

**RECORD OF SOCIETY OF ACTUARIES
1995 VOL. 21 NO. 2**

VARIABLE ANNUITY GUARANTEED MINIMUM DEATH BENEFITS

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Panelists will examine the structure, cost, and reserving practices of variable annuity guaranteed minimum death benefits.

MR. PHILIP G. JOHNSON: I'm currently a senior associate actuary at John Hancock Mutual Life in Boston. I work in the life annuity product management area, and my primary responsibilities right now are pricing and design of our variable annuities. I have to admit that I've been in the position for only about six months. We had a reorganization last November. I spent about 14 years on the life side, so this is all relatively new to me. Every day I've learned something new, and I'm sure that this session will be no exception.

Variable annuities with minimum death benefit guarantees is a very hot topic. More and more products are being rolled out in the industry with this particular feature just to stay competitive. There have been numerous articles in various actuarial and industry trade publications, and it seems to be a current topic at these particular SOA meetings.

When I was first asked to moderate this, I wondered why this particular issue is so controversial. And after having done a little bit of research, it seems as if my sense of it is it runs the gamut from the very basic issues—pricing, reserving, and reinsuring—to the more theoretical issues of, does this stay within the annuity balance, does it cross the border into life insurance, and do customers want and understand this particular feature?

To help us sort this out are Abe Gootzeit from the St. Louis office of Tillinghast and Mike Pado from North American Reassurance in New York City. Each will share his own unique perspective on this particular topic.

Abe Gootzeit will be our first speaker. He has been a unit manager in the life and health area at Tillinghast in St. Louis for the last eight years. He's also a member of the Society of Actuaries Task Force on Mortality Guarantees and Variable Annuity Products.

MR. ABRAHAM S. GOOTZEIT: I think it's remarkable that we're dedicating entire SOA discussions to this one product feature. There was a series of sessions in New Orleans on this topic and an interview session in 1994 as well on this minimum death benefit guarantee issue. However, I think this particular issue deserves this kind of attention, so my remarks are going to be concentrated in four areas. The first is some of the history of the development of guaranteed minimum death benefit (GMDB) provisions. The real heart is the second section, which is analysis of cost and volatility. We'll then look at a numerical example that displays some of the quantitative analysis that we have conducted.

Variable annuities have become increasingly popular with the insurance community over the years. Annuities are a sensible way for insurers to compete with mutual funds and other low-cost distribution channels, which is really a challenge for us. We can issue variable

annuities on a risk-controlled basis. Theoretically, we pass along all the interest rate, default, call, and prepayment risks, and so on to the consumer. (At least we were passing on all the risks until we took on this new mortality risk.) Of course, sales have been fueled by a healthy stock market over an extended period. Even with the minor correction that we had last week, stock prices are still up approximately 20% since the 1994 low, which happened, I guess, in November or December. Stock prices have been increasing for many years, and this has led to remarkable growth in the variable products, both in sales and in number of companies in the market. Now the rate of growth has slowed somewhat in 1994, but variable products are here to stay, and I'll preface that with, "as long as the tax-deferred treatment of those contracts remain."

Why are these products so popular? Benefits of variable annuities can be found for both insurers and customers. For insurers, of course, there can be low and fixed distribution costs, especially if we have distribution through marketing organizations or that kind of thing. Of course, there's an absence in interest rate risk, default risk, call risk, prepayment risk, and all those kinds of things. For customers, the tax-deferral treatment is the most highly compelling issue. However, the second item is access to funds. Many insurers make a variety of funds and families of funds available to their customers, and most variable annuity sales are not sold to affluent customers. They're sold to people with incomes of \$75,000 or less. Our distribution channel is really doing a good job in making these products available in this income bracket. So we really are in a niche marketplace, which is slightly different from other comparable products.

Now insurers do have to pay a price to be in the variable annuity marketplace. The regulatory activities are becoming more well defined. There are state and SEC regulatory burdens, but approval is now becoming much more routine. The administrative burdens now are being handled increasingly by the use of TPAs, especially for new entrance into the marketplace until an economic scale is reached. That has reduced the administrative burden for many companies.

There is, however, a need for insurers to affiliate with broker/dealers that are in this marketplace and, of course, we need to attract distribution outlets. And if you are trying to sell variable annuities through your own captive or tight agency, then, of course, you need to register those people. But the scenario, obviously, is attractive and compelling, and an increasing number of insurers are in variable annuities these days.

That's really the backdrop; we're in a competitive marketplace. There's not much differentiation among these products. Insurers have found ways to differentiate their products, and they have done that before when they've introduced rational products that are a good deal for the customer and are also easy to maintain. Of course, they differentiate the heck out of the thing until they can't understand anymore.

So the minimum death benefit provision evolved kind of in this order. We first included a death benefit, which is equal to return of premiums. This benefit wasn't in effect during early policy years when there was an existence of a surrender charge or an imposition of a policy load. That didn't really do very much, so we needed to be a bit more clever. The next design enhancement was the payment of the fund value rather than the surrender value

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upon death. And again, that wasn't very much. We were just waiving the surrender charges.

I guess the most important enhancement was the introduction of this ratchet. Insurers were noticing that agents and customers could roll their policies to new contracts at the end of the surrender charge period, and the death benefit would be equal to the new fund value. Now, of course, there would be a new commission paid to the agent, so agents were encouraged to use this rollover. There would be a new death benefit for the customer, so he or she would be encouraged to roll over as well. There would be an imposition of a new surrender charge, but for customers with long investment horizons, that really didn't matter. So the first ratchet was with the end of the surrender charge period. We had reset the death benefit equal to the current fund value.

We next have compound growth or roll-up. We guaranteed that upon death the return would not be less than premiums accumulated at a fixed interest rate of 4% or 5%. Then we were resetting on a multiple number of times every five or seven years. And now, of course, things have really gotten out of whack. We have combination benefits. We have daily ratchets and all sorts of things that I'm sure people are dreaming up now. So it really is getting out of hand.

The one up in competition has begun in earnest. We have these generous GMDB provisions that provide a differentiation feature for new entrants. It's the only thing that you can talk about generally for product features. Funds, of course, are important, but as far as the features go, the death benefit is the only thing that we have. These generous provisions essentially were requested by stockbrokers, and they didn't really recognize the impact on cost or volatility. Of course, insurers are the ones that decided to comply with those requests.

Of course, consider the variable annuity market. This is not the first time that we have marketed attractive consumer-oriented products with a control risk profile. It's not the first time that we've introduced features such as these generous GMDB provisions of marginal importance that contain risks that are difficult to measure and nearly impossible to control. That sounds kind of ominous.

Let's see how we come up with that conclusion. This part of the presentation will cover the analysis of cost and associated volatility. This is going to lead up to the example. So this particular section will look at the manner in which we analyze the cost in volatility. The next section will look at the specific numerical example.

So the generalized approach in the analysis of cost and volatility involves really a number of different steps. The first is that the calculation of death claims is based on the net amount at risk. The net amount at risk is the difference between the death benefit in effect and the fund value. That number often is zero. It's only positive if you have a declining fund value. So the real risk here is that fund values will decline or not go up quickly enough.

The analysis is conducted over multiple investment scenarios that represent potential investments of the separate account. The scenarios are modeled based on the characteristics

of the underlying funds, such as domestic equities, domestic debt, or those kinds of things. You want to make sure that the scenarios are sensitive to the characteristics of the underlying fund. And there are some standard actuarial assumptions for things such as mortality and expense (M&E) charges, lapse rates, mortality, and the rest.

A number of approaches to the investment scenario development have been suggested. This is really the critical assumption. And it may be fair to say, if you go through the literature from the last couple of years, that for the articles that have been written on this topic, most of those articles are involved in presenting and defending these particular approaches. The first approach is the normal distribution, and that assumes independence of movement from one period to the next based on the mean and standard deviation of historical movements of capital markets. Keep in mind that independence, because some of the other theories don't like that independence of movement.

The second approach is to treat the GMDB as a series of put options that are exercised upon the death of the annuitant, if you like. And then that series of put options are usually valued by using variations of the Black-Scholes pricing formula.

And the third one, which I've seen recently, is the Symmetric Stable Parentian distribution. That's a family of distributions that have fatter tails than the normal distribution, which is really significant. Some people say that this Symmetric Stable Parentian distribution family is a good model for death in equity markets. Naturally, of course, Tillinghast does something different.

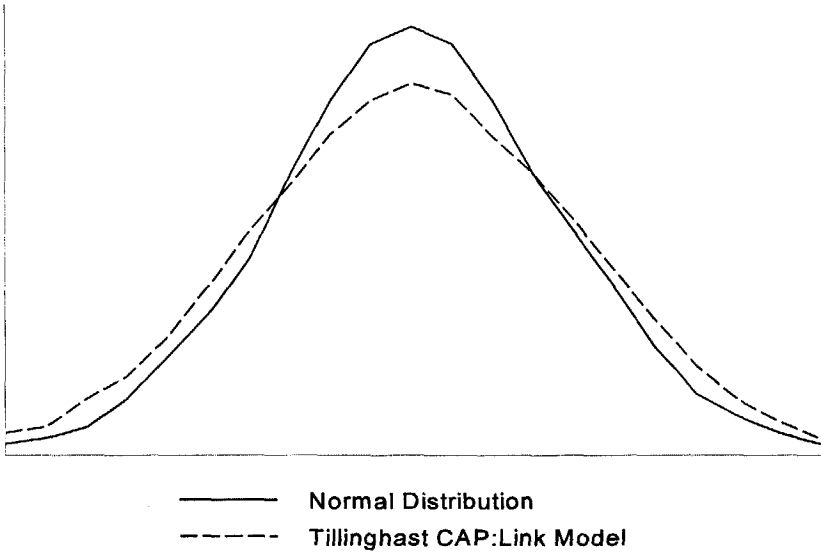
It's not the only approach that's available, but the one that we've used most recently is based on Monte Carlo simulation techniques. And the key characteristics of developing new scenarios are as follows. We use multiple future paths for each underlying fund type. In other words, we've done many scenarios. And we want to have characteristics that are germane to each of the individual funds. Now the movements among the different funds are correlated. So if you have a bond fund and an equity fund and you have some people in each of those, then you get correlation.

Capital market projections are linked to interest and inflation rates historically. But the important thing is that there's this serial correlation. Capital market projections are serially correlated. It's a phrase I just recently learned. Up and down movements are positively correlated. If you're in a market when the market is going up, the next movement is more likely to be up than down. So that's a part of the theory and it tends to make for a more representative set of scenarios.

Chart 1 is a depiction of maybe a typical normal distribution of what the Tillinghast CAP:Link model would produce. The one that we've used has the fatter tails as does the Symmetric Stable Parentian distribution. And that is important because the tails are where all the action is. So you want to make sure that you get the tails right. This is one of those places where it really doesn't matter what happens in the middle because most of the time the value of the death benefit is zero. So analyzing the tail becomes the critical part.

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CHART 1
DISTRIBUTION OF INVESTMENT SCENARIOS FROM
TILLINGHAST CAP:LINK MODEL COMPARED TO
TYPICAL NORMAL DISTRIBUTION



Capital market projections are measured on what we call both normative and initial-conditions bases, and that becomes important as well. Normative conditions reflect economic and capital market expectations over a typical time period. The projections are not biased by any current conditions. Initial conditions projections attempt to identify conditions that are reflective of the next period. So if current conditions are such that the market is rich, then some people subscribe to the theory that the market will go down relatively further than if it were in a normal kind of situation.

Most people who subscribe to this theory would agree that the markets right now are rich. That means that if you subscribe to that theory, the initial-conditions scenario would produce projected scenarios that are not rising as quickly as normative conditions. And that would generally produce a higher cost in volatility. So the selection of normative or initial-conditions scenarios will have an impact on the cost.

Let's look at an example. This is a specific example that builds on what we just discussed. Of course, we need assumptions underlying the example, and there are many assumptions. We generated many scenarios based on this CAP:Link model, representing domestic equities from this example. We have a 20-year time horizon. We must look at initial-conditions scenarios as of the end of 1994, which is different from initial conditions as of May 22, 1995.

The GMDB we're using is a six-year ratchet, which means that the death benefit is not less than the fund value at the end of the prior six-year period. We're doing a new business

model that is 60% male and 40% female; we're using four different issue ages on average. That turns out to be about 59.5. And we're using standard assumptions for all sorts of other things.

Table 1 shows major fund assumptions. We're looking at domestic stocks, domestic bonds, and a diversified mix. We're looking at the annual return and standard deviation on both the initial conditions and the normative scenarios. These are some of the major assumptions that are used in the development; they are not the only assumptions, but they are also some of the major assumptions.

TABLE 1
MAJOR GMDB FUND ASSUMPTIONS

	Initial Conditions		Normative	
	Annual Return	Annual Standard Deviation	Annual Return	Standard Deviation
Stock	9.5%	16.9%	11.4%	16.0%
Bond	7.4	8.5	8.4	8.3
Diversified	8.5	10.5	9.9	10.0
Stock fund is our base assumption				

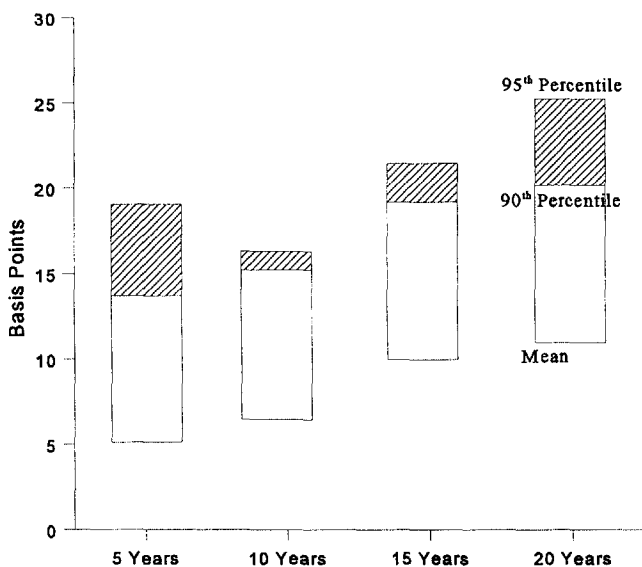
The annual returns in volatility of the bond fund are lower than the stock fund. That makes sense if it's historically based. Also, look at the standard deviation of the diversified fund. Let's say that under the normative side if you look at diversified standard deviation, it's 10% on the diversified, 16% on the stock, and 8.3% on the bond. So the diversified actually has a smaller standard deviation than the average of the stock and the bond, and that's because of the correlation between those funds.

When we do this work, we'll look at results, and we can typically look at results in a number of ways. We look at them in two ways. The first is to aggregate annual cost, and that's the discounted value of the cost of the GMDB divided by the discounted value of the fund in basis points. In other words, that's kind of the average cost over a long run, and we'll look at that. Then we have the year-by-year cost, and the year-by-year cost that we'll see in a bit will be more volatile. The year-by-year cost is the annual ratio of the cost of the death benefit divided by the fund in basis points. And, of course, because we're doing many scenarios, it's useful to look at this on a ranked basis.

We've run these thousand scenarios based on all these assumptions and methods, and we're now looking at the aggregate annual cost in basis points (Chart 2). We're looking at it in aggregate over a 5-, 10-, 15-, and 20-year period. We plotted some of the rank results: the 95th percentile, the 90th percentile, and the mean. The mean is the average. Again, remember that the median is probably zero because most of the time it doesn't have a cost. But on a mean basis, of course, there is a cost.

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CHART 2
AGGREGATE ANNUAL COST IN BASIS POINTS
BASELINE ASSUMPTIONS

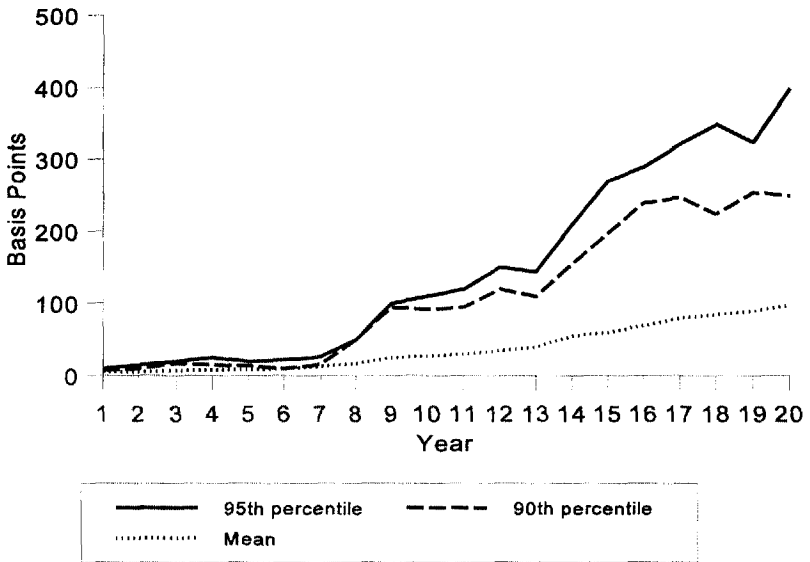


Let's just look at the 90th percentile. Going over a period of 5, 10, 15, and 20 years, the cost increases from approximately 14 to 20 basis points. And the mean only goes from about four basis points to nine. So in this depiction it really appears that costs look reasonable, and variations are modest. That's on average for a period of 5 years, on average for a period of 10 years, on average for a period of 15 years, etc. So if you look on average, it doesn't look very scary.

Chart 3 shows the year-by-year cost. It is the exact same example. Again, we're plotting year-by-year costs, the mean, and the 90th and 95th percentiles. There's a sawtooth pattern, which is another one of my favorite phrases. After the reset, at the end of the 6th year and the 12th year, there's an increase in cost because we're resetting the death benefit to the fund value at that time. So the death benefit goes up in some cases.

The year-by-year costs tend to increase with time, so let's just look at a few numbers. There is enormous volatility. In the tenth year, there's a 10% chance that the death benefit cost will exceed 90 basis points of the fund. And in the 15th year, there's a 10% chance that the death benefit cost will exceed 175 basis points. That's a great deal of volatility. That's a big number. And this is just this ratchet. Other designs have more volatility and more cost than this. On Chart 2, it looked as if things were costing 9 basis points and 14 basis points on average over a period of time between 5 and 20 years. But Chart 3 says that if you look at any one year, the volatility is considerably larger than that. And I think that's where the fear factor is ranging.

CHART 3
YEAR-BY-YEAR COST IN BASIS POINTS
BASELINE ASSUMPTIONS



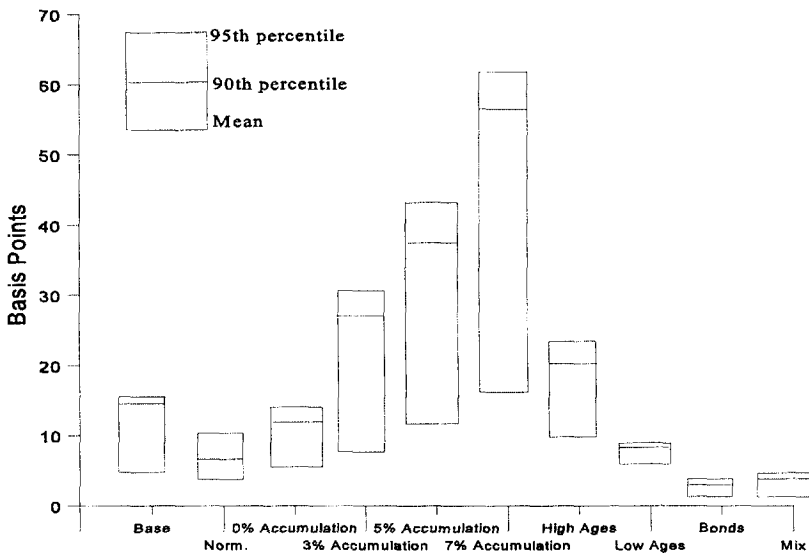
Like any good Tillinghast presentation that has an example, we need to do sensitivity testing. So we'll do some sensitivity testing that we think is indicated. We'll look at normative conditions rather than initial conditions. We'll look at some alternate GMDB provisions, different age distributions, and other funds; that's all summarized on Chart 4. You can see the base with the first bar. I've examined the base, both in aggregate and on a year-by-year basis.

We look at other designs, particularly a 7% accumulation design, which is much more expensive. So as you get into these designs in which the death benefit is equal to the premiums accumulated at a fixed interest rate, such as 7%; that's much more expensive than the base. And it's very sensitive to age distributions as well. If you get an age distribution that is slightly higher than what you think, you can have, say, double the cost that you might have planned for.

The bonds are very low, and the mix is less than the average of the stocks and the bonds. Those are the last two. There are some variations there to examine. This is the ten-year aggregate annual cost. So the year-by-year cost, again, will have significantly more volatility.

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CHART 4
TEN-YEAR AGGREGATE ANNUAL COST IN BASIS POINTS



There are some other things that we'd like to do. Actually, I should say that Tillinghast is anxious to do more testing. Thus far, all the analysis that we're doing is on a buy-and-hold basis. But typically, investments are much more active than that and we don't make intelligent decisions. If you're anything like me, you don't make intelligent decisions. Making bad investment decisions with this particular design increases the cost of the guaranteed minimum death benefit. So if you consumers do that, that will increase the cost. I don't know how you actually analyze that. We have some ideas.

Some investment houses are proposing the purchase of hedge investments, such as Standard & Poor's 500 puts. This applies not only for domestic equities, but also for all the various underlying funds and all the characteristics. I'm not quite sure how the S&P 500 puts, which I understand are the ones that are most readily available, will hedge other funds. Those are several things we'd like to look at.

Insurance people are just beginning to understand the cost and the volatility associated with these provisions. Even though there have been a number of articles, I don't think they have generally become part of the community yet. The risk profile is difficult to analyze and measure. The cost depends on a large number of factors, and the results are highly volatile, unpredictable and, most importantly, they're nearly impossible to manage. You are going to experience the difficulties in managing and analyzing the cost of GMDB.

However, there are several more intelligent ways to approach these provisions. We shouldn't have them, but that's going back, and we can't go back and undo what we did. There are some things we can do, I think, to manage this better. We can restrict or limit

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the effect of these provisions by issue age and/or attained age, and many companies do that. Loads right now are not assessed based upon individual ages of the participants or the characteristics of the fund, and there's no reason why that can't be done.

We can consider reinsurance and/or investment hedges with due regards to the reinsurers here. I'm not necessarily sure that the reinsurers know any more than the rest of us, but they are providing reinsurance. So we'll listen to see if North American Re knows more. But there is, I believe, an active reinsurance marketplace, and that's the reason why Mike is here.

You should also make sure that the GMDB pricing is flexible enough to reflect current market conditions. Again, going back to that normative and initial-conditions thing, the cost will change depending on when the premiums come in. Carefully analyze your GMDB provisions, weighing the value of generous provisions against the added cost risk and volatility.

MR. JOHNSON: I'm not sure if I feel good or bad about that. I guess I wish I had a crystal ball to look ahead about 15 or 20 years to see what actually transpires.

Mike Pado is a marketing actuary at North American Reassurance. He's responsible for all aspects of reinsuring the GMDB within North American Re. He is also on the SOA Task Force on Mortality Guarantees and Variable Products.

MR. MICHAEL W. PADO: I would like to review the guaranteed minimum death benefit from an options perspective. That is, I would like to discuss the risk characteristics of this unique benefit that Abe described, and ultimately how annuity writers have, in effect, constructed a very complex option. Also, I'd like to explore what options are available to annuity writers in terms of trying to manage the risk that they have now taken on. So we have options from several different perspectives.

If you get into option terminology, in any sense of the word, one of the first things you'll encounter is counterparties. In the first instance, the annuity writers and the contractowners can, in fact, be viewed as counterparties in the sense that if the annuity writers do anything to manage this risk in terms of entering into a bank-based hedging program or entering into a reinsurance agreement, they'll have additional counterparties to consider, that being the bank and the reinsurance company.

Before getting too far along, I'd like to just alert you that I have attended the Society-sponsored seminar, "Interest Rate Derivatives," given by Prakash Shimpi and Joe Koltisko. In applying what I learned there, I believe I'll prove, beyond the shadow of a doubt, that a little knowledge can be a dangerous thing.

It turns out that from this options perspective, the annuity writer has accepted considerations from the contractowners, if you'll look at that in the aggregate. They provide something called an embeddo. According to the *Chase Guide for Risk Management*, an embeddo is an option embedded in a financial instrument that affects its redemption. Let's look at what some of these embedded options are.

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In essence, the annuity writer has agreed to accept from the contractholders, considerations in terms of not only their premium dollars, initial and subsequent premium dollars, but also extracted M&E charges, administration charges, and contract fees. In the process, they give the contractholders a variety of annuity investment options, and the investment advisors take their cut.

In the end, they provide the contractowners with what I call a basket of benefits. One is the tax advantage, the account value that Abe spoke about earlier. There's also a cash surrender benefit, an annuitization benefit and, of course, the guaranteed minimum death benefit.

Let's focus on the *guaranteed minimum death benefit* instead of just considerations. The annuity writer is extracting a mortality charge that can be considered as an option premium, and it will provide the contractowner with a guaranteed minimum death benefit that would be the option payoff. Let's examine option payoff in greater detail.

It turns out that in return for getting the mortality charges, the annuity writer must provide the guaranteed minimum death benefit. You can see through some very high order algebra ($AV + [GMDB - AV]$), that what the annuity writer is giving back, if you look at the first part of that equation, is the account value. Well, that's something that the contractowner owns to begin with, so it's not much of a cross there.

It's the second piece, the guaranteed minimum death benefit less the account value, that gives rise to all this cost volatility. So we call that the mortality risk amount. In essence, if you're worried about surrender charges early on, you might subtract cash surrender value from the guaranteed minimum death benefit.

Let's look at the option payoff profile (Table 2). Given that the definition of the mortality risk amount is the guaranteed minimum death benefit less the account value, what you have is a situation in which your payoff under the option is certainly dependent upon both mortality experience and a cumulative investment performance.

TABLE 2
GMDB OPTION PAYOFF PROFILE

		Mortality Experience	
		Favorable	Unfavorable
Cumulative Investment Performance	Good	0	\$
	Poor	\$\$	\$\$\$\$\$

The upper left-hand side purports that if cumulative investment performance is good enough and outpaces your guaranteed minimum death benefit definition, the option is simply out of the money and there's nothing to pay. Obviously, if it's not as good and the mortality experience is somewhat unfavorable, you'll have to pay out. In the end, if you have poor investment performance and unfavorable mortality, you have to pay out quite a bit of money.

As an example, suppose you had about a billion dollars of premium to start (that's not unusual in this market, especially with the in-force business), and the guaranteed minimum death benefit is one of those 5% roll-up benefits. So one year later you have \$1.05 billion and the market has a 10% correction. You're down at \$900 million where risk in that is \$150 million. Include the surrender charge and you're up to \$220 million.

It just strikes me that it's unusual that people have gotten into the variable annuity market to basically get away from the investment risk, but they now have taken on a very hard-to-manage mortality risk. So again, the flow is here. The annuity writer is receiving mortality charges and if you divide by the account value, that's basically a fixed flow, and it is paying off realized mortality costs which, in effect, are floating.

Let's examine the factors affecting the mortality risk amount. I won't spend much time on this. Abe spoke about the varying types of guaranteed minimum death benefit designs. All I'll say is that, from a reinsurance perspective, it seems that there continues to be a lot of product innovation on this front. So you'll see various combinations of this, and some new fangled ideas as well.

From the account value side, obviously, one thing that affects the account value is net considerations. Except for some minimum and maximum dollar amount limitations, the contractholders have virtually unlimited options as to the size and timing of their considerations. That, in fact, makes it a little bit hard to manage if you have the risk.

In terms of the contract charges, Morningstar, as of April 30, 1995, indicated that the average mortality and expense charge was a 111 basis points. The average administration fee was 24 basis points. The average investment advisory fee was 77 basis points, and the contract fees were \$26. And this was based on 1,952 subaccounts. I'm not sure how many products were underlined, but they were all variable annuities.

In terms of the surrender charge, we've most typically seen a decline in surrender charge from 7% to 1% in about as many years. And in terms of the investment allocations, it's not unusual for an annuity writer to align itself with four or five different fund families and offer four or five accounts per family. In the end, you end up with domestic and international equity funds, domestic and international fixed-income funds, money market funds, as well as fixed accounts and modified guaranteed annuities (MGAs). So, here again, you've offered the contractholder an unlimited option as to the initial and subsequent investment allocations.

So to go back to this option framework that we've been using, in looking through the SOA interest rate derivatives, I was able to describe guaranteed minimum death benefit embedded as a long-term Asian-style automatically exercising path-dependent naked-basket option. It's a good thing.

Let's review each of these descriptions in a bit more detail. It's long term in that once you write the business, you're on the hook until the earlier of surrender, annuitization, or death. All of those are variables, obviously. It's also what I'd call Asian style in that the option pays the difference between the average rate of an underlying compared with a predetermined strike level. And in that regard, I would think that as a direct writer you're more or

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less interested in what happens to the market over various reporting period cycles. On a quarterly basis, you're kind of interested in what happened over that time period; not on a per-contract level, but on your whole book of business, and that's why it's the average rate that I'm using.

In terms of automatically exercising, it's simply exercised by death. It's either in the money or out of the money. It's somewhat path-dependent as well in that the path is directly related to the price of the underlying during the option's life. Well, we've just described the option's life as virtually infinite, and on a per-contract level, it really is dependent upon what each individual contractholder does. Contractholders come in at different points in time with different amounts of money and make different investment decisions. So, in essence, each contractholder is in a unique performance path that makes the risk a little bit more difficult to manage. It's also naked in that, if you accept it, you've written an option until, if you've done nothing else, you really have no offsetting position in the underlying, as it were, and that's referred to as the naked option.

Last, the reference to basket option is that the payoff is dependent upon a basket of currencies, equities and/or bonds. That's just a result of all the investment options that we've given the contractholders, but what really matters is the aggregate performance of all those different funds until the date of death; that is, from issue to date of death.

Let's see what options are available to annuity writers to help manage this risk. Everyone says that you can hedge the risk, so let's examine what that means. It turns out that the annuity writer can contract with the bank, or more than one bank, and try to get a basket of options that offsets its particular position; in effect, allowing you to hedge the risk that you've assumed from the contract owners. The annuity writer will pay a fixed charge, and the option dealer will pay off the floating amount: one that is related to investment performance and not mortality experience.

It is important to examine this arrangement and see what you're getting in return for your premiums. The hedge payoff is a notional amount times the difference between some index and a strike level. Now I have a projected notional amount. You have to actually project the mortality cost on the book of business over some course of time. That includes the amount and pace of new business writings.

You also must reflect in that the age and sex profiles of your business, and they may change over time. It has been standard to use 60%/40% for the male/female mix and somewhere close to age 60 for the average issue age. But I can assure you after having looked at a great deal of blocks of business, that it does vary, and you must be aware of that. Also, you must make educated guesses as to the lapse and mortality rates that will be experienced in the future. And while Abe mentioned that the term *standard actuarial assumption* has been becoming somewhat standard in use, there's really little, if any, mortality experience to support that to date.

Moving on down the formula, as it were, you have the difference between the index and the strike. In looking at the term *index*, I really should have said indexes because what you need to be paid off on is some basket of options, not just an equity; not just a fixed income, but some combination of the two. If you're looking for indexes, which one do you pick? In

terms of the equity indexes, you could have picked the S&P 500, the Dow Jones equity index, the Wilshire, Russell, and NASDAQ indexes. How do you know which one to pick? In terms of the fixed income, do you look at the Merrill Lynch corporate bond index or the Lehmann Brothers long term, or do you try to construct some sort of synthetic bond index? If you do that, should you go long or short in terms of the duration of that index? It's quite a complex task.

Last, with regard to the strike, the strike rate is a little bit simpler, at least for the roll-up benefit. It's clear that your investment performance needs to outstrip the guaranteed minimum death benefit definition, plus the contract and fund charges that are embedded. So if you had a 5% roll-up, contract charges of 125 basis points and fund charges of 75, you'd need to get an excess of 7% long term to be out of the money with respect to the mortality option.

So it's clear that hedging mitigates your risk, but it cannot eliminate it. Let's see what you're left with. In terms of trying to manage any financial risk, if you went into a bank-based hedging program, you'd certainly have the counterparty risk that I referred to before, and you'd also have the basis risk. Now the first four— age, sex, mortality, and lapse—are what I'll refer to as modeling risks. You must project notional amounts if you're going to enter into a bank-based hedging program, and you just have to accept that when you make that call with respect to that.

We just talked about the indexes. If you feel good about the indexes that you've chosen, there's still a correlation component that you must consider. You may not want to. If you have a 60/40 portfolio, you might not want to buy a 100%-hedged program because of the correlation factor. And also, the last three are the fund risks, if you will: the fund offerings, the fund allocations, and the fund charges.

The fund allocation is important in that you've had to make some assumption going into this that when you enter a hedging program there would be some mix of business. If that happens to change going forward, either from a new business perspective, or just your in force moving the business around, your hedge and fund charges may be out of whack. If it turns out that the investment agreement allows the fund manager to increase its charges, it will have somewhat of a negative effect on you as well. So you must protect against that.

In terms of hedging costs, in our discussions with various banks it's hard to actually enter into a hedging program unless you have board resolution to do that. More explicitly, you must pay the option premiums over the course of time. Next on the list is compliance. You must, if you enter into a hedging program, file a program with the insurance department of the state in which you're domiciled, and you have to find that to be acceptable and in compliance with the insurance regulations.

A great number of special accounting rules are involved with entering into a hedging program. I'll just go through a few of them. With respect to statutory reporting, all exchange-traded futures and options must be reported on schedule DB. Over-the-counter derivatives must be disclosed in footnotes, and interest rate swaps must be included in the risk-based capital (RBC) sensitivity test.

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You'd need to take account of *Statement of Financial Accounting Standards (SFAS) 105*, which deals with off-balance-sheet risk. *SFAS 107* deals with fair value of financial risk and *SFAS 115* deals with mark-to-market rules. And I understand that you need to also have management discussion of derivatives in your 10K statements.

Last, but not least, there are some tax implications. The relevant code in terms of qualifying hedge is 1.1221-2 and 1.446-4. A gain from a qualified hedge is treated as ordinary income and not a capital gain or loss, but you must comply with this tax rule. Of course, there's the cost of dynamic rebalancing. You can't really enter into the hedge program on a one-time basis and hope that everything works out. As you write new business, your projected notional amounts change over time and you constantly have to rebalance for everything that you're now aware of. Part of the problem, though, is if the market has a severe correction, you may be in somewhat of a tight spot in terms of being able to afford the coverage at that time.

Another little aspect of this as well is that the market for long-term options is kind of thin. So it's been my observation that you can enter into hedging programs at a somewhat reasonable cost for a period extending five to ten years. Beyond that, it's not too affordable. And so you have this mismatch, in essence, of having assumed a long-term liability, and you only have a short-term methodology in terms of trying to balance it. And, of course, you have the tracking error, which is simply if you're wrong, there's a little bit to pay for it there.

The other alternative to managing the risk is to reinsure it. It's a similar concept to entering into a bank-based hedging program except the one major difference is that you're paying a reinsurer a fixed premium, depending on your program, but a relatively fixed premium, and you're getting back your mortality cost. So there's really no basis risk there. It's a one-for-one match, and the reinsurance payoff is your realized mortality cost. If someone dies and that particular contract is in a positive mortality risk-amount position, the reinsurer will pay off.

In terms of the reinsurer risk, you still have the counterparty risk, but your reinsurer will pay you back at the time that you need it. But you don't have the basis risk. The reinsurance costs are simply the reinsurance premium. It's been our observation that you don't need to get special board resolution to enter into these to some extent. It may be easier internally for you to pursue that avenue.

So, in essence, I think the reinsurance may be a little simpler approach to take a look. And I'm not really a proponent of it in absolute terms, but you must decide where you want to be on the risk profile. If you feel very comfortable with the modeling risk, then perhaps a bank-based hedging program may be more appropriate for your company. If for all the other reasons I outlined you may not want to get into dealing with derivatives, just due to the administrative complexity and perhaps the political complexity, a reinsurance program may make more sense.

MR. JOHNSON: If there's one term I think I learned here, it's probably the term *naked embeddo*. I'm not sure I've ever heard that particular term before. It's a new one for me.

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MR. JOHN W. H. TAYLOR: I have a question for Mike. Regarding the reinsurance agreements that companies are entering into, how tied are the reinsurers to maintain that great basis and that long-term risk?

MR. PADO: I can't speak for other companies because the market's relatively new. We don't really have access to agreements that we did not successfully negotiate. But my observation is that most of the reinsurance agreements do have a relatively fixed reinsurance premium for the long term. So they are taking on that risk.

MR. ROBERT J. JOHANSEN: I'm Chairperson of the SOA Task Force on Mortality Guarantees and Variable Products and can bring you up to date. We are working on a questionnaire to be sent to variable writing companies, asking them to describe their products to give us an idea of how they're handling it, what reserves they are setting up, and then we will go on from there and try to develop some kind of reserve formula or system. I think the regulators would like us to develop something that's rather simple, but from presentations, I think you can gather that it will not be very simple. At any rate, pending the receipt of the questionnaires, we are going ahead with further investigations so that we'll have something to work with as soon as we get those results.

Meanwhile, we have to make a progress report to the separate account working group at its meeting in June, and we're going to aim to get something before the end of this year. We're aiming at that, but we're not guaranteeing it.

MR. MARC ALAN CAGEN: In the absence of any guidelines at the moment, what are companies doing for reserves on this?

MR. GOOTZEIT: We at Tillinghast asked about 20 companies what they were doing. And I guess we came up with three general approaches. One approach is to look at the death benefit that's in force right now, or the projected death benefit that may be in force during the next couple of years, and handle them like a life insurance kind of reserve. The second method is to accumulate the M&E charges that were attributable to the death benefit, or were actually specifically earmarked for the death benefit, and then accumulate that. That's then available for paying claims.

And the third general method is to do nothing. The state of Connecticut, at least the way I understand it, has mandated this one-third reduction rule. It has a one-year term reserve, assuming that the market is reduced one-third as of the valuation date. I think regulators like that because it's simple, and insurers hate it because it's meaningless. I think the purpose of Bob's task force is to head off the more general adoption by the NAIC of this one-third reduction in more states. So that's the situation at the moment. And I think the primary purpose of this survey that Bob's group is putting together is really to identify what companies are doing in a more rigorous and kind of less anecdotal basis.

MR. TAYLOR: One more advantage, obviously, of Bob's task force is actually to get a reserve formula that's accepted by the states as being reasonable. You can set up reserves that are tax offsets. Right now, the cost of this product is definitely, shall we say, made worse by the fact that anything you put up in reserves is not deductible.

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MR. JOHANSEN: I might say that one of our objectives is to make sure that any kind of reserve formula we come up with will be for a tax-deductible reserve.

MR. STEPHEN A. STANLEY: It seems to me as if I have never quite understood the reinsurance of this benefit because it seems as if that's concentrating all this risk into a very few carriers. How are the reinsurers investing? Are you going to be investing in these derivative instruments that will hedge against that market risk that you're taking?

MR. PADO: At North American Re, we feel that it would be imprudent not to hedge the risk similar to what you have to do as a direct writer. We recognize that in the reinsurance agreement, you're transferring all the risk—the mortality, the lapse, and the investment risk—which a regulator would like. It's one of those few times when the whole boat goes over. But it also seems as if it would be imprudent for a direct writer to enter into a contract with the reinsurer that was not financially prudent in this regard. So you must look behind the contract and see how the reinsurer is making good.

MR. HOWARD L. ROSEN: How do you factor in the lack of sophistication of the owner of the contract? It goes without saying that one would hope that the funds are well managed, but it's clearly possible that the owner of the contract, when moving funds from one fund to another, is just making the wrong decision. And it seems to me that could also be a major risk.

MR. GOOTZEIT: I don't think the analysis has become that sophisticated yet, at least in my observation of what companies have done. I haven't noticed anybody analyzing it. Remember that's one of the things I'd like to do. You haven't been fooled on it yet.

MR. PADO: I think that companies that have been in the business for some time and that have sophisticated enough management information systems probably have been able, if they were smart enough in the beginning, to track that type of activity. We're not close enough to the market to give you a direct answer on that.

