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Bells and Whistles or Time Bombs: The Costs of Long-Term Guarantees

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Summary: For decades, insurance companies have sold products with features that seemed minor at the time. With interest rates reaching all time lows and continuing mortality improvements, have these features moved up to the major leagues? The panel discusses the risks of some of these guarantees and the potential costs. Topics include:

- *Guaranteed annuity purchase rates—how close are current rates to the guarantees?*
- *Guaranteed minimum credited rates*
- *Guaranteed bonus rates—"minimum plus"*

Mr. Max J. Rudolph: Ken Mungan was supposed to be the moderator, but he could not get back from his assignment in Japan in time. Luckily Ken had coordinated the session very well. I'm going to give my presentation, then Zenaida will give her presentation, and I'll give Ken's presentation last.

Let me introduce Zenaida Samaniego. She is a vice president and actuary with the Equitable Life Insurance Society of the U.S., where she is responsible for the pricing and actuarial support of individual deferred annuity products. Zenaida is currently Vice Chair of the SOA Committee on Retirement Systems Practice Research. Prior to that she chaired the Safe Annuity Rule Study and the Committee on Group Annuity Mortality Experience. She also served on the U.S. Department of Labor ERISA Advisory Council from 1995 to 1997. I'm an actuary with Mutual of Omaha. I focus on financial risk issues at the enterprise level.

Most of the topics that I'm going to talk about in my presentation are also included in a Life Office Management Association *Resource* magazine article from April 1999 that I wrote. Interest rates are a lot higher today than they were last fall. I think that if we had this session in August 1998 the room would have been overflowing

Note: The charts referred to in the text can be found at the end of the manuscript and in the document 9atl88ch.pdf

and my fear was that because rates have increased over 100 basis points since then that we wouldn't have anybody so I appreciate the interest. The question is, are rates low today? Over the most recent 15 years, which is when most of our practice experience as actuaries has occurred, rates have been pretty low. But if you go back into the 1950s and 1960s, rates are not low. If you compare U.S. Treasury rates against those of other stable currencies, such as those in Japan, the U.K., and Germany, the U.S. rates still look pretty high. Central banks are meeting their goal of controlling inflation, although there was a spike up in the U.S. this past month.

Over the last couple of years the federal government has really done a good job of controlling the increase in prices. For the most part, low interest rates are a good thing for us individually. We recently refinanced our mortgage and I'm sure a lot of other people have done the same thing in the last year or two. If rates went down again, I'm sure everyone would do it again. Low interest rates encourage business expansion through the low cost of debt. For stock market valuations, generally you're discounting at a lower rate so you get a higher value. It's important to note that it is probably not what's driving the Internet stock valuations right now. But there is a potential for deflation despite Stuart Varney's comments and contention that we have a new economy that we don't need to worry about, since "we have all the tools we need." However, history hasn't shown that we've ever had all the tools we need. There's always going to be something out there, and Varney talked about that in terms of event risk. We just don't know what that event is going to be or when it will occur.

Can rates go lower than last summer? I don't know, but I did hear a talk given by Richard Hokenson, who is the chief economist at Donaldson, Lufkin and Jenrette. He made the argument, and it seems like a plausible scenario to me, that there are several trends leading towards lower rates in the future. One is the Internet. With the Internet you can eliminate the middleman. Amazon hasn't made any money so far, but it has completely changed the way a lot of people buy books. We may not buy from them, but we'll go somewhere and buy over the Internet or consider doing that. This reduces the price. Hokenson also discussed demographic trends. As the population ages, people buy services rather than goods. His contention is that goods drive inflation.

Chart 1 is a really neat graph. It shows the number of live births over most of the 20th century. It's interesting to look at 1933, which is the low point for the entire century. Think about how old those people are now? Last year they turned 65. This means Social security benefits will begin for this cohort. With all these people entering the payout phase, you can see why social security issues are being discussed so heavily right now and why it will become an even bigger issue 20 years from now. A couple of other things on this graph are interesting. There is the obvious drop in births due to World War II, but there is also a blip up in the 1960s. Initially, I couldn't figure out what was causing it. Hokenson provided an answer. Exemptions from the military draft for the Vietnam War were given to parents. That's what drove that blip. People had kids so they could avoid the draft. It's very interesting.

Will rates go lower? I'm not here to tell you that rates are going to go lower or that rates are going to go higher. If I knew that, I wouldn't be here. I'd be on an island somewhere. If anybody else did know that rates were going to go down, they would go out and buy as many assets as they could and that would arbitrage rates down. There are a couple of options to explain the summer of 1998. Either August 1998 was the low point of the cycle, and we've actually already seen rates come back up about 125 basis points from that, or this increase is a blip and the long-term trend to decreasing rates will continue and no one will remember August 1998.

Let's do some audience participation. Who thinks rates are going to go lower than they were last August within the next five years? How many think that's hooey? More people voted for rates going down than rates not going down. There are an awful lot of people who don't know and you may have noticed that I didn't vote. Everyone knows that interest rates have a major impact on insurance companies, especially life and annuity writers. Anytime you're not cash-flow matched you have a duration mismatch at some point. You could be duration matched today, but if you're not completely cash-flow matched, you're going to have a duration mismatch if rates go up 200 basis points or go down 200 basis points. This is an example of convexity mismatch. I know I'm preaching to the choir here. As rates drop, assets repay just like we as individuals do with our mortgages, and the liabilities stay. If you have an annuity with a guaranteed rate of 4%, and if the best you can do someplace else is 2%, you're not going anywhere. You're going to stay as long as that company is still in business. One of the things that I've become really cognizant of in the last year is flexible premium products, especially annuities, where you can dump in as much money as you want at any time. If you have a product with a 4% guarantee in a 2% earned-rate environment, think about viatical companies looking for something to do with lots of capital. It's free money.

Another concern that I have is cross subsidization of policyholder options. It's really important that we price separately each option that is offered to a policyholder. As actuaries, we tend to look at aggregate results. The ability exists to split out mortality, morbidity, interest rate, and other risks. I think that if we don't price each separately, someone will take advantage of that. Reserve assumptions defined by law can also act as a floor on the rates that you're allowed to credit.

Ken Mungan did some very similar work to Chart 2. We'll come back to it again later because he looked at it from a different, but equally valid, perspective. We took a standard single premium deferred annuity (SPDA) product with no bells or whistles and then looked at it with a 3%, 4%, and a 5% floor. This analysis was done with a start date of September 30, 1998. We also ran the same job as of December 31, 1998, where rates had come back up about 75 basis points. The results are impacted as expected. We used 63 low discrepancy scenarios. For low discrepancy scenarios you should use 2^{n-1} for best results. We sorted them from best case (lowest cost) to worst case (highest cost) for $1,000 of SPDA account value. You can see that with a 3% guarantee only the very top five or six scenarios even come into the money at any time during these scenarios. With a 4% guarantee you've got about 20% that come into the money, but there's only a few

that you become concerned about. With a 5% guarantee, and there are companies with products that were priced when interest rates were 12–13%, everyone thought this would never hit, companies are being forced to put up reserves because this product is now in the money. If it's a flexible premium product, you can keep getting more money. You have a negative margin on this product at this point. Almost none of the scenarios are no-cost.

When we discuss other impacts on insurers, event risk comes up a lot. I can't think of a bigger event risk than a *USA Today* article. If *USA Today* has a headline tomorrow that says it's in your best interest to refinance your house, then everybody will be trying to do it. If an article says it's in your best interest to dump more money into your flexible premium deferred annuity, we don't know what's going to happen. This is new territory, but my guess is people are going to listen to that because lots of newspapers pick up articles out of *USA Today*. An example of regulatory impact is the standard nonforfeiture law with a 3% rate coded in. We need to be talking to the National Association of Insurance Commissioners (NAIC). I believe there's a task force set up to look at that to either tie it to treasuries or to the London Interbank offered rate (LIBOR) or something other than a fixed rate. When they set it as a fixed rate originally, rates were quite a bit higher than now. I'm sure it didn't even occur to them that the option would come into the money at some point. How many of us offered settlement options with 3–4% interest rates priced in thinking that's not a big deal? We don't even have to charge for that. We should have, due to the reinvestment risk. If your assets mature (say you have a block of structured settlements priced in a 12% environment), those assets are rolling over now and you're reinvesting them at 6% or 7%. That's a lot of margin to go away all of a sudden. I would guess that the reinsurers are getting a lot of phone calls on stuff like that these days.

What can you do to protect your company? Long term, there's not a whole lot you can do. You're an insurance company and risk taking is your business. If we don't take risk we don't add value so, you have to take the risk. In the short term, there are some things you can do. You can buy floor options that kick in if rates go below a certain percentage. Barrier options are kind of neat. If we go back to Chart 2, we found the worst scenarios were ones where interest rates went down initially, stayed down for awhile and then came up suddenly. You lost all this money over time because you were crediting more than you could afford to credit. All of a sudden rates popped up and policyholders left to go somewhere else. You don't have a chance to make it back up in the long term. Barrier options essentially work the same way. They don't get triggered until rates have fallen. Once the trigger is hit, then a cap option kicks in so that if rates rise by 2% or 3% than you would be paid. The other option you have is to put call restrictions and make-whole provisions on your assets, but you have to give up yield to do that. As always, there's a cost to any type of protection that you can get.

Chart 3 is an example showing how *Financial Accounting Standard (FAS) 115* can confuse the issue because it impacts the asset side of the balance sheet but not the liability side. Assets are adjusted to market value, but liabilities are not, so if you take a scenario where rates go down, your risk has increased because you have these interest rate guarantees in the product. The asset market value goes up

because rates fell. It seems like a good thing initially, but the liabilities aren't adjusted so your GAAP surplus goes up. It goes up the same amount that your asset market value went up, but in reality your economic surplus, the true value of that block, went down. At the SOA sponsored Fair Value Seminar in New York earlier this year a Wall Street analyst said that people in his profession ignore *FAS 115*. I wonder if he would say the same thing about *FAS 133.* His point was that if you're not going to do both sides of the balance sheet they will ignore it. He backed off of the position a little bit by saying that if a company owns lots of equities maybe they would look at it, but if you own primarily bonds, they just ignore it. Chart 3 represents a very simple example to show what's going on. It looks more complicated than it really is. This product is an SPDA with a 4% floor and business in force is written in a higher interest rate environment. Rates are lower, so over time, you adjust your earned rate down with the renewals as you have assets mature. Since rates have decreased, the market value of the assets goes up on your assets so you might think you're doing really well. Of course, if rates revert to the higher level, your unrealized gain would come back to zero. Essentially, all I did was pop down the rates and then left it flat like the cash-flow-testing scenario. The result is a big GAAP surplus increase initially that grades off over time, but in reality you have a negative margin that didn't show up in the accounting.

When I first started looking at interest rate changes I was planning to research the impact of increasing rates. Rates went down, so I decided to focus on decreasing rates. This caused me to think a little bit about the differences between the two. What I decided was that if rates increase you have a one-time event risk. If rates go up everybody leaves and if you survive that, which you may not, you're essentially starting over with new policies. It's a one-time event and your sales will not be impacted, especially if you're a new money crediting company. But if rates drop and stay down so that your credited rate is unsupportable, then it just keeps getting worse and worse because policyholders are not going anywhere until they die.

So is there any hope? Let's do some more audience participation. How many people in this room work on the corporate side as opposed to the pricing side? How many people work in pricing? More pricing actuaries, but they tend to sit more towards the back. It's really important for the pricing actuaries to look at these risks when they're pricing the product. Look at all the options and recognize the risks you're taking. Because, if you don't and you grant these options to a policyholder or to an asset or whatever, the corporate side can't change the contract that was written. They can inherit it, and they can manage it, but it's really important for the pricing side to take ownership. I'm really pleased to see so many pricing people in this room. I am from the corporate side, but I've done some pricing in the past as well. Insurers need to take risks. If we're not adding any value, then why would someone give us their hard-earned money? We're out there to allow someone to get a higher rate than they would be able to get by buying a bond on their own because we have the economies of scale. The dynamics should include a lot of things that we don't necessarily look at today. Most of us are looking at some type of interest rate option pricing but, as an industry, we really don't look at the distribution of mortality and morbidity. The

equity models are getting a lot better with the equity-indexed products, but I think we still have a ways to go there as well. Flexible premium products scare me to death because there is the unknown factor.

Ms. Zenaida M. Samaniego: Max ended his presentation by emphasizing the role that we actuaries have, especially those actuaries that are in the insurance industry. That is the business of insuring and managing risks. Whether you're involved in property and casualty, health insurance, life insurance, or annuities, there is some form of protection offered, whether it's premature death or saving for retirement or whatever. We invariably have an accumulation or saving phase and at the end of that period the form would change to involve a payment in the form of income or face amount of insurance at the time of death. I'm sorry to disappoint those with a primary interest in life insurance because I'm going to focus on annuities, but the concept is very similar for both life insurance and annuities.

Whether it's life insurance or annuities you are going to come across both variable and fixed options. This session will focus on fixed annuities such as SPDAs. In particular, we're going to discuss individual deferred annuities and life settlement annuities, because these are options under deferred annuity contracts that offer some guarantees at the time that you're ready to annuitize. When we talk about fixed account options we think about interest rates that are declared and credited to those accounts. Certainly we make assumptions as far as persistency and mortality, but often we lose sight of the fact that we have minimum guarantees in those contracts. As long as we're in an environment where rates are high and mortality is pretty much what we had assumed in the beginning, then that's fine.

Let's focus first on interest credited rates. In general, as a pricing actuary, you have to set a credited rate for your annuity products or life products. You are cognizant of your company's investment philosophy that drives your target returns and your capital requirements and if you have any need for a liquidity pool. You will come up with a target asset portfolio that would generally be a mix of good quality taking into account your capital requirements, balancing it against your target return. You would have public bonds, private bonds, some mortgages, equities, and, of course, a little bit of cash. Here is an algorithm for crediting rates, starting with a given investment. Take the gross return on the particular investment, usually expressed as a spread over Treasuries, minus a provision for fees to manage the investment and a margin for default risk. From the various investments that you select, you're going to put together a portfolio. The earned rate on that portfolio will simply be the weighted return on the various investments that you have picked using the allocation that you made to those investments as well as some rate for the pool of liquidity that you want to maintain. From that you make provision for expenses and there will also be a provision for risk and profit margin.

This is a very simplistic way of stating a crediting rate spread, but the exercise is really a little bit more complicated than that, as pricing actuaries know. Embedded in the crediting spread assumption is the assumption you make with regard to lapses and withdrawals and things like that. Of course, for deferred annuities,

mortality is not as significant as you would have in life insurance. But when we get to the life settlement options, mortality is certainly important.

Let's look at life settlement options and the expected mortality. How might we pick the basis of expected mortality for pricing purposes? If you are a large enough company, and you've been in business for a long time, you would look up your recent company experience. Otherwise there are studies that the SOA sponsors that pull together the experience of many companies. They are updated periodically and include recent experience for life income settlements. After you come up with your expected basis for mortality and a static table including historical experience, you might consider the job complete. But if you're aware of the way mortality has been trending, you might want to put in a factor for future mortality improvement. We've called these the infamous F factors. In some cases you might want to create a more sophisticated table that projects mortality for each age and year.

When you choose your expected mortality, there are three different areas where this enters into pricing, one of which is called the purchase mortality. This is the mortality you assume in pricing the benefits or the premiums that you need to provide the benefit. Unlike insurance, when mortality rates are low it's more costly to buy an annuity whereas for life insurance, of course, it's cheaper. The ideal situation when comparing expected mortality against reserve mortality is those bases will be in sync. If one of them is mismatched with the purchase mortality, such as when your actual mortality is lower than what you expected, that translates to a loss to the company.

The same issues apply to reserve mortality. If there is a mismatch, you have reserve strain at issue, but it also continues because the mortality differential persists. Let's take a look at minimum interest guarantees. Minimum guarantees are set at product introduction and are typically fixed for the life of the contract. They typically differ between deferred contracts and the life settlements. When you think about it, the life settlement options available would be in the same contract that offers the minimum guarantees during the deferred or the accumulation phase. If you want to change this minimum guarantee you know that you cannot do so for existing business, and even if you get approval for the change after going through the filing process, you'll only be able to use it for prospective new business.

These guarantees, like the current declared rate, are backed by general account assets. As Max pointed out, the historical levels show that such guarantees might have been set at around three because of minimum nonforfeiture. We got a little carried away, I guess, some years ago when rates were high and we thought that 5% and 6% were conservative. As far as minimum mortality guarantees go, and as I indicated earlier for fixed deferred annuities, it's a nominal risk. Look at any of the fixed account options in a variable contract with a return of principal guarantee. If your fixed account is growing with interest, which hopefully exceeds any charges that you deduct, then you're always covered. However, under life income settlements, because this is part of the deferred contract that you sell, it assures that when it's time for you to annuitize that you can do so on a guaranteed basis. At one time we thought that historical guarantees of experience mortality wouldn't

change more often than once in a century. Typically you'll see minimum guarantees for mortality using static tables with no provision for future improvement.

Let's turn our focus to interest rate risk. When interest rates are high, you have the risk of high lapses, particularly under deferred annuities. This dynamic is worse if the annuity contract is past the withdrawal charge period. The worst part about that is that just as the contractholders are lapsing and you have a lot of disintermediation, you're going to be liquidating your underlying assets at very low values and you have a big gap between what you actually have and what you need to pay. When interest rates are low, these contractholders aren't going anywhere. This is especially true under life settlements; unless you have a contract that provides for a cash option, they're generally not commutable, and it's not a matter of annuity choice. The insurance company is stuck with this life settlement that you guaranteed at a level that in today's environment would seem pretty good. In the meantime your underlying assets are going to get called, and you are reinvesting in new assets that are going to give you even lower yields.

When you're dealing with interest rate risks, if rates stay high enough you can maintain your pricing spreads. The difference between what you earn on your investments and the credited rate is the spread that you need to support the expenses and some of the profit and risk margin. If rates are not too low, that is easy. All you have to do is lower your rates. It's not as simple as that, because when rates drop so low there is this floor that you have built into the contract that you cannot pierce because that's the whole purpose of the minimum guarantee. Since you cannot credit lower than the minimum guaranteed rate, you either narrowed the spread or you fall below the spread that you need to be profitable. This loss translates into a hit to company earnings. If your competition decides to keep rates high and you need to catch up with the market, then that's another reason why you could lose out on your crediting spread. At least that is a matter of choice. With a minimum guaranteed rate, you have no choice because you are contractually bound to pay those minimum guarantees.

You might think that you could shore up the earned rate on your investments in order to maintain your crediting spread. The danger is that typically the higher yielding investments will be higher risk and lower quality and that, in turn, will translate into increased capitalization and the risk of higher defaults. There may also be reserve strain because, as we know, reserve rates are typically updated according to current economic conditions. If there is a lag in the interest rate, they had been set at a time when rates were really low and rates went back up a little bit, then you have a potential reserve strain, and there is a greater risk of loss to the company.

Chart 4 shows that over the last 20 years, the general trend in earned rates, both government issued and publicly issued, has been down. If you have crediting spreads between 150 and 200 basis points, there is not much room left for profit, especially when your interest guarantees are at 5%. So this gives you a feel as to how close you really are to the minimum guarantees.

Let's look at historical mortality. When mortality rates are declining, typically you will update your current purchase basis using the current levels of expected mortality by either increasing premiums or lowering benefits. You have set a minimum guarantee within the contract, and there is a chance that the benefit that you evaluate on a current purchase basis is going to fall below what you have in fact guaranteed. That's a no-no. In that situation you have to provide them with a minimum guaranteed benefit and incur the loss. This becomes worse when current levels of mortality are as low or lower than what you have assumed on your existing blocks. There is nothing you can do about that because the existing book is there to stay and you're going to continually incur that ongoing loss.

As reserve standards are updated, which they are from time to time, you must change your purchase basis or you're going to experience additional reserve strain. Chart 5 shows, for each age group starting with age 35, the levels of male mortality during the 20th century. Mortality is declining, especially as you get into the older ages, where most of your annuity contracts would be. There is a whole discussion about how far this decline is going to be, but certainly it has already happened. If you're not going to make any provisions for mortality improvement in your assumption, then you're really missing out on a lot.

Chart 6 shows U.S. female mortality experience and the bars exhibit the same shape as the male table. Chart 7 shows an example of some of the annuity tables that you are probably familiar with. The 1983a table has been around for some time. It is based on experience from the 1970s. At that time an improvement scale was provided for use with it, and we probably use it for current pricing. In the meantime, because the NAIC recognized the need to update the valuation standard, it came up with an interim table called the Annuity 2000 table that has some projection built in. For females, it takes half of the scale G factors, using the 1983a table and projects it to the year 2000. I believe they are also in the process of developing more data that they could use to form a new valuation standard. The group side has already done that, creating a fully dynamic mortality table that is used for group annuities.

You can see the mortality rate assumptions until the end of the life table for females aged 65. You can see that the lines for the 1983a table and the Annuity 2000 table are very close together whereas the 1983a table with full projection ends up with a much lower mortality assumption, which is quite a difference from what you might have assumed in your minimum guarantee. If we look at the financial impact of minimum guarantees on a deferred annuity, a 10-basis-point loss in crediting spread would hit your internal rate of return by about 1%. For life settlements, the hit would be about 3%, recognizing the fact that life settlements are much longer than deferred annuities. If you have a $1 billion book of business, the lost investment income would translate into about $1 million annually. The life settlement benefit payments that you have to pay beyond what you could support would be about $500,000 a year.

Let's look at the effect of both changes in interest rate and changes in mortality rates under life settlements. Table 1 and Chart 8 show the life annuity single premium per dollar of benefit and charts the dynamic single premium. The first

three bars are valued at 5% so you vary the mortality assumption, whereas the last three bars are valued at 3%.

Let's compare a female age 65 under various scenarios shown in Chart 8. Let's say the life settlement guarantee is based on 3% and the 1983a static table, and the current rate is 5%. If everything else is equal, then the current premium you would charge is low enough so as not to invoke the guarantee. If the minimum guarantee is based on 5% and Annuity 2000 and the current rate are also 5%, but mortality is now expected to be 1983a with full projection, then the impact on premium would be 7% above the $100 million premium, giving a loss of $7 million. If the minimum guarantee is based on 3% and Annuity 2000 and the current rate is also 3%, but mortality is now expected to be 1983a with full projection, then the impact on premium would be 9% above the $100 million premium, giving a loss of $9 million. If the minimum guarantee is 5% and the current rate is 3%, the impact on premium would be 22% above the $100 million premium, or another $22 million loss.

TABLE 1
LIFE ANNUITY SINGLE PREMIUM PER $1 OF MONTHLY BENEFIT

			(1)	(2)	(3)	(2)-(1)	(3)-(1)
	Female Age	**Interest**	**1983a**	**Annuity 2000**	**1983a full proj by G**	**Mortality % differentials**	
I.	55	5%	$184	$187	$197	2%	5%
	65	5	154	158	169	3	7
	75	5	115	119	129	4	8
II.	55	3	235	241	260	2	8
	65	3	187	193	211	3	9
	75	3	132	138	152	5	10
III.	55		28%	29%	32%		
Interest %	65		22	22	25		
differentials	75		15	16	18		

So how do we manage this risk? From a mortality standpoint, you certainly need to think about future mortality improvement and not expect your recent experience to continue. It won't.

From the Floor: You seem to be making the point that the Annuity 2000 table is inadequate when using half of the projection scale G for females. Is that based on data that you've seen? I'm wondering why the SOA decided to modify projection scale G if it wasn't based on some actual experience that they had.

Ms. Samaniego: As I mentioned, the scale has been around since the 1983a table was developed. The attempt, I believe, was to project the level of mortality up to the current year and not go beyond that until they have collected more evidence. If you're going to come up with a new valuation standard then you have to really

look at the experience. This was, as I said, an interim measure. I mentioned the group annuity side, where there was a lot of experience that had been tracked over time, and they came up with a fully dynamic table that was truthfully developed from actual experience. Going forward, if you required a fully projected table, think of the sizable increases in reserves that you're going to have. You must have a very good basis for it.

Mr. Rudolph: I will now attempt to give Ken Mungan's presentation. Ken is with the Milliman and Robertson office in Chicago. Since I didn't get a chance to speak with Ken, these are my comments based on his slides.

Ken's presentation gives some examples of what has happened in Japan in the last ten years. Over the last seven years there has been stagnant or negative gross domestic product growth. There are over $600 billion in bad and doubtful bank loans. The economic situation is driving fundamental social changes. Now they're starting to go through downsizing. You're seeing a lot of U.S. companies go in and try to get some companies at a time when they cost pennies on the dollar. Hopefully those will work out for everyone.

Some of you might remember back in the early 1990s when land prices in Japan were so high that the Japanese thought that Rockefeller Center, at whatever price, was pretty cheap. They came over and started buying a lot of U.S properties. They started selling it back as market values came down in Japan and they started having other problems that required cash. The Nikkei stock index, as of March, was in the 16,000 range. It has dropped 60% from its high in the late 1980s and early 1990s.

Chart 9 says it all. The 10-year Japanese government bond has gone from just over 8% in late 1990 to a low below 1%. It has come back up from there, but it's still below 2%. We think of our rates being low today in the 5–5.5% range. In Japan, they're a full 300 basis points lower than that. In relative terms, it doesn't seem like we have such a big problem right now, but the possibility is certainly something to be aware of. The insurance industry in Japan marketed products in the 1980s and early 1990s that emphasized substantial interest rate guarantees backing various product lines; whole life, endowment, and annuities. The guarantees are over 4%, but the government bond is in the 2% range. It's really hard, especially on an annuity product line, to make any money. For the life lines, my understanding is that the Japanese are allowed to adjust mortality in the opposite direction of interest rates. For the year 1997 the interest rate loss of the five largest insurers was a trillion yen or $8.5 billion dollars. That's a lot of money.

This is where we get back to one of the examples that I had in my presentation. The SPDA product is an annual crediting rate product with an eight-year declining surrender charge scale and a 3% minimum guaranteed rate. He kept everything the same except changing the guaranteed rate to 4%. He ran it through the same 100 scenarios and looked at what the differences were by using return on required capital. Ken gets to the same answer as in my example but presents it differently. I know when I looked at his results I had to adjust my paradigm. It's good to look

at things from different perspectives because you can always learn something from someone else's research.

What Ken did was to issue $100 million of SPDA and applied his strategies for crediting interest and investing, projecting 100 scenarios. I don't think that the 100 scenarios were any magic number. I think he was doing them more as stress tests than anything else. If you're going to do a test, you need enough scenarios for your results to converge. I don't really know what the magic number is for an SPDA. I think that's a topic where, in the next year, I would guess someone might tell us. For each scenario he projected asset and liability performance, capital requirements, and distributable earnings. Chart 10 tells you what your return is for each of the 100 scenarios given both the 3% guarantee and the 4% guarantee.

Chart 11, is more interesting to me because it compares the differences in return by scenarios of varying the guarantee. It takes the same interest rate scenario and runs it through both a 3% guarantee and a 4% guarantee. As with anything that we do, the outliers are the most interesting. I would look not only at the outliers where the difference was the highest, but also the outlier where having a higher interest rate guarantee gives you more profit. I had to think about that one for a while. Apparently, when the interest rate guarantee kicks in, you get a higher credited rate early on, but then rates stay very stable after that. People stick around for a long time so you're actually earning your margin on a little higher account value. I wouldn't count on that scenario. Most of the time it doesn't make a lot of difference. Over 50% of the time the return is within 1%. So if you're pricing and have 10.5% versus 11%, how much difference is that going to make to you? Probably not a whole lot. What's important to note is that the worst case scenarios have a difference over 10%. I will say again that these are my comments, not necessarily Ken's.

What can you do to hedge these scenarios so that they are less costly? Can I buy some type of an option, or maybe a barrier option that improves results by 4% or 5%? Buying an option will cost real dollars, but it might improve the other five or six disaster scenarios. What we've been finding in our research is that if you take care of the worst five or six scenarios, it does a good job of addressing a lot of other issues as well. Then you can rerun your scenarios and see what the five worst scenarios are now. There's a cost to everything and you have to weigh that, but it seems to be a good way to do it. I've seen research from other actuaries that's showing the same thing.

Ken into another topic that I am not comfortable expanding on. I think he's trying to make the point that you always need to look at the risk-adjusted economic value or the risk-adjusted return. He lists three different strategies that you can use. The first one is to maximize risk-adjusted economic value using a formula of the mean minus the variance divided by the company's risk tolerance. He's risk adjusting the mean. In the second strategy, he suggests focusing on the worst couple of cases, the first or second percentile, and then tries to minimize the worst thing that happens to you by maximizing the value of the worst scenarios. You would also have a constraint saying that you wouldn't allow the model to take all your risk away because that would cost too much. The third strategy is to study

year-by-year distributable earnings and minimize the probability of a negative event. Negative event is defined as a ratings downgrade or a forced transaction. I think these strategies are very useful and I want to make the point that you don't want to look at just one tool. For example, you might have a price behavior curve that shows the economic surplus of a company, and it looks like a frown based on where you're at today. If you're at the very peak of that frown, then the duration of your surplus is zero and management might think that they don't have any interest rate risk. In reality there is convexity in both directions. If interest rates change at all, you lose value. So it's important that you do not use just one tool.

CHART 1
U.S. BIRTHS BY YEAR

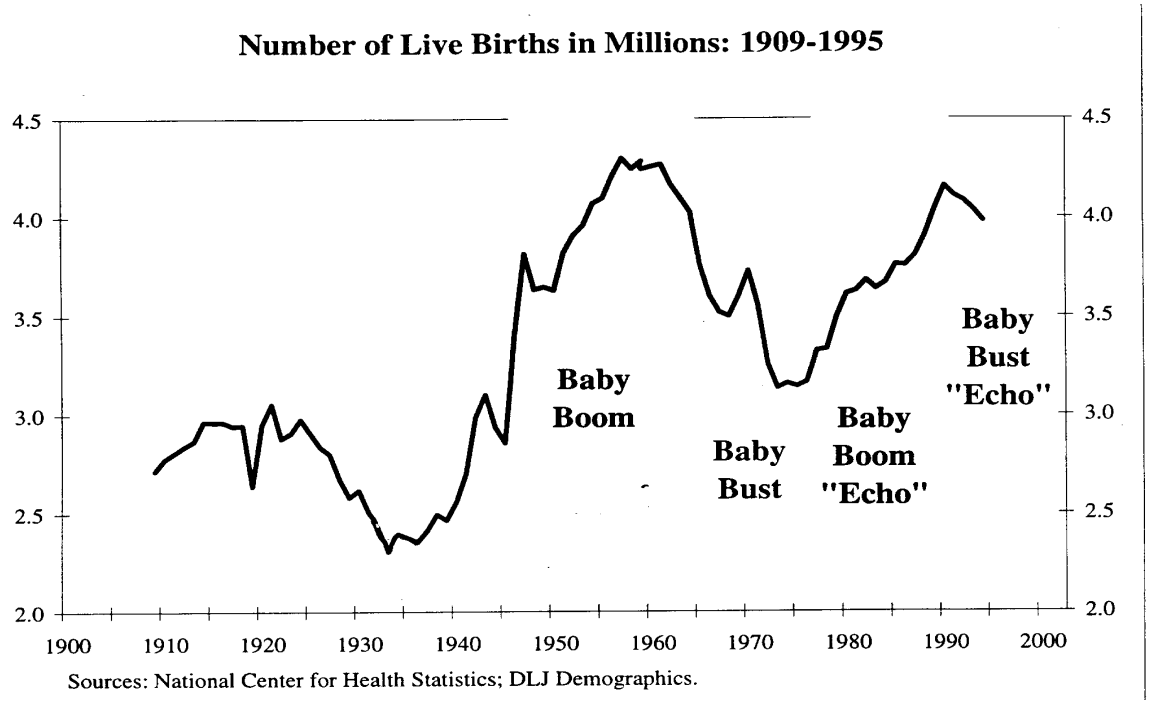

CHART 2
COST OF 3%, 4% AND 5% INTEREST RATE
GUARANTEE FOR SPDA

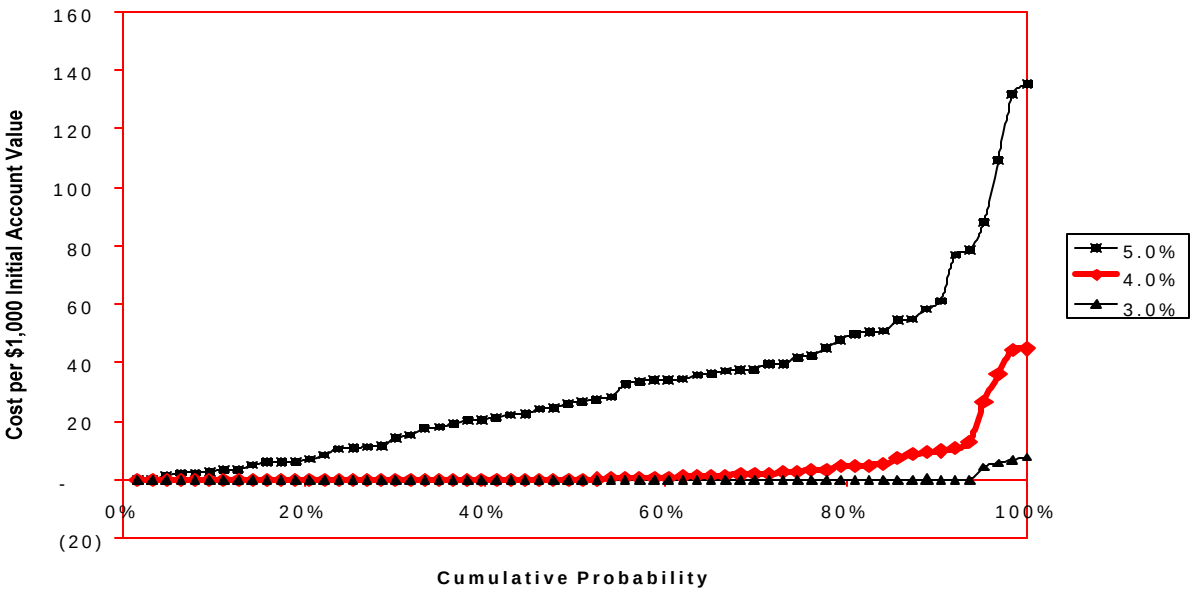

CHART 3
MISLEADING ACCOUNTING