Beg of Qtr	% Change From Beg of Qtr
12/31/1999	187,775	570,157	(382,382)		
01/07/2000	185,279	568,757	(383,478)	1,096	0.19%
01/14/2000	182,349	567,121	(384,772)	2,390	0.42%
01/21/2000	179,398	565,476	(386,078)	3,696	0.65%
01/28/2000	176,428	563,830	(387,402)	5,020	0.88%
02/04/2000	173,865	562,409	(388,545)	6,163	1.08%
02/11/2000	170,854	560,746	(389,892)	7,510	1.32%
02/18/2000	364,826	947,057	(582,231)	199,849	35.05%
02/25/2000	359,623	945,061	(585,438)	203,056	35.61%
03/03/2000	353,607	942,766	(589,159)	206,777	36.27%
03/10/2000	348,282	940,755	(592,473)	210,091	36.85%
03/17/2000	342,895	938,727	(595,832)	213,450	37.44%
03/24/2000	337,446	936,689	(599,243)	216,861	38.04%
03/31/2000	331,932	934,646	(602,713)	220,331	38.64%

Case 2 Continued

Valuation Date	Asset Option Value	Liability Option Value	Difference	Change in Diff From Beg of Qtr	% Change From Beg of Qtr
03/31/2000	331,932	934,646	(602,713)		
04/07/2000	327,153	932,884	(605,731)	3,018	0.32%
04/14/2000	321,513	930,820	(609,308)	6,595	0.71%
04/21/2000	315,801	928,747	(612,946)	10,233	1.10%
04/28/2000	310,013	926,656	(616,643)	13,930	1.49%
05/05/2000	304,150	924,562	(620,412)	17,699	1.90%
05/12/2000	298,206	922,457	(624,251)	21,538	2.31%
05/19/2000	514,591	1,402,490	(887,899)	285,186	30.57%
05/26/2000	505,110	1,399,986	(894,875)	292,162	31.32%
06/02/2000	496,856	1,397,826	(900,970)	298,256	31.97%
06/09/2000	487,071	1,395,296	(908,225)	305,512	32.75%
06/16/2000	477,108	1,392,743	(915,635)	312,922	33.54%
06/23/2000	466,961	1,390,181	(923,220)	320,507	34.36%
06/30/2000	455,125	1,387,229	(932,104)	329,390	35.31%

Admittedly rather extreme assumptions, but I think it illustrates the point that if you're not properly hedged, you can end up in a situation where you're not hedged-as-required fairly quickly.

For the first quarter the percentage change is very small for the entire quarter, not even anywhere near approaching 10%. But note that the assets are somewhat underhedging the liabilities because they're shorter.

In the second quarter there is essentially no change—very much like the first quarter. Now we go out to the end of four years, and note that the asset options are about to expire but the liability options are still there.

There's still one year remaining in the liability options. The percentage change in the difference is still less than 10%, which means that under the compliance evaluation test standard you're still hedged-as-required.

However, on December 31, your asset options have all expired, and at that point you don't have a hedge. So you're not hedged-as-required at that point in time.

This is case two, where I essentially shorten the asset option to one year and then bump volatility. The percentage change at the point where volatility is bumped up is quite large, and in this particular scenario the hedged-as-required criterion

compliance evaluation test has failed and the company would not be hedged-as-required.
This is just the extension to the next quarter, and at the end of the second quarter the 35% level has been exceeded. This company now has had 2 consecutive periods where the 35% level has been exceeded. Under the guideline, this company would be required at this point to convert to one of the market value methods.

I'd like to discuss various issues regarding the hedged-as-required criteria. Are they holding up? In some regards, it may be too early to tell. But there are some criteria that leave room for interpretation.

One thing I mentioned earlier is that the notional amount comparisons should incorporate the participation rate in the calculation of the account value under the second criteria.

Also, failure is not clearly defined in all of the hedged-as-required criteria. It is defined in the case where the compliance evaluation test exceeds that 35% level, but otherwise it's really not totally clear as to whether or not you may fail the hedged-as-required criteria.

Also, the compliance evaluation test probably should consider a widening under the hedge as opposed to only a narrowing.

Are the hedged-as-required criteria an extreme burden? Yes, there's some administrative hassle, but for the most part you should already have systems in place to monitor the hedging of the asset and liability portfolios.

You may need some modification to the system to produce the required test, and if you don't have the framework for these systems in place, you're probably not going to be able to state that you're hedged-as-required anyway.

If your equity index in-force is immaterial to the business that you have, maybe it's not worth the hassle to go through the particular requirements of the EDIM; perhaps you may want to use a market value method instead.

In summary, the EDIM calculation is simpler than the two market value calculations, but you still do need to perform a market value method calculation to derive the initial reserve. Hedged-as-required clearly adds complexity to the EDIM calculations and requirements.

But much of that infrastructure required to perform the necessary tasks to meet the hedged-as-required criteria should already be in place in order to actually hedge the liabilities. I think in choosing a valuation method you'll want to consider issues such as the materiality of your equity-indexed block to your total in-force.

In terms of monitoring the hedge, do you have the ability to meet the hedged-as-required criteria?

Mr. Greaton: Thanks, Alan. Our final speaker today is Martin Goldman. He's a Director and actuary with American General Life Insurance Company in Texas. Prior to joining American General, he taught math at Rice University and The City College of New York, and he's been involved with equity-indexed life since 1996 starting with the development of his company's product. He also worked as the cochairman of the Academy's Working Group on Actuarial Guideline ZZZZ. He's going to talk about ZZZZ.

Mr. Martin E. Goldman: I'd like everybody to clear their minds for a moment and forget everything you know about annuities, because this is not about annuities. Equity-indexed universal life (UL) is a much simpler product.

I'm going to talk about what the typical product looks like. The first product came to market at the end of 1996. There are only somewhere between five and ten companies selling it. It has become a fairly significant portion of American General's nonvariable UL sales.

These products look like typical flexible premium UL policies. The guaranteed rate is a little bit lower, 3% in the example I will use, and gets credited monthly during the policy year. Indexed interest is credited at the end of each policy year.

A participation rate is set at the beginning of each year; in this example it is 50%. Indexed interest in this case would be 50% of the S&P index percentage increase for the year less the 3% guaranteed rate, floored at zero.

Some policies have a guaranteed minimum participation rate for the whole life of the policy. Some states are requiring some small minimum—usually 10–20% is used.

Most of the premium goes into bonds backing the 3% guarantee. Indexed interest is hedged with S&P 500 call options.

Products on the market have participation rates anywhere between 35% and 85%. Of course, the participation rate offered depends on what the current option costs and bond yields are and very much on what products loads are, and what the indexed interest formula is—i.e. point-to-point or averaging.

Different from the annuities, under the life insurance model illustration regulation we need to give policyholders illustrations. What do you use as your illustration rate?

What most companies are doing is looking at the last 20 years of the index performance and figuring out what the average indexed interest rate would have been over those 20 years if the current participation rate had been in effect the entire period. That's coming out usually somewhere between 7% and 9% nowadays.

Continuing the example, with 50% participation rate and 3% guarantee, the indexed interest drops to zero when the index increase is less than 6%.

So I need to buy a one-year S&P call option with a strike price 6% above the current S&P value. The cost of those options in May was 8.6% of the notional amount, i.e., the amount of what you're getting full S&P experience on. Because I have a 50% participation rate, I'm going to be spending 4.3% of my indexed account value.

The cost to the company, if I want to put this on the same basis as a credited interest rate on a regular UL, is the 3% guarantee plus the 4.3% option cost, accumulated to the end of the year—i.e., 4.6%, to express it as an interest rate. That gives me a total of 7.6%.

So what I can say is that the economics of this product are just as if I had regular UL and was crediting 7.6%. In ZZZZ we call that 7.6% the implied guaranteed rate. If 7.6% is a little more than you're crediting on your regular UL product, you might want to drop the participation rate to 45%. In May that would have given an implied guaranteed rate of 7%.

Assuming we have a renewal participation rate guarantee of 20%, indexed interest will drop to zero when the indexed increase is less than 15% (20% of 15% is 3%).

So if I wanted to hedge one year of this renewal guarantee, I would buy a 1-year call option, strike price 15% above current S&P value.

But nobody's going to sell you a hedge for your 20% participation rate guarantee for the next 80 years on future premium that hasn't come in yet and whose amount isn't known. By looking at a one-year option we're just trying to put some value on the guarantee.

Suppose that option cost is 4.6% of the notional amount. 20% of that is 0.9% of my account value. My implied guaranteed rate is the 3% guarantee, plus the 0.9% accumulated to the end of the year, which gives me a total of 4%. So guaranteeing a 20% renewal participation rate has the same value as guaranteeing a 4% renewal interest rate.

If 4% gets you uncomfortable, i.e. if you only have a long-term guarantee on your regular UL of 3.5%, you'd want to drop your renewal participation rate down to 15% or even 10% because you don't know what future implied volatilities are going to be.

Volatilities have spiked up quite a lot from when we first started issuing this product.

The illustrated rate, looking back 20 years, is 8.4%. If I look back 30 years, it would come out to about 7.6%, and if I went back 40 years, it would look more like 7%.

I like to think of this rate as an expected return for the next year. If you believe that the probability distribution of next year's S&P performance can be obtained from its behavior over the last 20 years, then with the current participation rate this gives you an expected value for next year.

ZZZZ as a reserving method was approved by the NAIC Life and Health Actuarial Task Force in March. It's scheduled for final approval by the NAIC next week at a conference call. It will be effective December 31 at the end of this year for all policies in-force.

As we go through ZZZZ, bear in mind the difference between UL and annuities. We're dealing with the Commissioner's Reserve Valuation Method (CRVM), not CARVM. We're dealing with UL model regulation reserves. All the task force had to do for this guideline was replace guaranteed rates by implied guaranteed rates when you project in the UL model reserve regulation to get future benefits. We just had to figure out the right way to calculate implied guaranteed rates.

The first year or the current year implied guaranteed rate in the example I gave you was 7.6%, and the renewal year implied guaranteed rate was 4%. You just plug this into your model UL reserve calculator and you're done.

Well, not quite so simple. We came up with three methods. We have a Type 1 method, the implied guaranteed rate method, which is book value. It was designed for the current products now on the market. Plug it right into your valuation system. It results in very stable reserves.

The updated market value method, Type 2, is provided for more aggressive policies that might be coming out. We didn't know what they were going to look like, but we had to provide a reserve method for them.

The Type 2 method is responsive to market value changes, particularly option cost changes.

We also came up with an interesting Type 2a hybrid method, which is the updated average market value.

Let's look at the Type 1, book-value method. To qualify for this you need an indexed interest-crediting term of not more than one year. (We wanted the option cost to be a fairly small portion of the total investment.) Also, the renewal implied guaranteed rate has to be less than or equal to the maximum valuation rate. This criterion assures a not too significant future guarantee.

In the example, the renewal implied guaranteed rate was 4%, which is less than the maximum valuation rate of 4.5%. The final requirement was hedged-as-required for the current one-year term. Hedged-as-required has the same meaning as in ZZZ for annuities, i.e., a very nice match.

At issue, determine your guaranteed maturity premium, guaranteed maturity fund, and net premiums. For the initial term, use the implied guaranteed rate, calculated using the option cost at issue, just as I calculated 7.6% in the example for a policy issued in May 2000.

The renewal implied guaranteed rate will be used for the next 80 years (for a 20-year-old), so you don't necessarily want to use a value just based on issue date option costs. Also, unless the renewal guarantee is significant you're not actually going to be hedging it. So you don't want something that was affected just by what Alan Greenspan had said the day before.

To put a value on the renewal guarantee, we used the option cost for a one-year term (assuming the interest-crediting period is one year) and took an average cost over the last five calendar years prior to the issue year.

The average cost was determined using the Black-Scholes formula, with the implied volatility, dividend rate, and risk-free rate each averaged over the previous five years. The average implied volatility is to be obtained by taking the actual volatility of the index and adding 3% to it. (We noticed that implied volatilities for the S&P 500, looking back historically, tended to run about 3% higher than actual volatilites.)

Using this five-year average gives a lower result than the 4% in the example, which was calculated using May's high volatilities. A five-year average would have come out to about 3.5%. The average actual volatility over that period was about 15%—plus 3% gives 18% implied volatility. This compares to the 25% implied volatilities you're seeing today.

At the valuation date, to get the implied guaranteed rate for the current term, go back to the start of that term, the point at which you should have purchased the option for the current term, and derive the implied guaranteed rate the same way I did the 7.6%.

Then for renewal terms, just stick with the option cost you determined at issue. Because again, the value of that future guarantee is pretty small, so you don't have to update it to current market value. It's just like guaranteeing something less than the maximum valuation rate on your regular UL policies.

Type 1 is an easy method that fits right into your systems. It's the same as if you had regular UL, but you were guaranteeing the current rate at the beginning of each policy year.

Now let's take the Type 2 updated average market value method. You have to use this if you have significant long-term participation rate guarantees, i.e., if you have an indexed interest-crediting term greater than one year, or if the renewal participation rate guarantee gives an implied guaranteed rate greater than the maximum valuation rate. (This would be equivalent to giving your UL policy a lifetime guarantee of 5%. It would be pretty aggressive.)

Everything in this method (relating to indexed interest) is done at current market. At issue, your initial term option cost is determined at market. Your renewal term option cost is determined at market. At the valuation date, you bring in the actual option cost for the remainder of the current term and add it into your fund value as you project forward. For renewal terms, you recalculate the value of the renewal guarantee using one-year option on the valuation date. If your renewal guarantee is at a fairly high rate this will cause your reserves to fluctuate significantly. (In UL, it's the ultimate guarantees that really determine your reserve.)

So this method is very volatile on the upside. The downside has certain limits. There were some floors that we put in the method so your reserves can't go too far down if the option costs go down. (Otherwise, in theory you could end up with zero reserves.)

The idea behind the Type 2 method was to force a prudent company to hedge any significant guarantees it made.

The Type 2a Updated Average Market Value (UAMV) Method is a hybrid of the other two methods. It was designed for a company that qualified for the Type 1 method, i.e., a one-year participation rate guarantee and a renewal guarantee worth less than the maximum valuation rate, but one that didn't want to fully hedge. In other words, maybe you only want to partially hedge and let the company take some risk.

It only applies to the more conservative current policies—terms not more than one year and renewal implied guarantees less than or equal to the maximum valuation rate—but you don't have the hedge-as-required. The main feature of this method is that for the current term you must value your options at market (because you're not hedged-as-required).

Let me just skip to the valuation day reserves. The reason it's a hybrid method is that the remainder of your current term option cost is at market. Also your renewal term option costs do get revalued, but they get revalued very slowly. You revalue them using an average over the five years prior to the year of the valuation date. So they will be somewhat responsive to changing option cost conditions, but very slowly.

To summarize, the Type 1 book-value method was designed for the current products now on the market.

We didn't know what the future products would look like, but we felt we had to put something in place for them. If these products come out differently than expected, there probably needs to be a modification, particularly in putting a value on renewal period guarantees.

If some companies figure out how they can hedge lifetime renewal period guarantees and come out with more aggressive ones, it may be that the way ZZZZ

is valuing those future guarantees will have to change so as to reflect the new hedging techniques.

Mr. Greaton: Thanks, Marty. We now have some time for some questions.

From the Floor: Two questions. Number one, you mentioned that you obtain the fair value for the option from a broker. For a point-to-point option what is the implied volatility for seven-year call option versus the volatility for a one- or two-year call option?

The other question is, what is the RBC for EIAs and their associated options?

Mr. Downey: I'll comment a little on this because we go out seven years on one particular design. We go to a specialized broker who gives us a volatility curve that goes out through five years and then we grade it up to make it a nice smooth curve through the seven-year point, so we think we're consistent in valuing a seven-year option.

So yes, you don't really observe it in the marketplace, but there are places where you can get longer-term option quotes. It might not be all the way out to seven years, but you can imply them from there.

With respect to your RBC question, are you thinking more on the asset side, or the liability side, or both?

From the Floor: Both.

Mr. Downey: Both. I'm probably less familiar with the asset side. In terms of the liability side, we generally place all of our liabilities into the medium risk category.

Obviously, if you have an implied surrender charge contract that falls below that 5% level, then you have to consider those particular liabilities as high risk as opposed to medium risk But the liabilities, at least the ones that we're holding at this point, are pretty much at medium risk.

From the Floor: With regard to the EDIM method, one of the flaws I can see in it is the withdrawal issue. Do you have any comment on how to deal with partial withdrawals under EDIM?

Mr. Greaton: If you have a product design that anticipates a lot of partial withdrawals, you may not want to use EDIM. But on a lot of designs there's a heavy penalty on partial withdrawals. Either they have vesting schedules or you drop totally to your underlying guarantee.

I know our product. If you pull out you will forfeit a lot of unvested gains. We're hoping for lots of partial withdrawals or a lot of people pulling out because we make a lot of money on them. But our observed data is that it's been less than 2% a year, which means that people aren't withdrawing their funds.

In those types of situations, it's not much of a value of the benefit and the conservatism in the initial reserve valuation more than makes up for it.