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Session 25
Minimum Guaranteed Benefits for Variable Annuities: Implementing Guidelines

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Summary: Guideline XXXIV was effective year-end 1998 and addresses reserving for minimum guaranteed death benefits associated with variable annuities. Companies are now offering other guaranteed benefits such as guaranteed living benefits, and the NAIC and the American Academy of Actuaries are working to address reserving for these benefits.

This session describes the varieties of minimum guaranteed benefits in the marketplace and discusses the risks associated with providing the benefits. Current reserving practices and the latest NAIC and Academy developments will be discussed.

Specific examples will be provided, when practical, to illustrate the integration of minimum guaranteed benefits into the benefit stream, as required by Guideline XXXIII.

You'll have an up-to-date understanding of the current and emerging reserving practices for minimum guaranteed benefits for variable annuities. Specific examples will show how the reserving concepts are implemented.

Charts referred to in the text can be found at the end of the manuscript.

MR. JAMES W. LAMSON: I'm with Actuarial Resources Corporation, and I'm going to act as moderator. In addition, I'll be addressing the Actuarial Guideline 34 topics that pertain to the reserves for guaranteed minimum death benefits. The other panelist is Tim Hill who is a consulting actuary with Milliman & Robertson in Chicago, and he's going to provide us with a look at the Keel Method and some other work being performed by the American Academy work group dealing with reserving issues surrounding guaranteed living benefits in variable annuities.

I'll be speaking on how to implement Actuarial Guideline 34 (AG 34). I'll discuss what's involved in the calculation, what the steps in the process are, and some of the assumptions and data that you'll need in order to do the calculation. I've prepared a sample calculation of the minimum guaranteed death benefit (MGDB) reserve for a single integrated benefit stream. We'll go through it and I'll give numerical examples for a couple of different MGDB designs, and we'll trace the reserve through different market environments. Finally, we'll consider the effect of reinsurance on the MGDB reserve.

As you may know, Actuarial Guideline 34 was adopted two years ago to be effective at year-end 1998. It covers business issued from 1981 onward. It effectively applies to virtually your entire block of variable annuity business. The reserve was needed because current or future actual death benefits may be more than the variable account value. There was a three-year grade-in available to ease the pain of establishing the new reserve as long as you could demonstrate that delaying your implementation of Actuarial Guideline 34 would not "cause a hazardous financial condition or potential harm to your policyholders," which, to me, sounds like cash-flow testing.

The new guideline applies to all variable annuities whether group or individual. The only exception is for business exempted from the Standard Valuation Law. Variable annuities that have minimum guaranteed death benefits, under which the potential exists for a death benefit greater than the variable account value, are covered by the new guideline. Therefore, older variable business that does not have an MGDB, even a return of premium guarantee, does not need to have an MGDB reserve calculated.

A roll-up MGDB is when the death benefit is guaranteed to be no less than the interest accumulation of the premiums paid less withdrawals made, where the interest rate is stated to be a rate, such as 5%. A reset is one in which the death benefit is guaranteed to be not less than the account value on some previous anniversary. A ratchet is a reset that cannot decrease. Like any other product arena in the insurance business, your company's product may have nuances that create subtle but important differences between them and these simple definitions of MGDB death benefit guarantees. In applying the guideline to your business, you will have to read the policy forms carefully and decide just how to apply the provisions of Guideline 34.

The objective of AG 34 is to establish a reserve in the general account for the excess of the MGDB over the account value. This applies whether the MGDB is "in the money" (meaning if the MGDB exceeds the account value on the valuation date) or if a drop of a certain size in the market value of the assets comprising the account value would create such an excess. The excess is called the net amount at risk. One feature of AG 34 is that it establishes rates of market value declines and subsequent growth rates to determine the amount of the net amounts at risk associated with the MGDB during the period following the valuation date.

If you have reinsured all or a part of the net amount at risk, then you are eligible to reflect the reinsurance recoveries and premiums in the calculation. However, instead of calculating a reinsurance reserve credit, AG 34 requires that you reflect the recoveries and premiums directly into the reserve calculation, thus resulting in a reserve net of reinsurance. You must subtract this net reserve from the direct reserve to determine the amount of the credit that might either be positive or negative.

AG 34 also specifies how to calculate the reinsurer's assumed reserve, which utilizes the same components as are necessary for the reserve net of reinsurance for the direct writer. However, since the assumed reserve is computed using the Commissioner's Annuity Reserve Valuation Method (CARVM) method, it will produce its own CARVM duration or future time at which the greatest present value occurs.

AG 34 determines an extra reserve to be held in the general account, but it defines the reserve as the excess of one reserve amount over another. One must determine these two reserves in a series of steps. The first step is to use the methods prescribed by Actuarial Guideline 33 to calculate a normal AG 33 CARVM reserve, which is referred to in the guideline as the separate account reserve. Since there is no variable counterpart to the guaranteed interest rate in fixed annuities, AG 34 specifies that you should use the valuation interest rate less any contractual asset charges, such as mortality and expense (M&E) charges, to project the future benefits. In addition, the mortality rates to be used are the special mortality rates specified in the guideline, which I'll discuss a bit later.

Next, you must calculate the net amounts at risk. For this you must drop the funds for each policy using rates specified for this purpose and then project them forward to find the point beyond which the net amount at risk is zero. You will need to generate a set of net amounts at risk for each AG 33 integrated benefit stream that you test. As the third step, you must take the net amounts at risk from the previous step and add them to the death benefits from the AG 33 calculation. Once done, you then calculate the present values all over again and find the one that represents the greatest present value. Note that this may result in a different CARVM duration. The reserve is called the integrated reserve. Finally, as a fourth step, derive the MGDB reserve as the excess, if any, of the integrated reserve over the separate account reserve.

The reserve we just discussed, namely, the integrated reserve, is composed of four parts identified in AG 34 as:

- "A", the set of net amounts at risk from the projected reduced account values, which is what results from dropping the account value as of the valuation date. Remember, there is a set of net-amount-at-risk for each integrated benefit stream.
- "B" represents the death benefits already included in the corresponding integrated benefit stream from the calculation of the AG 33 reserve.

- "C" represents all benefits other than death benefits included in an AG 33 stream.
- Finally, "D" is the stream of reinsurance premiums and is only used in the calculation of the reserve net of reinsurance and the assumed reserve, of course.

I've prepared Table 1 to show these four components for the three types of reserves computed under AG 34: the direct reserve, the reserve net of reinsurance, and the assumed reserve. To calculate the reserve net of reinsurance, you need only modify the "A" stream by subtracting the reinsurance recoveries that would result from claims occurring during the period when the net amount at risk is projected to be positive. In addition, you must add in the reinsurance premiums projected to be paid as component "D". You can see from the table that the "Net of Reinsurance" column is equal to the "Direct" column, minus the recoveries in the "A" and "B" components. You, of course, put in the reinsurance premiums as component "D". The "Assumed Reserve" column is just the difference between the "Direct" column and the "Net of Reinsurance" column, which it thus nets to equal the recoveries in both "A" and "B" components and the reinsurance premiums as a negative amount as the "D" component. When you're calculating the assumed reserve, it's calculated in the normal fashion, that is; it is the present value of future benefits minus the present value of the future premiums.

TABLE 1
Direct and Reinsurance
Integrated Reserve Components

	Direct	**Net of Insurance**	**Assumed Reserve**
A	NAR's	NAR's less Recoveries	NAR Recoveries
B	Regular DB's	Regular DB's less Recoveries	Regular DB Recoveries
C	Other AG 33 Benefits	Same as Direct	0
D	0	Reinsurance Premiums	Reinsurance Premiums (as negative)

To determine the net amounts at risk, AG 34 specifies a set of assumed market value drops and so-called grow-backs or gross assumed returns. To determine the appropriate rates for each of these you must assign each fund for a policy to one of five asset classes defined in AG 34. As you would expect, AG 34 specifies a zero drop for the fixed fund. The immediate drop equals the percentage specified in Actuarial Guideline 34 for each asset class times the fund balance for each particular variable fund in that class for each policy, and the reduced account value is then equal to the account value on the valuation date minus the sum of all these drops. The grow-back rates also vary by asset class. You can derive them by subtracting your contractual and noncontractual asset charges from the gross assumed return for each fund. You use the guaranteed interest rate for fixed funds. Finally, once the net assumed returns are derived from the gross assumed returns, you can use the fund balances as weights to compute a weighted average net assumed return for purposes of projecting the reduced account values.

The immediate drop percentages and gross assumed returns are shown in Table 2. You can find these in Actuarial Guideline 34. You'll notice that for several of these, like the equity funds, were it not for the fact that you're subtracting off your asset charges from the gross assumed returns, the fund would drop 14% and immediately grow back in a year. In fact, in actual valuations right now, because the stock market has been doing so well, the MGDBs are really not "in the money," and small MGDB reserves result because you're already starting with an MGDB that's probably less than the account value. Even though you drop the account value, sometimes it's not even enough to actually produce a net amount at risk.

TABLE 2
Immediate Drop Percentages and
Gross Assumed Returns

Asset Class	Immediate Drop Percentage	Gross Assumed Return
Equity	14.00%	14.00%
Bond	6.50	9.50
Balanced	9.00	11.50
Money Market	2.50	6.50
Specialty	9.00	9.50

As noted earlier, the net amounts at risk are computed as the excess, if any, of the projected MGDB over the projected reduced account value. Note that you will need to determine the future values of the MGDB as well. If your MGDB is a roll-up of premiums, then you will need to have the roll-up interest rates and other provisions available, such as any caps on the roll-up limits as might apply at older issue ages.

The account value is projected using the weighted average net assumed return. All other projection assumptions, besides the fund growth rates, such as mortality, are taken from the AG 33 integrated benefit stream. A separate set of net amounts at risk are calculated for each benefit stream tested. The projected reduced account values should be distinguished from projected unreduced account values, which are the AG 33 projected values used to derive the stream amounts B and C.

The fixed funds are projected at guaranteed rates in the usual manner. The variable funds are projected at a rate derived from the valuation interest rate. Since there can conceivably be more than one valuation rate used in an AG 33 style valuation, you have to make a choice as to which rate to use for this purpose. Generally speaking, the conservative choice is to use the *highest* valuation rate applicable to the policy. Note that it was intended by Actuarial Guideline 34 that only the contractual asset charges be deducted in determining the projection rate, which produces the more conservative result.

AG 34 specifies its own mortality table for reserve calculation known as the 1994 Variable Annuity MGDB Table. This same mortality is used to determine components B and C, as well. This table has a loading of about 10% for conservatism, as it is applied to the net amount at risk death benefits, and was derived from the 1994 Group Annuity Basic Table. No mortality improvement was projected.

To illustrate these requirements, I have prepared a sample set of calculations based on the following product specifications and valuation assumptions. The assumed issue date for the sample policy is June 30, 1999 and was issued to a male, age 55. The valuation date is assumed to be this coming year-end. One of the effects that has not yet been observed in actual MGDB valuation is that of having the MGDB be "in the money" as of the valuation date, as I was referring to earlier, because stock market performance has been so good during the last few years. To illustrate what can happen when the MGDB is "in the money" as of the valuation date, that is, when the MGDB already exceeds the account value as of the valuation date, I have selected an actual period of stock market volatility that occurred about 12 years ago. In other words, my sample policy, issued June 30, 1999, is assumed to experience returns as would happen if it had been issued on June 30, 1987.

You might remember the crash that occurred in October 1987 during the Society of Actuaries' Annual Meeting in Montreal. While the market recovered, it was still down quite a bit as of year-end. Suppose that the same thing were to happen this year. How would you compute the MGDB, and how much could it be? I assumed a single premium, just to make the calculations easier, and I'm using the MGDB mortality table and 1999 valuation interest rates to compute a continuous CARVM reserve.

Typical surrender charges applied to each premium were assumed, along with a 10% of account value free partial withdrawal. The MGDB is assumed to be a 5% roll-up. There's a $30 annual contract charge. The integrated benefit stream being tested this morning is one that does not have any free partial withdrawals or annuitizations and is assumed to terminate with a full surrender to eliminate some of the complexity from the sample calculations. In reality, one must also consider streams that incorporate these and other features that have been omitted here. I also assumed that the policyholder had all his funds in the stock market initially but then redistributed them following the crash so that equal amounts are in each of the five asset classes as of the valuation date.

Chart 1 shows the stock market performance represented by the black line over the period preceding and following the issue of the same policy. The policy is issued in mid-year 1987, after the stock market has been going up and up and up. The gray line shows the values of the MGDB roll-up. So the stock market came way down and then eventually came back up. Additional reserve examples that I'll present later are also based on this performance, and you'll be able to see what happens to the MGDB reserve as the stock market later catches up to the MGDB.

Table 3 shows the drops in returns along with the assumed combined contractual and noncontractual asset charges. Referencing the table, there are the five AG 34 asset classes, and the immediate drop percentages and gross assumed returns for each, taken directly from Actuarial Guideline 34. Again, it is assumed that this policyholder had evenly distributed his funds, which started out at $10,000 as a single premium and now are down to $8,016, evenly distributed among the five asset classes. Our asset charges, in this case, are the sum of our M&E charges and our charges for investment management fees. Each of the individual components of the account value are dropped according to the immediate drop percentages, and the resulting reduced portions of the account value are shown in the far right column, so that for the projection done to calculate the net amount at risk, we start with an even further depressed account value of $7,359.

TABLE 3
Projection of Reduced AVs

Asset Class	Immediate Drop Percent	Gross Returns	Asset Charges	Initial Amount	Reduced Amount
1	14.00%	14.00%	2.10%	$1,603.31	$1,378.85
2	6.50	9.50	2.00	1,603.31	1,499.09
3	9.00	11.50	2.20	1,603.31	1,459.01
4	2.50	6.50	1.95	1,603.31	1,563.23
5	9.00	9.50	2.50	1,603.30	1,459.00
TOTAL				$8,016.54	$7,359.18

Table 4 shows the calculation of the first seven years of net amounts at risk calculated as the difference between the projected premium roll-up and the projected reduced account values. The first column contains the dropped account value projected forward. You can see that as of the seventh year it's still way behind the premium roll-up shown in the second column. In actual AG 34 calculations today, this projection takes one or two or three years, resulting in very small net amounts at risk. But in this case, even after seven years, the premium roll-up far exceeds the projected reduced account value. The next column represents the average difference or average net amount at risk. The next column shows the regular death benefits from the AG 33 reserve calculation. Finally, the last column just represents the sum of the two, or quantity "A" plus "B," resulting in the actual death benefits to go into the greatest present value calculation.

TABLE 4
NAR Determination — Years 1 - 7

t	Reduced Fund Value	Premium Roll-Up	Average NAR	AG 33 Death Benefit	AG 34 Death Benefit
VD	$7,359.18	$10,246.95			
1	7,617.22	10,497.89	$2,884.22	$8,182.86	$11,067.08
2	8,200.41	11,022.79	2,851.52	8,562.01	11,413,53
3	8,830.54	11,573.93	2,782.88	8,960.11	11,742.99
4	9,511.40	12,152.62	2,692.30	9,378.11	12,070.41
5	$10,247.07	$12,760.26	$2,577.20	$9,817.02	$12,394.22
6	$11,041.96	$13,398.27	$2,434.75	$10,277.87	$12,712.62
7	$11,900.84	$14,068.18	$2,261.83	$10,761.76	$13,023.59

Table 5 then shows the remaining seven years of the stream of net amounts at risk. Since the MGDB is already "in the money" at the start of the projection, you can see that it takes 14 years for the account value to finally catch up with the MGDB. Again, contrast that with current valuations in which this usually only takes two or three years. You can see the roll-up MGDB values and the dropped account value finally catching up. It takes 14 years before the catch-up actually occurs. The average net amounts at risk are what is used in the reserve calculation because Actuarial Guideline 34 provided for use of the average because, otherwise, on some of these funds, it will recover almost immediately, and you might not even have any net amount at risk if you just measured it at the end of the year. Again, the fourth column is just the AG 33 benefit from the previous projection of this integrated benefit stream. The last column represents the sum of the two death benefit amounts, or the AG 34 total death benefit.

TABLE 5
NAR Determination — Years 8 - 14

t	Reduced Fund Value	Premium Roll-Up	Average NAR	AG 33 Death Benefit	AG 34 Death Benefit
8	$12,828.86	$14,771.59	$2,055.04	$11,269.85	$13,324.89
9	13,831.58	15,510.17	1,810.66	11,803.34	13,614.00
10	14,915.02	16,285.68	1,524.62	12,363.51	13,888.13
11	16,085.68	17,099.96	1,192.47	12,951.68	14,144.15
12	17,350.58	17,954.96	809.33	13,569.27	14,378.60
13	$18,717.30	$18,852.71	$369.90	$14,217.73	$14,587.63
14	$20,194.04	$19,795.35	$17.04	$14,898.62	$14,915.66

Table 6 shows the present values for full surrender at various future time periods, with the greatest present value occurring at t=3. Again, when you're doing AG 33 or AG 34 calculations, you might be looking at many, many, integrated benefit streams. This just happens to be one of them, and it's a rather simplified one at that. In this column, you merely take whichever one is the biggest, and that happens to be the one at the end of the third policy duration following the valuation date.

TABLE 6
Development of One Candidate
For Integrated Reserve

	Present Values		
t	Surrender	AG 34 DB	Total
1	$7,385.55	$29.56	$7,415.11
2	7,335.82	94.28	7,430.10
3	7,271.24	164.56	7,435.80
4	7,192.40	240.63	7,433.02
5	7,099.79	322.69	7,422.49
6	6,993.72	411.10	7,404.82
7	6,874.27	506.28	7,380.55

Table 7 reports all the values needed to compute the integrated reserve under AG 34. Note that annuitizations have been ignored for these calculations. The stream of free partial withdrawals is actually larger than the reserve candidate from our sample calculations, so it would become the integrated reserve. The value we came up with is smaller than the one with free partial withdrawals, which usually is the case in doing AG 33 and 34 calculations. As a result, the integrated reserve is equal to the reserve candidate from the stream with free partial withdrawals. One thing that doesn't happen in this example, but does often happen in real life, is that the cash surrender value may be larger than both the AG 33 reserve and the integrated reserve. When this happens, it washes out the MGDB reserve, and nothing is held in the general account for the MGDB.

TABLE 7
Summary of Sample Calculations

Account Value	$8,016.54
Cash Value	7,372.66
AG 33 Reserve*	7,475.19
Integrated Reserve*	7,547.19
No PW	7,435.80
With PW	7,547.59
MGDB Reserve*	72.40
As BP of AV	**$90.31**

* No annuitizations or ancillary benefits considered.

Notice that the MGDB reserve is quite high in this example; it is slightly over 90 basis points. This would result in a 90-basis-point reserve increase over the six months this policy would have been in force. That's a large amount for a block of annuities. However, different results would occur on other policies, and this sample is absolutely not representative of what would happen on a large block of business. In fact, it should be stressed that you should not read too much into the results I'm showing today as it is very difficult to draw definitive conclusions from examples. The calculations required for the MGDB reserve are very complicated, and small changes in one feature or another can have a large impact on the results. I encourage you to do calculations on your actual products and business.

Table 8 is intended to address the question of what would happen to the reserve calculations we just went through if the policyholder had kept all his money in equities rather than reallocated across the five asset classes? There are two interesting facts here. First, you can see that initially larger net amounts at risk are generated by the equity class compared with the reallocated example. You can see that the average net amount at risk for the equity class exceeds that for the reallocated one until four years following the valuation date, at which time the reallocated one is bigger than the equity net amount at risk.

TABLE 8
How is MGDB Reserve Affected By
Reallocated vs. Equity Funds

	Average NAR			Present Values		
	Reallocated	Equity	(3)=(1)-(2)	Reallocated	Equity	(6)=(4)-(5)
t	(1)	(2)	(3)	(4)	(5)	(6)
1	$2,884.22	$3,295.54	($411.32)	$7,415.11	$7,416.21	($1.10)
2	2,863.14	3,108.91	(245.77)	7,472.62	7,475.12	(2.50)
3	2,830.50	2,842.87	(12.37)	7,510.78	7,513.34	(2.56)
4	2,802.71	2,562.18	240.53	7,533.74	7,534.79	(1.05)
5	2,779.86	2,266.11	513.75	7,545.01	7,542.66	2.35
6	2,762.00	1,953.88	808.12	7,547.59	7,539.62	7.97
7	2,749.21	1,624.66	1,124.55	7,544.00	7,527.81	16.19

All calculations based on streams and free partial withdrawals

Column 3 represents the differences between them. The present values represent candidates for the reserve as the greatest present value. Column 4 contains the same present values we looked at a moment ago, and column 5 contains the ones for the equity position. You can see that since the greatest present value occurs at the end of durations 5 or 6, the fact that this equity version produced larger net amounts at risk initially really doesn't matter because the "all equities" reserve is actually less by $4.93. Obviously timing is important.

In Table 9, beyond performing some sample calculations, I ran a series of reserve calculations for a set of five policies, kind of like a model, representing ages 25 through 65, with most of the business occurring at ages over 50. The reason that the MGDB shown here is so much smaller for t=1 than in the sample calculations, is due to the inclusion of business at other ages and having the cash value wash out the MGDB reserve at some of those ages. That washout feature really does happen an awful lot in real life.

TABLE 9
Relationship of Roll-Up MGDB Reserve to
"In The Money" MGDB

t	Account Value	Roll-Up MGDB	MGDB Reserve	
			Amount	In BP
1	$8,016.53	$10,246.96	$3.97	$4.95
2	19,092.30	21,006.26	50.49	26.45
3	35,522.25	32,303.53	6.63	1.87
4	43,123.03	44,165.66	81.07	18.80

Annual premiums of $10,000 were assumed in this example. Valuations were performed for year-ends 1999, 2000, 2001 and 2002, and the table should show those dates instead of values of t. The same stock market performance as in the sample calculation was assumed. Thus, the relationship shown in the earlier graph between the account value performance and the roll-up MGDB is reflected in the MGDB shown in this table. You can see that the amount by which the MGDB is "in or out of the money" is reflected directly in the amount of the MGDB. It's lowest in the third year where the stock market has recovered to the extent of making the MGDB be "out of the money." You can see that the beginning account value is in excess of the roll-up MGDB, so when you drop the $35,522 by the drop percentages and project forward, you wind up with a pretty minuscule MGDB reserve, only representing 1.87 basis points, whereas at some of these other durations, it's more significant.

Table 10 is similar to the last one, except that the MGDB is a reset type rather than a roll-up. In this particular example, you can see that the MGDB reserve is of similar size, but don't draw conclusions from this because this result is affected so heavily by the stock market performance, when the policy was issued, and many other features.

TABLE 10
Relationship of Reset MGDB Reserve to
"In The Money" MGDB

t	Account Value	Reset MGDB*	MGDB Reserve Amount	MGDB Reserve In BP
1	$8,016.53	$10,000.00	$0.00	–
2	19,092.30	20,000.00	23.69	$12.41
3	35,522.25	30,000.00	0.00	–
4	43,123.03	47,167.29	93.63	21.71

* 3-Year Reset MGDB = Sum of Premiums First Three Years.

Let's turn to reinsurance again. The nomenclature used in Actuarial Guideline 34 to identify the four parts of each stream to be considered for the integrated reserve net of reinsurance is shown below.

$\mathbf{A^r}$: Direct "A" NAR's reduced by insurance recoveries

$\mathbf{B^r}$: Direct "B" Unreduced AV's paid on death reduced by reinsurance recoveries

C: Direct "C"

D: Projected reinsurance gross premiums using projected reduced account values

Again, the A amounts are just the projected net amounts at risk reduced by anticipated reinsurance recoveries. If you've reinsured the MGDB 100%, then this would mean that A^r would be zero. B^r would be identical to the same quantity as in the corresponding AG 33 integrated benefit stream, unless some portion of the basic death benefit has been reinsured, such as the surrender charge. C is the same as in the AG 33 stream, and D is the reinsurance premiums determined using the projected reduced account values, or the net amounts at risk under the MGDB, depending upon how the reinsurance premiums are determined for your treaty. Once you've computed all four components, then you must find the greatest present value, and that amount becomes your reserve net of reinsurance.

As noted earlier, the reinsurance reserve credit is determined by subtracting the net reserve from the direct reserve. Since the two CARVM calculations are done separately from each other, they may have different CARVM durations, and the credit may turn out to be negative. Indeed, my sample reserve calculation (Table 11) does produce a reserve candidate net of reinsurance that is larger than the direct reserve candidate, and I didn't try to make this happen. The reserve candidates are shown for t=3. In my example, reinsurance premiums are a percentage of account values, and, as you can see under this no-partial-withdrawals path, premiums exceed recoveries, thus producing a larger reserve net of reinsurance.

TABLE 11
Reserve Net of Reinsurance

t	Direct Reserve	Recoveries Less Premiums	Reserve Net of Reinsurance
1	$7,415.11	(1.41)	$7,416.52
2	7,430.10	(3.69)	7,433.79
3	7,435.80	(5.70)	7,441.50
4	7,433.02	(7.58)	7,440.60
5	7,422.49	(9.47)	7,431.96
6	7,404.82	(11.53)	7,416.35
7	7,380.55	(13.96)	7,394.51

Actually only based on one Integrated Benefit Stream – FPW path produces a larger reserve.

For the assumed reserve, or the reserve carried on the reinsurer's books, the stream consists of projected reinsurance recoveries less projected premiums where A minus A^r and B minus B^r, using AG 34 nomenclature, result in the recovery amounts, although expressed here in a rather convoluted way. That's exactly the way that it's expressed in the guideline. The calculation uses the same mortality and interest as the ceding company. The assumed reserve calculation being separate from that for the direct or net reserves may result in using a different CARVM duration; that is, the duration where the greatest present value occurs. Also, the reinsurance reserve credit and the reinsurer's reserve will likely be different from each other.

In fact, the greatest present value is likely to be dramatically different than for the direct or net reserve calculations. Remember that the assumed reinsurance streams are tiny by comparison to the integrated benefit streams for the direct or net reserves. Therefore, a very unusual pattern to the assumed stream, that is, assumed reinsurance stream, will hardly affect the direct stream as the effects of reinsurance are subtracted to produce the net of reinsurance stream. As a result, the CARVM duration for the direct reserve might be three, and for the net reserve it might be four, but for the assumed reserve it might be eight, for example. This means that the assumed reserve may be quite different from the credit taken by the ceding company. Also, consider that if reinsurance premiums are expressed as rates varying by age, multiplied by the net amounts at risk, then the projected death claim recoveries will be more or less in lockstep with the premiums. However, if the premiums are expressed as basis points of account value, then the behavior of the account value will determine the premiums, and, thus, the premiums will be independent of the recoveries.

In the free partial withdrawal streams, the declining account values will project declining premiums, which can have a dramatic effect on the assumed reserve. This is especially true since the net amount at risk may be about the same as for the no-withdrawal scenario, thus increasing the assumed reserve.

That concludes my presentation about Actuarial Guideline 34. Tim will now pick up with what has been done so far in developing reserves for the guaranteed living benefits.

MR. TIMOTHY E. HILL: Jim, that was a great background on AG 34, and hopefully everybody got all that because we're going to refer back to a lot of that during this portion of the presentation because the direction that the Academy Task Force on Variable Annuity Guaranteed Living Benefits (VAGLB) is currently taking is to try to leverage AG 34 as much as possible.

First, I'll talk a little bit about the products and their descriptions and definitions. We're going to talk about the task force summary, a Keel Method sample calculation, and we'll get into that more. Then we'll look at what the task force is planning next. Let's get into the product descriptions and definitions.

What is a VAGLB anyway? It is a variable annuity guaranteed living benefit, and you'll hear me throw out the term VAGLB a lot. There are three different types of VAGLBs in the market right now. They are guaranteed minimum accumulation benefit (GMAB), guaranteed minimum income benefit (GMIB), and a guaranteed payout annuity floor (GPAF), which makes up a smaller portion of the market.

So, what are these going to do for you? A VAGLB provides a minimum floor of policyholder value. You have a variable annuity. Everybody knows that your account value is determined by the performance of the funds, and there's really not a lot of restrictions on that. If the market crashes, people are going to lose money. What a VAGLB can do is provide a certain amount of protection on certain pieces of the product benefits. For instance, a GMAB will provide a floor protection as long as you survive the waiting period and survive both deaths and surrenders. GMIBs are for owners satisfying the waiting period and annuitizing the contract. GPAFs apply only to immediate variable annuities or variable annuities that have been annuitized into a variable payout stream. All this does is it provides a floor for the payment. For instance, it might guarantee that your payment would never drop below the initial payment. Let's walk through these one at a time just to see how they work.

First, it's the floor on the account value. How does this work? You usually have a waiting period of somewhere between 7 and 20 years. Oftentimes, the benefit is a return of premium or premium accumulated at a low percentage. At the end of eight years, the company is going to guarantee that you have at least your premium at that point or maybe they'll guarantee that you have your premium accumulated at 2% or 3%. At the end of that period, if the account value is less than the guarantee, then there are two ways that you can structure this. Either your account value can be topped off or increased to the guarantee automatically or you might be forced to surrender in order to get the topped-up account value.

There are only a few of these out in the market right now. I'd say more of them will just automatically top you up to the guarantee at the end of the waiting period. Like I said, there's only a few of these being offered. Why is that? So far, they're relatively expensive if it's offered as an add-on benefit. That 100–150 basis point charge is a considerable amount. In addition, the benefit is oftentimes pretty restrictive. You have to have all your money in the S&P 500 account. There can be no additions. There can be no withdrawals. It's a very restrictive type of contract, and this is mostly for hedging purposes. If the company has to go out and buy options to hedge this contract, the only ones that are out there and are regularly tradable are S&P 500 type options. That's why they oftentimes require you to be in that type of a fund.

What's the risk profile? What's the risk to the company if they do sell a GMAB? Typically it's not necessarily the same risk profile as you had with the GMDB where it's that sudden drop that really has you on the hook. It's more of a stagnant market. If you were to go into a market like that of the 1970s or something, when it was fairly flat most of the decade, that's a real risk. If you look at historical results, the odds of actually losing money over an eight to ten year period with an S&P type fund are very low. It probably will not happen based on historic results. Obviously, all the caveats go along with that. Don't take that figure and publish it any place.

The problem with these benefits is that if the market does go down, and if there is some event that causes the market to have a major correction and then is very flat, all of your GMAB benefits have to be paid off at once. This is one of the big differences between a living benefit and a death benefit. With the death benefit, the benefit is "in the money," and you have net amount at risk there, but they still have to die in order to get this. With a GMAB, if they've stayed around for the eight to ten year waiting period, they're going to get the benefit. So everybody's going to get it. Some people say that you have some diversification with a GMDB because of mortality. With these benefits, you really have a concentration. The point I want to make is that if there is a bad scenario, it's a very bad scenario. There's a very long tail to the cost distribution of most of these guaranteed living benefits.

Let's go on to GMIBs, and these are probably the more popular ones in the market right now. There's a lot of these out there, and many of them are also coming on the market. First, I want to spend a couple of minutes talking about some terms and definitions. The calculation of this benefit is a little complicated. There's a couple of moving pieces. But the benefit base piece is the piece that is most visible. This is the premium accumulated at 5% or the annual ratchet. It's kind of an intermediate part of the calculation, but it's the one that's going to be held up in front of the customer, and that's what they're going to see. If the policy is sold in conjunction with a guaranteed minimum death benefit, the benefit base is often the same as the guaranteed death benefit. If there is a death benefit, which is the greater of a 5% rising floor and the highest anniversary account value, oftentimes companies use the same definition for the benefit base.

Guaranteed annuitization factors. What happens in this calculation, and what you're actually guaranteeing, is that at the end of the waiting period, if the customer elects to annuitize the benefit, you're going to apply your benefit base to the guaranteed annuitization factors. So these guaranteed annuitization factors are pretty similar to the guaranteed annuitization factors that you have all put in at the end of your variable annuity and fixed annuity contracts. We've all put those in there just assuming that they're never going to actually be used. It's a conservative estimate, with 3% interest type numbers, and a fairly optimistic mortality table. With these annuitization factors, the contract typically requires people to have a life contingency in their annuitization. They can't just take a five-year period certain or a ten-year period certain or something like that. There has to be a ten-year and life type of annuitization. Like I said here, it's often the same as what's in your base VA. Just for consistency's sake, it makes it a little bit easier if you pick up those same numbers as is in your base VA.

The benefit utilization is just the portion of people who are actually going to elect to utilize your benefit. I have a few more terms and definitions. There is a step-up or reset feature. This is something that has been fairly popular with some of the roll-up benefits, especially some of the more current ones. On each anniversary, the customer has the option to kind of step up their base for the roll-up calculation. Initially the contract was premium accumulated at 5%. Let's say that you've had a great couple of years of stock performance, and it's gone up 25% each year. Now your account value is well above your benefit base. You would have the option to step up that benefit base. Now it would be the account value as of Time 2, and that 150% of where you started, now accumulated at 5%. You also have to restart the waiting period. These were put in so that if you have really good stock performance, the benefit just doesn't look worthless. They won't be out there eight years from now, with no chance they're every going to use this thing. You're still requiring them to pay the premiums for the benefit. These were added to kind of make sure that doesn't happen.

Waiting periods for the GMIBs are typically in the seven-to-ten year category. There is an election window. You have to state, in writing to the company, that you would like to annuitize your policy and take advantage of your GMIB within 30 days of each contract anniversary. Some contracts don't require this. Most contracts can require that it's within 30 days, and this does a few things. This kind of limits the number of people who can actually annuitize. Only a 12th of your total block of business could possibly annuitize at any one time, so it cuts down on the number of annuitizations. It also puts a little more restriction on there so people are going to forget to do it, and they're going to have to wait until next year. It just cuts down on the number of people who are going to utilize the benefit.

As I said, this benefit is intended to provide guaranteed income. In order for this benefit to really mean anything to somebody, they have to anticipate that they would, at some time, possibly annuitize. Most companies are having a relatively generous benefit base. The kind of benefit bases that you would see with a GMDB is a 5% roll-up or a minimum anniversary. Things are fairly generous. The charges for these benefits are typically on the order of 20–40 basis points, and that might be charged either against the account value or the benefit base. It's something that's a little bit different than most of the GMDBs; the charge is against the account value. This benefit works because, if you are a sales agent, you can sit down with a customer, and discuss a 5% roll-up product. I can sit down with a customer who's currently age 55 and going to retire when he is 65. If he puts in an amount of money, I can guarantee you that he will get payments of a certain amount starting at age 65 for the rest of his life. That's kind of the sales pitch that you can use with these products.

What the insurer is relying on, though, is that not that many people are actually going to elect these if it is, in fact, "in the money" at the end of the ten years or at the end of the waiting period. There are reasons for that. Like I said, only 2% of people have typically annuitized their variable annuities. It has just been very low in the past. Most people aren't really all that attracted to life annuitizations. If you would look down your book of annuitizations, I'm sure it's a lot of 10-year period certains, and a lot of 20-year period certains. As for the life options, I don't know if people just don't understand exactly what the benefit is there or they're just not all that comfortable, especially if there's no period certain. If they could walk off and get hit by a bus, and their money's all gone, obviously people aren't real attracted to that.

Also, this benefit, does put a lot more focus on annuitizing. I think some of the regulators have had some problems with variable annuities. Only 2% of the people have been annuitizing. If more of the sales pitch is on actually annuitizing these benefit, there could be an ancillary benefit of kind of bringing the focus back to that piece and having the product really do what it's supposed to do. All these annuities were originally intended for people who would hold on to them for a while and then annuitize. As we all know, very few people actually do the annuitizing.

Like I said, there are quite a few of these in the marketplace right now (currently about 10 or so), and there are more coming. This is becoming one of those benefits that your wholesalers are going to start demanding. They're going to say, "Hey, such-and-such has this and such-and-such has that. We've got to have this." Oftentimes, the wholesalers carry a lot of weight, and so companies are being forced to add a lot of these benefits.

The most generous benefits that are out there are a 6% roll-up and the highest anniversary. There are a large variety of guaranteed annuitization factors, and I'd said earlier that oftentimes it's convenient to use the same ones as in the contract, but this is one place where you can do a lot of playing and reduce the cost of the benefit. The customer is not necessarily going to understand exactly what the difference is between a 3.5% interest rate, guaranteed annuitization factor, and a 4% interest rate, guaranteed annuitization factor. I mean they can see the numbers, but it's not going to mean quite as much to them. If you say you're using a certain mortality table, and somebody else is using something different, they're not going to be able to understand that. I'm not saying these are the best ways to do it, but this is what's going on in the market. People are offering products with 2.5% interest rates but a 6% roll-up. That probably has less value than a 4% roll-up but a 4% interest rate on the guaranteed annuitization factor. Those are some of the things that are happening in this marketplace.

What's the risk profile on a GMIB? It's sensitive to both the equity market and interest rates. The equity market is going to determine how "in-the-money" the benefit base is, but the interest rates determine how attractive your guaranteed annuitization factors are. The Japan scenario and the steep decline in the equity market, plus the absolute bottoming-out of interest rates is the worst possible scenario for a GMIB. Not only is the benefit base deep in the money, but that 3% guaranteed annuitization rate is looking pretty good at that point. That's the worst case scenario for these. That risk profile also depends a lot on the benefit that you're offering; obviously, it matters whether it's a roll-up or whether it's an annual ratchet of some type.

Let's talk just for a minute about some of the guaranteed payout annuity floors. This is fairly new to the market, and so we won't spend much time. It is used with variable annuitizations only. It doesn't mean anything for a fixed annuity, and it guarantees a minimum monthly payment. You might be guaranteeing the initial payment (future payments will never drop below the initial payment or 85% of the initial payment) or something along those lines. Some other possibilities would be that you could guarantee the payments would never decrease. That's going to be a fairly expensive guarantee, but it might be a lot more attractive. There are two ways that you can charge for these. You can either charge as a front-end load or as an M&E charge. There's pluses and minuses based on the different benefits that you're going to offer. There are only a couple in the current marketplace. As annuitizing in general becomes more popular, we're all waiting for all the baby boomer dollars to come out of investments and we're trying to figure out how we're going to capture all these payout dollars. If that does happen, I would guess that these benefits are going to become very popular at that time.

We've seen some examples of what we've been talking about as far as guaranteed living benefits are concerned. Let's talk a little bit about what the VAGLB Task Force is trying to do. The Academy group was formed in January of 1998. I joined the task force in January of 1999. Jim joined about the same time as me. The reason why it was formed is because the Life and Health Actuarial Task Force (LHATF) had asked for some information on these new benefits they were starting to see. There were only a few out at the time, but they were starting to crop up a little more often, so they wanted some information on it. The task force was asked to provide a summary of what's out in the market. LHATF wanted to just get an idea of how much these benefits should really be costing. We see what companies are charging, but we wanted a feel for what the actual cost is. Some historic data analysis, similar to what was done in AG 34, was also requested as was some information on hedging strategies and potential reserve methodology.

I'm going to discuss the VAGLB Task Force potential reserve methodology. The VAGLB Task Force considered a lot of different reserve methodologies over the past, and when I first joined, there were many different ideas being thrown around. I think we all had a feel for what we'd like to see happen, but it was just tough to actually get a methodology that seemed to work, so some goals were established. One of the goals was that it had to be relatively simple. This has to be a calculation that is not going to be terribly complex, and it must be compliant with the Commissioner's Annuity Reserve Valuation Method (CARVM). We'll talk a little bit more about that. It must fit within the Actuarial Guideline 34 approach. It would be great if we can just fit this with AG 34. We won't have to completely revamp the system. People will kind of have a head start on what's going to happen. The calculated reserve had to be sufficient in a large majority of scenarios. If you do stochastic modeling, and you generate a lot of scenarios, the simplified reserve calculation, had to be greater than the stochastic reserve in 80–85% of the trials. It has to say that the reserve is sufficient in 80–85% of possible future scenarios.

Let's discuss stochastic modeling. The task force has built a model, and it's a stochastic model based on thousands of trials. It tries to calculate the 83rd to 85th percentile of a stochastic reserve. So, after a thousand trials, it'll take the 83rd to 85th percentile of the stochastic reserves. This stochastic reserve is being calculated based on a CARVM-type framework, and when I say a CARVM framework, the major components of CARVM are the idea of taking a maximum present value and doing your calculation on a seriatim basis. You're going to look policy by policy, and you're going to do some calculation. You're also going to take the maximum present value. It's very different than a Canadian method or some other method where you can do some aggregating. You can kind of look at a block more in total and use some more realistic assumptions, rather than this worst case type of an attitude that is often taken with a CARVM calculation. The model used historic mean and volatility. Any of you who followed the development of AG 34 know that they were relying on historic data in order to do the drops, and the grow-backs of AG 34 were based on historic data. We're again relying on historic data for the majority of our modeling.

The task force started with the premise that AG 34 was going to be innocent until proven guilty, and so we started off with saying, "Let's just try AG 34 and see if we'll get a proper or a reasonable reserve just using the AG 34 calculations." It was quickly determined that the drops and grow-backs of AG 34 were not going to be sufficient for these benefits. Perhaps you have an extended waiting period, such as a 10-year waiting period. You know that, as Jim showed, that the drop of 14% followed by a mean growth of 14%, means you're not going to have very much net at risk at the end of ten years if the market has been growing at 14% unless it's a scenario like Jim presented. It is kind of an "after-a-crash" type of a scenario. There was a big difference. Like I said earlier, with a GMDB, the riskiness is that you're going to have a major market correction happen fairly soon, and then things are going to return more to normal. With these benefits, it's more of a stagnant market. The market is just flat for an extended period of time. It just doesn't move a whole lot. That's the main risk with these guaranteed living benefits.

The approach that the task force took was to use the stochastic modeling in order to devise a new stress test scenario. When I say stress test scenario, I'm referring to the AG 34 drops and grow-backs. That, in my mind, is a stress-test scenario. It's a deterministic scenario that's meant to kind of shock the block of business and see what types of reserves emerge. This can be done using the modeling to kind of get to the answer that you know you want to get. You can back-solve for what kind of returns you would get there. Hopefully this will be a little more clear in a second. I don't know how many of you are on different NAIC mailing lists, but you might have seen the term the Keel Method. Now we're going to get into the Keel Method.

The Keel Method is used when we use this back-solving technique. If I'm sitting at valuation date two, for instance, and my benefit has a ten-year waiting period, I can do a bunch of stochastic modeling and say, "When I'm eight years out, I want a reserve of x." That's based on stochastic modeling. So now if I have a AG 34 type framework, I can say what return would get me that same reserve following the AG 34 type methodology? What cumulative market return will get me that same answer? That was the technique that was used to come up with the Keel Method.

The Keel Method represents the 83-1/3 percentile of future cumulative equity returns. For example, if I am doing a reserve calculation, and I am projecting out two years, there's an infinite number of possibilities where the market could be at that point. I want to pick the 83rd percentile of those possible stochastic returns. I'll get some graphs a bit later that will clarify a lot of these points. A simple equation can be used to calculate the Keel, assuming that you have a couple of different things. You should be able to say that subaccounts follow a lognormal distribution, the mean return and volatility are stable over time, and subaccount returns have no memory. For instance, good markets don't follow bad, and markets are completely without memory.

Listed below is the formula that can be used to calculate the Keel. Those of you who do much stochastic modeling will probably recognize it as being very similar to the stochastic process used to generate lognormal distributed market returns.

$$\text{Index}_t = \text{Index}_{t-s} \times e^{\mu s + N F \sqrt{s}}$$

Where: Index_t = the index at time t

μ = mean fund index return (stationary over time)

F = fund index volatility (stationary over time)

s = period in years between t–s and t

N = 1–p percentile of standard normal distribution (p=83.3rd percentile)

It's a typical lognormal distribution. There are a couple of things that you have to do before you can apply this formula. If you're looking at annual returns from a market, and you see that the Standard & Poor's Index returns are 17%, you'll know that it's typically an annual return. The formula needs to use a constant force return and it is a natural log. Oftentimes, when you look at historic data, its returns are stated as being based on a normal distribution. If you look at historic returns for the S&P, and somebody tells you that it's 12% mean return with a 20% standard deviation, that's based usually on a normal distribution. There's a conversion to get into a lognormal distribution. These are more of the details and not really the important part. Let's get into the important part of this.

Chart 2 is a graph of the Keel versus historic data. This is historic data. What do I mean by historic data? This is a graph of the 83-1/3 percentile of cumulative market performance. I think the data was 38 years old. Let's look at all one-month returns of the market. It's a very large number, I take the 83-1/3 worst number, which would be this 2.5%, and this is assuming a growth type fund on this. Then, if you looked at the three-month cumulative market performance for the past 38 years, and you take the 83-1/3 percentile, you get 3.5%. I hope people see what we're talking about when we use the term historic data on this.

The goal was to try to find a simplified method that would fit this distribution, so that's when the Keel Method comes in. The formula I gave earlier was used to generate this curve. You might be wondering why we call it the Keel Method. It turns out that Noel Abkemeier and I were working on the task force at the time, and we were sitting around in our office in downtown Chicago talking about this idea that we had. We just couldn't come up with a name, so we said, "It kind of looks like the keel of a boat." That's why it's named the Keel Method.

Chart 2 shows the first two years. Let's expand this and show a little more data. Chart 3 shows the Keel Method versus historic data versus AG 34. We start with historic data. The fit is not too bad. Then we look at AG 34, and, as expected, it drops quite a bit lower than historic data would show that it needs to initially. Then, as you get out further, it's well above what historic data would tell you is probably appropriate. Remember, the risk is more of a immediate drop and not the long-extended period. It doesn't really matter for AG 34 that it doesn't fit all that well out in the tails because that's not where the majority of the risk is. AG 34 can still do a very good job of calculating an appropriate reserve for death benefits. It's just that it can't be used for living benefits.

Let's take a quick look at the sample calculation for one of these benefits. Let me first say that this is still in the very preliminary stages. This is something that the task force is going to be talking about with LHATF. It still has to be approved by LHATF. They could say that it is the dumbest thing ever and go with something completely different. This is very preliminary. I want to make sure I have given all the appropriate caveats.

The Keel Method follows the same AG 34 idea of dividing things into three pieces, and we're not even considering the reinsurance piece at this point. We're going to skip Piece D for now. I'm going to have an example too. There are certain assumptions. There was a valuation date of Time 5 and the initial premium is $1,000. It's a return of premium guarantee. By the valuation date, the market has dropped to 700. For whatever reason, there have been a few fairly bad years. The market is way down, and the benefit is "in-the-money." These assumptions are just for illustration purposes.

The first step is to calculate the Keel. Presumably the Academy is going to come up with a mean and a volatility assumption similar to the mean return and the drop of AG 34. Some table will be published and it will say, here's the mean and the volatility you should use for the various types of funds that you might have people invested in. Just like Jim had shown, you would take a subaccount weighted average of however the money is actually invested. You would just weight the mean and the standard deviation with those same factors. The example that I'm going to show here is actually for an aggressive growth type fund, so I have an annual net of fund management fee return of 17.7% based on historic data and mean fund volatility of 21.9%. After I do the converting that I was talking about earlier, that gets me to a constant force lognormal distribution of 11.52%. This is net of all fees also. From the assumptions page, you probably saw that I'm assuming 135 basis points of M&E, and a 100 basis point charge for my GMAB. There are 235 basis points right there, plus the conversions. That gets us down to 11.52%. Then the volatility is 18.46%.

The formula is listed below:

$$\text{Index}_7 = 700 \text{ x } e^{11.52\% * 2 + (-0.9673) * 18.46\% * \sqrt{2}} = 685 \rightarrow -2.2\%$$

For demonstration purposes, I've picked Index 7 as being what I'm going to show. Remember we're doing this as valuation date five. Index 5 is 700. We apply the Keel Method. Here you have the mean. There is the T for time. How far ahead are you going to project? We used two years. This is the 16.67th percentile of the normal distribution. It is one minus 83-1/3. There is the standard deviation and the square root of time, or the square root of two. That gives us the value of 685, which is a negative 2.2% cumulative return over those two years.

Let's look at Table 12. Remember that we're doing this as valuation date five. Five is our kick-off date, so, we would have a zero cumulative return. As of time six or one year projected out, it's a negative 6.1, time 7, negative 2.2, time eight, 3.7. I hope that when you see those numbers, you can kind of visualize where the Keel drops down, and how it then picks up towards the end. It's going to keep increasing indefinitely. At the bottom are my ${}_np_x$'s based on male, age 65 mortality. I included this so you can work through some of these calculations yourself.

TABLE 12
Keel Method ¾ Sample Calculation

Year	5	6	7	8	9	10
Cumulative Projected Return	0.0%	-6.1%	-2.2%	3.7%	10.9%	19.3%
Annualized Projected Return	0.0%	-6.1%	4.2%	6.0%	7.0%	7.6%
$_{n}p_{x}$	100.0%	98.3%	96.4%	94.3%	92.1%	89.8%

Let's look at the calculation of the X piece in Table 13. I'm not going to call these A, B and C. I'm going to call them X, Y and Z just so it will be distinctly different from AG 34. The idea is the same. This is going to be the net amount at risk that's generated by this guarantee. I showed you the returns on the prior page. That's what my account value is going to do. It's going to stay at 700 at time five. It's going to drop down to 657, come up, and then start increasing again. My projected GMAB is the return of premium. It's $1,000 across the board with a ten-year waiting period. I have five years worth of data here. At the end of ten years, they have the option to utilize their GMAB. I'm going to assume that they're automatically going to receive the increase. Therefore, I have a projected net amount at risk of $165 at the end of 10 years. I hope that's clear to everybody. This is the exact same process as an AG 34 drop with a grow-back, except the drop and grow-back returns have been substituted with the Keel Method. Now we take the present value of that net amount at risk, which is 112. That's our X piece, which is related to the A piece.

TABLE 13
Calculation of X Piece

Year	5	6	7	8	9	10
Projected Account Value	700	657	685	726	776	835
Projected GMAB	1,000	1,000	1,000	1,000	1,000	1,000
Projected GMAB NAR	—	—	—	—	—	165
PV of Projected GMAB NAR	—	—	—	—	—	112

The next piece is the Y piece, analogous to the B piece, in that this is the amount of account value that's released when the guarantee is utilized. We've just modeled the net amount at risk. When they actually surrender the product and take their money, they're also going to get their account value. This is where that's going to come from. We are projecting forward at the valuation rate minus M&E minus the guaranteed living benefit charge. We're reducing our projection rate by 235 basis points. We're projecting at 3.4%. There's our projected account value under this methodology. The present value of account value at the GMAB utilization, which is the end of year ten, is 562 (Table 14).

TABLE 14
Calculation of Y Piece

Year	5	6	7	8	9	10
Projected Account Value	700	724	748	774	800	827
PV of AV GMAB Utilization	—	—	—	—	—	562

We pull in Piece Z, which includes everything else like cash surrender values and deaths (Table 15). It is similar to AG 34, although it projects at that valuation rate minus M&E minus the guaranteed living benefit charge. The account values are the same. We calculate the cash surrender values and deaths.

TABLE 15
Calculation of Z Piece

Year	5	6	7	8	9	10
Projected Account Value	700	724	748	774	800	827
Projected Cash Surrender Value	670	704	738	774	800	827
PV of Cash Surrender Value	670	654	636	617	589	562
Cumulative PV of AV Paid at Death		12	25	38	53	68

We're now ready to pull this all together and actually calculate the maximum present value (Table 16). For those benefits that are elective or mostly cash surrender value, we're going to take the greatest of those, and we're going to add in our nonelective benefits, the death benefits, and take the overall greatest present value. The top line reflects our nonelective death benefits, and we also see our cash surrender value. Here is our GMAB being utilized. So the greatest present value is $741. Obviously, I came up with an example that would give us a greatest present value where the benefit was being utilized. I'm not even going to go into things like partial withdrawals and things like that. This is a very simplified example, but hopefully it's demonstrating what the Keel Method is all about.

TABLE 16
Calculation of Maximum Present Value

Year	5	6	7	8	9	10
PV of Nonelected Benefits	—	12	25	38	53	68
PV of Elected Benefits GMAB	—	—	—	—	—	673
Cash Surrender Value	670	654	636	617	589	—
Total (Elective + Nonelective)	670	666	661	656	642	741
Greatest PV	**741**					

What has the Academy done with this methodology? We've done an awful lot of modeling with GMABs, with roll-ups, and with return of premium using the Keel Method. We use that target reserve I talked about earlier. We compare that to the reserve the Keel Method calculates, and it appears right now that the Keel Method does a very good job of getting an appropriate reserve for most GMAB benefits that have a return of premium or a roll-up type guarantee. The Keel, however, does not do a very good job with annual ratchets, and there are a couple of different reasons for this. The Keel doesn't do a very good job with a path-dependent benefit. What does path-dependent mean? With an annual ratchet, the guarantee is dependent on the past performance of the market. If the market goes up steeply in the first couple years, then your guarantee also steps up versus a roll-up in which case it doesn't matter what the market has done. It's just going to grow at 3%. That's the distinction between a path-dependent and a non-path-dependent guarantee. The problem with these guarantees is that, in the early years, there's no intrinsic value as such. It's just all potential value. An annual ratchet doesn't mean anything unless the market goes up at some point, and the guarantee gets ratcheted up.

After seeing that we had to talk a little more about some alternative reserve methods, we found that another approach would be a modified Keel Method. The Keel Method works great for a lot of the benefits, but there are other methods that we could try. However, we've tried an awful lot of these immediate drops grow at something, then drop various places, and tried a lot of different iterations on what could be done. None of them seemed to do all that great of a job for an annual ratchet type GMAB.

Another possibility would be some type of an integrated CARVM with multiple scenarios. Maybe we would require everybody to do 1,000 stochastic trials on each of their policies for the valuation and take the 85th percentile. That'll take everybody a very long time on their computers, but that'll give us the right result, and obviously it is not going to be reasonable. Another approach would be a New York 7 type approach in which we would have seven fairly bad scenarios or fairly stressful scenarios. You would take the greatest of them. That's just kind of an extension of the modified Keel. None of these seem to do all that great of a job with some of the benefits.

Another approach is an Actuarial Guideline 35 type approach. This is the equity-indexed annuity reserving where you're looking at the value of the option that you're guaranteeing. With a GMAB, you'd be trying to value the put option and what that is. That would somehow get incorporated into the reserve. We've had a lot of discussions about this in the task force, and this could work very well in certain instances. The problem is that for a lot of these benefits, there is no option that can be purchased to perfectly hedge these benefits as you can with an indexed annuity. Companies aren't purchasing these options or any options, oftentimes in order to hedge these. Many companies are going naked on these, and so the concept just doesn't work quite as well for these benefits as it does with an equity-indexed annuity. However, if a company were doing a very good job, and they had a benefit that could be perfectly replicated by buying an option, then the Keel Method would actually not work very well. They would have this asset that perfectly offsets their risk. They would have to hold that at market value, and then they'd have this reserve on the other side, which is based on the Keel Method, which is completely separate from that. They would potentially have a lot of income statement volatility when they're really doing a good job and shouldn't be forced to have that income statement volatility.

Some other possible methodologies would be an integrated CARVM similar to what we just showed but where the valuation actuary is essentially charged with coming up with a Keel Method that works for their particular benefit. It would be your responsibility to say we've come up with this very innovative product, and we're going to use this deterministic stress test scenario in order to do our reserving and sign a certification saying, yes, we've thoroughly tested this, and this is appropriate. This is kind of a catch-all. We can't anticipate what is coming in the market. We've got to put some responsibility back in the valuation actuary's hand and make them responsible for coming up with a potential methodology.

Some other options would be cash-flow testing. UVS is out there, and there are a lot of changes going on in the valuation world. It could be that several years down the road this reserving methodology will just be tied in with that, or you could use a combination of the above. You'll have to use the Keel Method for certain type products or where you can demonstrate that it calculates a sufficient reserve. Then you have to use a different method if it doesn't work well. There are some other things that are being considered at this point, too.

What are the next steps for the task force? We're going to test the Keel Method a little bit more with the GMIBs, and so our hypothesis is that the Keel Method is going to work pretty well for roll-up type GMIBs. They're analogous to GMABs. There's really not a lot of reason why they shouldn't. But the annual ratchets are probably going to present a problem. This is where quite a bit of testing is going to have to occur. We intend to investigate the combination of GMDBs with some of these living benefits and see if the Keel Method or whatever the methodology is can also work on the DB side. We intend to ask LHATF for some guidance on some of the other alternative methodologies that I've presented. Do we need to come up with a methodology that works for absolutely everything or can we come up with something that will work just fine for the products that are currently in the market. Somebody's going to come up with something, and it's not going to work for that. That's just the nature of reserving. We also need to determine how reinsurance is going to affect these benefits, and that really hasn't been talked about all that much. It would probably be adequate to follow a AG 34 type methodology, but that's difficult to say at this point.

In conclusion, what I want to say is that the Keel Method is still out there, and it still works very well for a lot of the benefits (although there are a few in which it doesn't) that are in the market right now. We are still pursuing a few other methodologies, but that's basically the status of the task force at this point.

FROM THE FLOOR: I have a question regarding GMIB, even though you haven't talked too much about that. On the pricing side, like when you do the GMIB, you have a gain generated from between the guarantee interest and the annuitized interest rate. When you're doing the valuation calculated reserve, are you going to factor that gain into the calculation?

MR. HILL: Yes, you would. When you are calculating the net amount at risk, the Piece X that I was demonstrating, you would take the benefit base which is a 5% roll-up type of a number times what I usually call like an annuitization factor, which is the relative value of your guaranteed annuitization rates versus a valuation interest rate is what would be done on the valuation side. You would essentially take the present value of the annuitization factors that you guaranteed and discount based on valuation interest rates and valuation mortality. That typically gets you a number that says the relative value of the guarantee versus annuitization rates is about 70–75%. You would multiply that times your benefit base, and that would be the true cost of that guarantee.

FROM THE FLOOR: So if you are using the stochastic model, your current interest rate is basically generated stochastically as well?

MR. HILL: That's right. That's what our model does when it calculates the target.

FROM THE FLOOR: I assume that you're using the 100% utilization rate in the calculated reserve.

MR. HILL: That's also true. I mean it's a true CARVM methodology where the customer is going to act in the worst possible way for the company on a present value basis. If that's 100% utilization, which it oftentimes is with the GMIB (so as to give you the greatest present value), that is what would be assumed.

CHART 1
5% Roll-Up vs. 1987 Stock Market

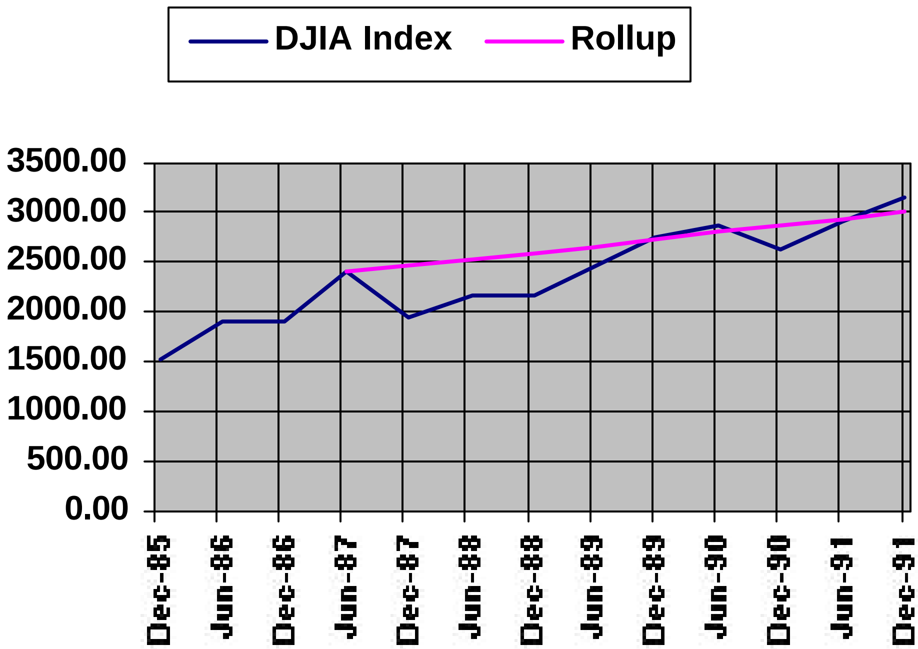

CHART 2
VAGLB Task Force
Keel Method

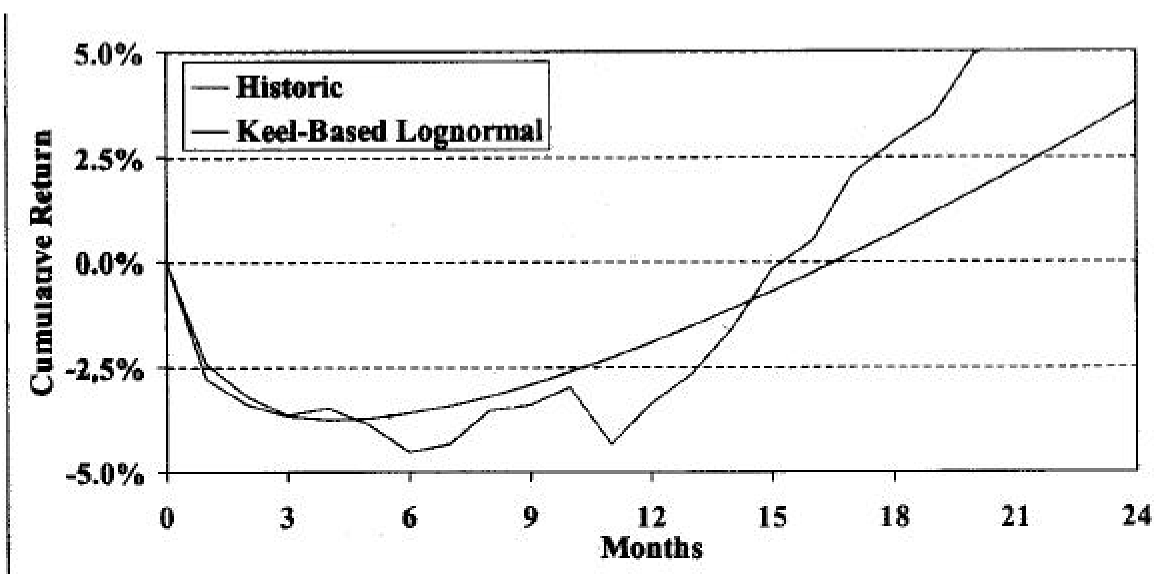

CHART 3
VAGLB Task Force
Keel Method