RECORD OF SOCIETY OF ACTUARIES
1995 VOL. 21 NO. 4A

BENCHMARKS FOR INSURANCE PORTFOLIO MANAGERS

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Insurance companies need methods for evaluating portfolio managers. This session will review the issues relating to various methods:

- *Developing benchmarks based on liability requirements*
- *Linking the benchmarks to business needs*
- *Measuring performance against the benchmark*

MR. GREGORY J. ROEMELT: It seems as if, in the past, insurance companies haven't had the best means for evaluating their portfolio managers. The focus always seemed to be on yield and not on developing good strategies to enhance the value of the insurance company. Both Marty and Steve will talk about benchmarking methods that companies can use to better evaluate their portfolio managers.

MR. MARTIN P. KLEIN: Our topic is setting appropriate benchmarks for insurance portfolio managers, and for us it's a very interesting topic. My company, Zurich Investment Management, runs money for insurance companies and also provides investment advisory services. So this is obviously a topic that comes up frequently. It's also one that can be very confusing to many people. I don't know if most of you have your own investment department or if you use outside managers, but you'll find that they all claim to do an incredibly good job all the time. No matter what benchmark they use, they somehow always miraculously outperform. To me it would be very refreshing to actually come across an investment group that actually shows numbers that really don't look very good versus a benchmark and say, "Well, really we didn't do very well, but please let us continue managing your money because we need the practice." I'm not sure if that would be very successful, but it would be refreshing if nothing else.

Before we talk about benchmarks, I want to talk for a moment about investment guidelines and investment strategies for insurance companies. Clearly those guidelines and strategies should reflect a number of different things, one being the liability obligations of the particular insurance company. Investment managers who are managing money for other types of institutional funds or mutual funds don't really have these same types of considerations, but clearly liability obligations are important. Regulatory and rating agency considerations are another consideration that the strategy should reflect. Finally, the particular financial return and risk objectives of the insurance company also need to be reflected.

Investment benchmarks should reflect the investment strategies so investment guidelines should also reflect these three basic areas. This is something that's really not true for many benchmarks that are being thought up. I want to take you through a number of basic approaches that insurance companies use or might be able to use and discuss the advantages and disadvantages. Following that, Steve Reddy will take you through a more specific type of benchmark for single premium deferred annuity (SPDA) products.

This first approach we will discuss is the "do-nothing" approach. In this approach no benchmark is established. Clearly, you are sitting there thinking that this is sort of a humorous example, but there are some advantages. It's easy to implement and it's also a very common method among insurance companies. Many companies use this particular method. However, there are many disadvantages and clearly the three basic aspects that we touched on that investment guidelines should reflect are not addressed by the "do-nothing" approach.

Another approach that follows closely on the heels of the "do-nothing" approach, although a little more work is involved, is what I call the peer approach. Here the performance of the particular company's portfolio is compared with the performance of a peer group of other insurance company portfolios. There are some advantages to this approach. Certain types of peer information are readily available. You can go to their GAAP reports or their statutory statements and pull out various sources of information. Also, the exercise of doing that is really helpful in better understanding the competition, what the competition is doing, and how they're making or not making certain spreads. Certainly by going through an exercise you can learn through some of their mistakes or learn through some of the things that they're doing well.

But there are a number of disadvantages—actually a very large number of very serious disadvantages. One is just from an accounting standpoint: much of the information that's required is really not available. Or, if it's available, it's not really prepared on the same basis that your information would be prepared, particularly when you get to many mortgage-backed types of securities. The liability obligations among the different insurance companies may be different, and if they're not different the mix among them may be slightly different from your own particular company. The financial objectives of the companies may be different. The return goals and the risk constraint goals that the management of the insurance company has placed on a particular portfolio manager may be different. The asset class, sector, and credit criteria may be different and, again, these are sometimes imposed on the particular investment manager, whether there is an investment department or an outside manager.

Certain restrictions on these categories are just imposed on the manager and he or she has to work within that framework. Finally, the trading constraints may be different. Some managers are allowed to manage the portfolio on a total return basis and actively trade day to day. Others are not given that same amount of latitude. Perhaps even more significantly in bad bond markets in which many investments can be under water, some companies are really more concerned with the long-term economics of the business and they allow their managers to trade. Others are perhaps more concerned with how GAAP earnings play out and they don't let their managers trade. But clearly the ability to trade or not trade in given environments has an impact on performance. So there are a number of disadvantages with the peer approach. Let's go through a few more approaches. As we go we'll get more and more in depth and talk about some approaches that get more and more refined.

The next approach is the generic index approach. In this approach the performance of the portfolio is compared with the return of some generic market index: Treasuries, government/corporate, or an aggregate or broad index. Sometimes there's a refinement, looking at whether the index is made up of intermediate or long securities. Many of the various Wall Street houses have their own indexes. Lehman has its government/corporate and

aggregate indexes. Both Salomon Brothers and Merrill do. There are some distinct advantages of this approach. One is that the information is very readily available. Information on the return of these indexes and the makeup of them is really easy to get from the various Wall Street houses, particularly if you do trades with them. Also, these indexes are indicative of what the general market is doing, which is also helpful. It gives the company's management an idea of what's going on in the investment marketplace.

The disadvantages, though, are very numerous. Think about the points we talked about earlier, that all these benchmarks really should address the liability obligations, financial goals, and regulatory and rating agency concerns. This general index approach compares this particular insurance company portfolio with some broad market index, and clearly we're not addressing the liability obligations that this portfolio needs to be able to back. Nor are we really adequately addressing the particular asset class or sector allocations of the portfolio. The broad market index will be made up of different classes and different credit quality than the insurance company portfolio's objectives or guidelines may allow. In the broad index, which includes governments and corporate and mortgages, what's in the mortgages are really just agency pass-through securities. So collateralized mortgage obligations (CMOs) and other mortgage derivative securities, to the extent a company invests in those things, really are being compared against a pass-through type of basket of securities. Finally, the generic index approach does not really address trading constraints.

There's a way to improve on this generic market index and that's to compare the performance of the portfolio against an index which is customized from a generic index. As we customize it, some adjustments are made. One is that the generic market index is adjusted so that it now has the same duration that the liability has. Here we're adjusting for the liability duration. That's a huge improvement. So, for example, if the duration of liabilities is three years on average, you can adjust a broad index, which might have a duration of, say, four-and-a-half, and adjust it such that it now has a duration of three.

Asset class and sector allocations can be adjusted for. So, for example, if a portfolio in its guidelines has a certain amount of corporate that it's allowed and a certain proportion of Treasuries and a certain amount of mortgages, those proportions can be adjusted to mirror that of the guidelines of the portfolio. Finally, credit quality can be adjusted for. For example, some companies are very high-quality-conscious and maybe don't allow investments in BBB assets, which a broad or aggregate market index will typically include. But one can go into that broad generic index, for example, and take out the BBB aspects or parts of securities that are in that benchmark.

What's left is an index that does not have any BBB bonds. That's appropriate because there are a number of times when the BBB segment, for example, might outperform or underperform that of higher-quality investments. So it takes out a little bit of the confusion as you're trying to measure performance of the manager. Some of the managers may not like that because they're always able to better confuse the issue to their advantage, for example. If they're not allowed to invest in BBB securities and BBBs have performed well, they can say, "Well, of course we didn't outperform. The BBBs did very well, but we're not allowed to invest in BBBs, so that's why we underperformed the index." Or conversely, if BBBs underperform and they don't have anything in BBBs, they'll probably just be silent and use that as a reason why they've performed well, but they won't mention that specifically.

Making these three adjustments is really a very powerful adjustment to make to the generic index. It has a number of advantages. It's really very simple to develop, so you get a great deal of benefit for not much work. It somewhat addresses liability obligations. I used the caveat somewhat because here we're adjusting only for liability duration, but the convexity or the options embedded in certain liabilities really can be somewhat dangerous. This duration-only approach kind of leaves out those aspects. But for companies that really don't have interest-sensitive liabilities, it's not as big an issue. You can again reflect asset class, sector allocations, and credit quality.

There are some disadvantages. It requires access to the various components of the index, which is actually not a big disadvantage because it's relatively easy to get access to those components. It doesn't adequately address certain types of liabilities such as SPDAs, universal life (UL), basically liabilities that have many options embedded in them. The problem, as we had before with the generic index, is the pass-through part of it. It only reflects pass-throughs; it doesn't really reflect the CMOs or mortgage derivatives. Finally, we don't really fully address trading constraints.

I'd like to now take a broad category of approaches and then talk more specifically about one of them in particular. These fall into a category of what I'll call model-driven approaches. Basically, asset/liability models are used to develop benchmarks that adjust for and consider liability obligations and cash flows, regulatory and rating industry considerations, and financial return and risk objectives. As we talk about regulatory and rating agency considerations, for example, we can deal with cash-flow testing and risk-based capital measures or factors that impact the company's ratings and really adjust for those factors outside the model. So in an asset/liability model you're using investment strategies to develop these guidelines, which already reflect aspects that will affect a company's ratings or risk-based capital ratios and so forth. We'll soon go over an example to make this clearer.

Also, these models and this model-driven approach, this general type of approach, can really reflect the financial return and risk objectives for a company. A company needs to develop those, and many companies really haven't developed those perhaps as fully as they should. But if the driving force for an insurance company, from a return standpoint, is GAAP earnings, it can really optimize based on that. Or if it's growth and statutory surplus, it can optimize based on that. On the other part of it, on the risk part of it, it can also impose its own particular risk criteria in this approach. Some companies may want very stable GAAP earnings; other companies may be more concerned with statutory surplus adequacy.

Most of the disadvantages of the other approaches really turn around and become advantages here and we can fully address the liabilities. We can reflect asset class, sector allocations, and credit quality criteria. We cannot fully reflect CMOs because we're dealing with models that don't always really deal with CMOs as rigorously as we'd like, but we can get somewhat closer to addressing CMOs. Finally, we can consider, at least on a basic basis, some trading constraints.

There are some disadvantages. You get a lot of benefit with these approaches, but one disadvantage is it's clearly more time-and-effort-intensive than some of the other approaches, which may or may not be worthwhile, given the company's own particular

liabilities and so forth. However, if a company does have in place a good cash-flow-testing model, which at this point many insurance companies do, that model can really serve as the basis for developing some of these kinds of approaches that removes some of the additional work and also gives the person doing the cash-flow testing a feeling of doing something even more worthwhile than what is already being done.

There is some subjectivity involved as well. In the course of all models we should always remember that the things that come out are only as good as the assumptions that go into it. Clearly, many assumptions go into these models. If many of the liability-driven assumptions are wrong in one iteration of the strategy, they're wrong for all of them. So on a relative basis, the liability side noise that might take place is not as significant when developing these approaches. Setting the assumptions on the asset side becomes slightly more artistic and slightly more critical to the process. For example, setting spread assumptions among various types of asset classes and among various different credit classes is a subjective exercise.

I'll talk about a couple approaches and then we'll get into a third approach. One approach is called the market value of surplus approach. In every period, the assets and liabilities are marked to market and the growth and the difference is measured. There are some issues to this approach. If you're dealing with publicly traded securities, it's easy to get the market values on the asset side. It's much more difficult on the liability side, and there are really not that many commonplace ways to mark liabilities to market. More approaches are being developed, and clearly the SOA and other groups are putting together more papers and so forth to address marking liabilities to market, but it's more in its infancy at this stage.

One of the other issues is that the surplus or the difference between the market value of assets and liabilities is impacted by more than just investment management results. Things on the liability side also obviously impact that, and those are the things that typically the investment manager has no discretion over.

Another approach is what I'll call the cost-of-funds approach. This is more like an interest rate or yield approach versus the approach we just talked about. It's based more on values, if you will, of the portfolio. Here the difference between the return on assets and the liability cost of funds is measured. The greater that difference, the greater the spread and presumably the greater the profitability of the company.

One issue here is that cost of funds is difficult to determine for certain products. One of my former employers had a guaranteed investment contract (GIC) that was indexed to the London Interbank Offered Rate (LIBOR) and there were really no mortality aspects. So it was very easy to determine the cost of funds of that particular product, which was basically LIBOR plus ten basis points or whatever it was. But for other products, UL or other types of products in which there is a significant mortality component or other types of insurance aspects to it, determining cost of funds is more difficult to establish.

The other issue with cost of funds is that the cost of funds for liabilities fluctuates for reasons that aren't really under the control of the investment manager nor are they really necessarily predictable by the investment manager. Sometimes actuaries, much less people on the investment side, have trouble predicting what those will be.

I'd like to go into a third approach in a little bit more depth. For lack of a catchier name, the baseline investment strategy approach is based on the baseline investment strategy for the portfolio. The actual results of the portfolio are compared with the results of this baseline strategy portfolio, and performance is measured based on that. There are four steps, but the first step is a very big step and numerous ministeps are involved to develop a baseline investment strategy. This is not a trivial exercise but we'll go through an example soon of what I'm talking about.

Once this baseline investment strategy is developed, we then select a specific basket of securities that fits this baseline strategy. So we develop a baseline strategy, pick some securities that actually fit that strategy, and that becomes this basket against which we measure performance. So we now have this basket of specific securities. We measure the performance of that basket and compare the performance of that basket with the performance of the actual portfolio.

There are four steps; how hard can it be? Let's go through an example. You can do this for almost any kind of insurance product. Let's pick an SPDA block. Whenever you deal with an investment question, the SPDA seems to be the favorite liability. Let's say we want to develop a benchmark for a portfolio that backs single premium deferred annuities. Again, we could do this for a portfolio backing any other type of liability or a portfolio backing several different types of products. We will now go through some of these steps.

We're kind of in step one of developing the baseline strategy. First we need to have some financial objectives. What will we optimize on? What kind of risks will we want to watch out for? Let's just say for this particular exercise that we want to optimize the expected present value of profit of x dollars. You can express profit or return in terms of basis-point spread, or present value of profit, or present value as a percentage of premium—all numbers of measure. Let's just say that this is the particular measure we will optimize on.

Let's say that the risk constraint that we must consider is statutory insolvency. There are other measures of risk—earnings volatility. One might look at the standard deviation of earnings results and so forth. But let's say for this particular purpose that we want to really be concerned with a probability of statutory insolvency of $y\%$, y being presumably a very low number—1%, 2%, 5%.

Again, we're outside the model process; we're not necessarily doing any modeling at this point. The next step is to develop asset class, sector, and credit criteria. For example, let's say that this company wants the average quality of the portfolio to be AA. Let's also assume that we want a limit of 35% for any specific asset category. Outside the model, the company will impose whatever philosophical constraints it has with respect to asset classes, diversification, and quality. Some companies may now say, "We don't want to ever invest in any CMOs. We don't care how well they might do over the long term. We just don't want to invest in them." Other companies may say, "We don't want to invest in any high-yield bonds at all. Zero." But this is the point outside the model where you really reflect these constraints.

Given that you have all these sets of criteria, you have financial objectives to optimize on and risk constraints, and you also have some general bounds on certain sectors and quality aspects, you can then start modeling various investment strategies against the SPDA portfolio, in this case, under different sets of stochastically generated yield curves or

perhaps under the cash-flow-testing set. It's generally wisest to do this under many stochastically-generated scenarios. Let's say that after doing this a number of times, somewhat iteratively we come up with a strategy for this particular example that meets all these criteria. Let's say for this purpose that the strategy we come up with is one in which it's 35% in five-year noncall corporates; 25% in five-year planned amortization class (PAC) securities; 20% in constant maturity treasury (CMT) adjustable rate mortgages (ARMs) that reset off one-year Treasuries (which many of you may have your own mortgage indexed to), and 20% in LIBOR-indexed floating rate notes, either corporate issue debt or perhaps some sort of mortgage security that's indexed to LIBOR. So let's say those are the four basic classes in this investment strategy in those particular proportions.

The next step would be to select a specific basket of securities that fits that baseline category. You can then go and select various securities. They may be ones that the company owns or they may be ones that it has some way to track the performance of. Fill up a basket with representative securities that fit not only those categories but also fit the proportions. So now I have a specific set of securities. We can then measure the return of that specific set of securities. That's the benchmark. Then to determine the value added, if you will, we compare the investment manager's actual results to that of the benchmark. Again, this benchmark was developed in a way to reflect the major three things we want to reflect: liability obligations, regulatory and rating issues and other business types of constraints, and the company's financial goals and risk constraints.

MR. STEPHEN D. REDDY: I work at Morgan Stanley and we had come across this issue a couple years ago. In the course of meeting with portfolio managers on a fairly regular occasion, the issue of liability benchmarks came up quite often. After a number of those meetings, we decided, rather than to just talk about it, we would do something about it.

Basically, the idea was to create a total return index based on a liability or a set of liabilities just like total return indexes for assets that you see every day in *The Wall Street Journal* and on Telerate and what have you. Probably the primary motivation here was portfolio managers asking about it, saying they'd like to have something to manage against, and investment management wanting some criteria for measuring the performance of portfolio managers.

You can ask the question, "Why liability benchmarks?" With pure total return portfolio management, you're not taking into account the underlying liability, so obviously there's a problem there to the extent you're trying to implement good asset/liability management in the business. You must take into account the liabilities in some manner. Having such a total return based on liabilities, you now have a facility for measuring the performance of a manager or portfolio manager. As Marty alluded to, one way that can be done is to create a benchmark portfolio based upon the liability requirements. That benchmark portfolio becomes the bogey for the portfolio manager, whose performance can be measured against the performance of such a benchmark portfolio.

Up until now one of the problems with creating liability indexes is that illiquid markets in terms of the liabilities make it difficult to put a price on a liability or a block of liabilities. It'll have to be calculated or estimated in some way. There are many different liabilities out there and they're all somewhat unique in some way and they have many complexities. That has made it more difficult to construct these.

Why SPDA indexes? Those are the indexes we chose to construct. It's where the money's at. SPDAs have been where all the growth has been in terms of asset accumulation. The growth in assets was tremendous from the early 1980s up until the current time, and that's continuing. They are perhaps the most interest-sensitive insurance products. I think that has been believed for a while. Maybe it hasn't been proven yet because we haven't had a real interest rate spike of a prolonged nature to bear that out, but it certainly seems to hold the most potential for that. Because it is a single premium product and doesn't have a mortality component really to speak of, the index is simpler to construct than, say, an index for a UL product.

In setting out to construct some SPDA indexes, we decided rather than pick one product, because there are so many out there, we would do a few of them and try to capture the main product features that exist in the marketplace. To do that we had to look at the various product features that will define an SPDA product: credit rate strategy, interest rate guarantees, reset frequency, surrender charge schedule, market value adjustments to the extent they exist, and then expected surrender behavior, which is really not a product feature but certainly is a component that will affect the pricing of a given product. So these are all things that we considered and we would use as a way of distinguishing among the various products we wanted to create indexes for.

We ended up creating five generic products for which we would create the indexes and we also decided to track each product in what we call a low- and a high-surrender environment. Everyone has his or her own prediction of where surrenders might pan out, but a lot of that is a function of a specific company or the distribution system. Again, companies have different predictions in terms of how high surrenders might be when there is an interest rate spike. So we decided to go with two, what we call a low- and high-surrender environment. In addition to that, in terms of product features, Table 1 summarizes some of the key parameters.

Basically, a new money product has a reset rate at a fairly large percentage of new money—65.0% if rates are moving up, 82.5% if rates are moving down—and a fairly typical surrender charge schedule. A teaser product has a higher initial credited rate but a lower reset rate. There is a bigger negative spread there on reset credit rates and a bigger and longer surrender charge schedule. A portfolio product has a credited rate that is slower to reset—it's stickier both on the way up and on the way down, perhaps to reflect the earnings of a portfolio of intermediate bonds, for example. A three-year reset product has a credit rate that is reset every three years as opposed to every year, which was the case of the first three products. There is a slightly different surrender charge schedule there as well.

Finally, a five-year market value adjusted (MVA) product has a five-year reset period so you get guaranteed rates for five years at a time. In addition, in the first five years there's a two-way market value adjustment, which would essentially be paid on surrenders to reflect the change in the price of a five-year bond since the issue of the product. There is a recycling surrender charge schedule there. So these are products that we chose to focus on in constructing these indexes, with the intent of covering most of the kinds of products you see in the marketplace.

In terms of how to construct an index, we're trying to do it just as you would construct an index for an asset. You're looking at the total return for any given period. Then a

cumulative total return will generate your index up to the current point in time. So your index starts at one at policy issue. Then the one period return is defined as being the cash flow paid on the policy during that period, and in this case our periods are months. We're calculating this on a monthly basis. Then you look at the price change at the end of the period, the last price at the beginning of the period, and divide it all by the price at the beginning of the period. So it's cash flow plus change in price divided by initial price. These are your one-period returns. That's a general formula for total return of a financial instrument.

TABLE 1
SPDA PRODUCT SUMMARIES

Product	Target Rate	Target Spreads (bp)		Reset Years	Reset Percentage		Surrender Charges Percentage
		Initial	Renewal		Up	Down	
New Money	5-year CMT	(15)	(40)	1	65.0	82.5	7,6,5,4,3,2,1,0
Teaser	5-year CMT	100	(75)	1	65.0	82.5	10,9,8,7,6,5,4, 3,2,1,0
Portfolio	5-year CMT	0	(25)	1	20.0	20.0	7,6,5,4,3,2,1,0
Three-Year Reset	3-year CMT	50	0	3	65.0	82.5	7,6,5,4,3,0
Five-Year Reset	5-year CMT	0	0	5	100.0	100.0	5,5,5,5,0,5,5, 5,5,0...

Source: Morgan Stanley

The trick here is in calculating the price, because there's no liquid market for liabilities. It has to be calculated or estimated. Essentially through option pricing techniques we've discounted cash flows through a set of paths. We chose to discount Treasury rates flat, and that's something that could be debated. Here it actually doesn't make that much difference because it's the change in price that's key here, not the price itself, when it all comes down to it.

SPDA Index Construction

$$Index_0 = 1.0 \text{ (at policy issue)}$$

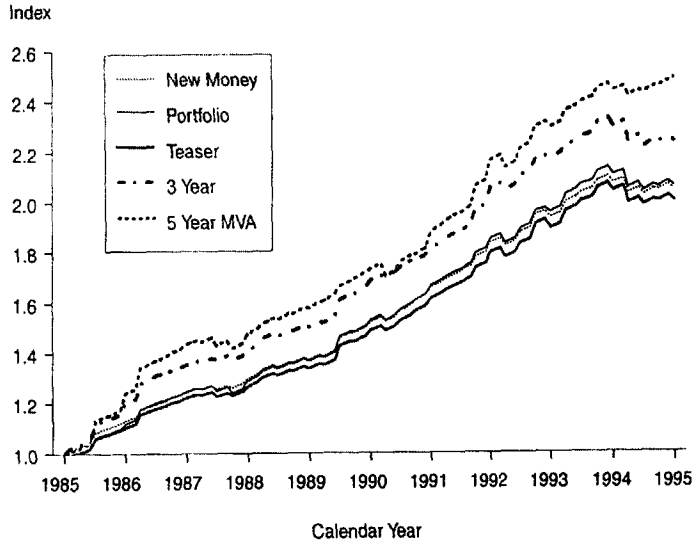
$$Index_1 = Index_0 \times (1 + OPR_1)$$

$$Index_t = Index_{t-1} \times (1 + OPR_t)$$

$$\text{Where } OPR_t = \frac{CF_t + P_t - P_{t-1}}{P_{t-1}}$$

Having defined the products, in addition to tracking these indexes going forward, we decided to also retroactively issue these products every quarter starting January 1, 1985. Then we'd actually have some historical data we could look at from which to compare product returns by the various product features. In Chart 1 you can see the relative cost of the products on a cumulative basis. The five-year reset product was the most expensive over that ten-year period. Basically what happened was rates were very high on January 1, 1985; a five-year product locked in a fairly high credited rate for five years. Rates then fell, so other products were resetting their rates down faster than that product. At the time that the product reset five years later, rates actually fell again a fair amount after that, so the five-year product was hurt by that. In addition, the MVA, being a two-way MVA, actually was a positive adjustment to the policyholder in the falling rate environment. So that also added to the cost of that product.

CHART 1
TEN-YEAR HISTORY OF SPDA INDICES
JANUARY 1, 1985 ISSUES WITH LOW SURRENDERS



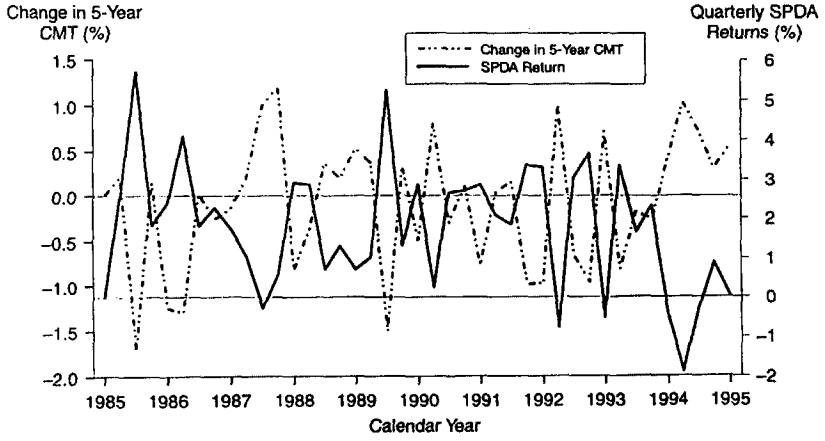
Source: Morgan Stanley

Once we had gone and issued these products, we actually got a few interesting pieces of data to look at. We wanted to check the quarterly returns in this case. We said, "OK. Well, how would those compare or be a function of five-year Treasury rates?" We looked at it versus five-year Treasury rates. That was one way to look at it.

We also looked at the change in SPDA returns versus the change in five-year CMT rates (Chart 2). In this case we looked at SPDA returns versus the change in five-year Treasury rates. You can see a fairly strong inverse relationship here. It almost suggests that you could draw a line right through the middle of that. If there's no change in the five-year Treasury, you might expect something in the order of a 2% quarterly return on the

liability. You would need a 2% quarterly return on assets to essentially match the total return on the liabilities.

CHART 2
SPDA RETURNS VERSUS CHANGE IN FIVE-YEAR CMT
NEW MONEY PRODUCT WITH LOW SURRENDERS



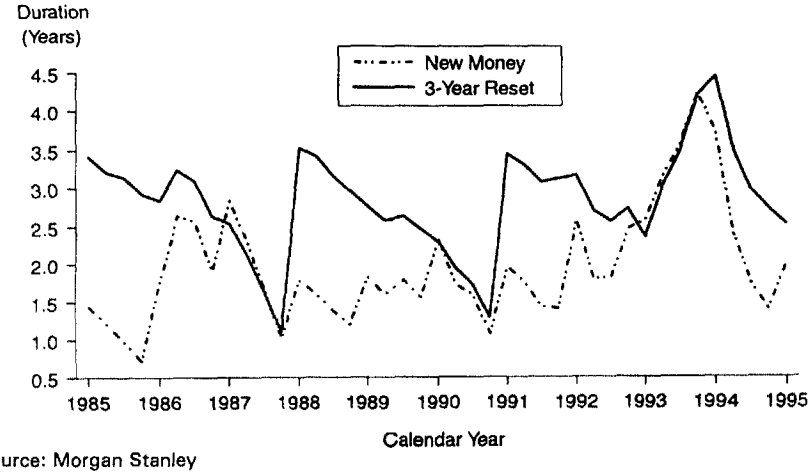
Source: Morgan Stanley

One thing I didn't mention before, which I should have, is that when we constructed these indexes, one issue we had was how to deal with acquisition costs. They're all upfront and on an ongoing liability flow. We decided to leave them out. Therefore, any of the returns you see here are totally exclusive of acquisition costs or profit requirement. To the extent the indexes reflect some periodic return here, a portfolio manager would need to meet that return just to essentially cover the ongoing periodic returns and the liability, and then earn something above and beyond that to amortize the initial acquisition cost as well as to generate a margin for profits and adequate return on equity. This is an interesting pattern. At least for this product, over time it suggests a fairly interesting pattern in terms of the relationship of SPDA returns to change in the five-year Treasury rate.

An interesting relationship also became apparent. You can draw three things from Chart 3. This is a graph of duration for two different products that were issued January 1, 1985 and tracked during a ten-year period. The first thing it says is that duration of a liability declines during the reset period, so as you get closer to a credit rate reset, the duration of the liability for that particular policy or block of policies, if you're considering a block, declines during that period. The second point, which is related to the first, is that a three-year reset product will have a higher duration than a one-year reset product, which the new money product is. Again, it's also declining during that reset period, but generally we'll see that of the new money product. The third thing is you see an upward drift here over time on both products across the whole graph. The January 1, 1985 products had a 5.5% guarantee in each of them and as you got into the early 1990s and beyond, you started to get right on top of the guarantee, which causes an upward movement in duration. Credit

rates can't get below the minimum rate guarantee and that causes upward pressure on duration and convexity.

CHART 3
HISTORICAL DURATION FOR JANUARY 1, 1985 ISSUES
WITH LOW SURRENDERS



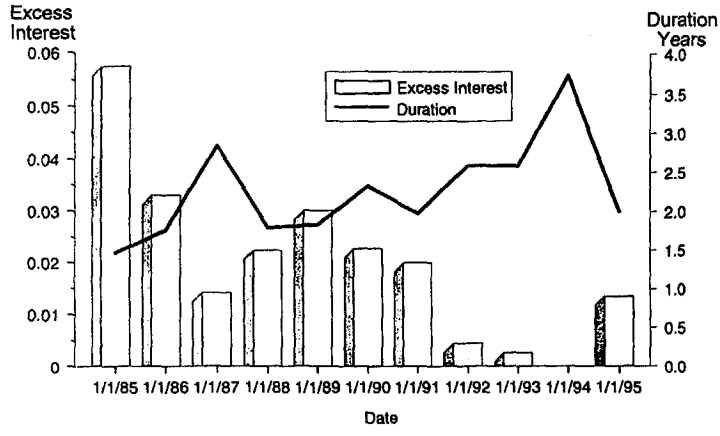
Source: Morgan Stanley

Chart 4 is related to Chart 3. For a 1985 issue, a lot of excess interest was being credited early on, which resulted in a lower duration. You can see somewhat of an inverse relationship between the amount of excess interest being credited and the duration of the product. As you got into the early 1990s, you were right on top of the minimum rate guarantee. You can see duration spiking up somewhat and again coming back down as of January 1, 1995. Credit rates had shot back up as interest rates moved back up in late 1994.

Chart 5 illustrates how duration might be a function of expected surrender behavior. As I mentioned before, we created these indexes under two surrender environments. Here's one product measured under those two environments. The historical duration, not surprisingly, is consistently higher under the low surrender environment (on the order of approximately one-half a year) during that period. In checking it out further, it seemed to be the case that the high surrender environment was higher both in the case of base lapses and dynamic surrenders. Each of those components contributed to the lower duration in the high surrender environment. So it's not just dynamic lapses that create that difference, it's a higher base lapse rate as well.

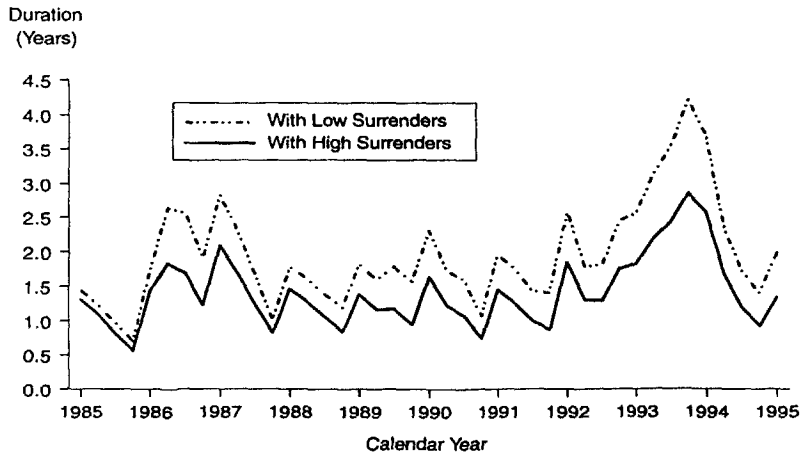
A distribution system in which you may expect to experience 10% ongoing surrenders as opposed to 5% in some other shop will result in lower duration just from that feature alone. Similarly, convexity is very much related to duration as is the issue of credit rates getting on top of the minimum rate guarantees. That caused a spike in convexity as well during those same periods of time (Chart 6).

CHART 4
DURATION VERSUS EXCESS INTEREST
FOR JANUARY 1, 1985 ISSUES
NEW MONEY PRODUCT WITH LOW SURRENDERS



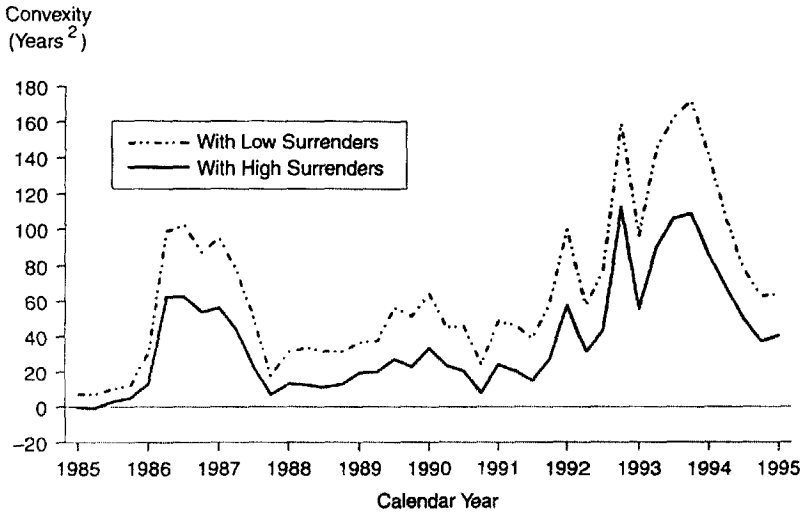
Source: Morgan Stanley

CHART 5
HISTORICAL DURATION FOR JANUARY 1, 1985 ISSUES
NEW MONEY PRODUCT



Source: Morgan Stanley

CHART 6
HISTORICAL CONVEXITY FOR JANUARY 1, 1985 ISSUES
NEW MONEY PRODUCT



Source: Morgan Stanley

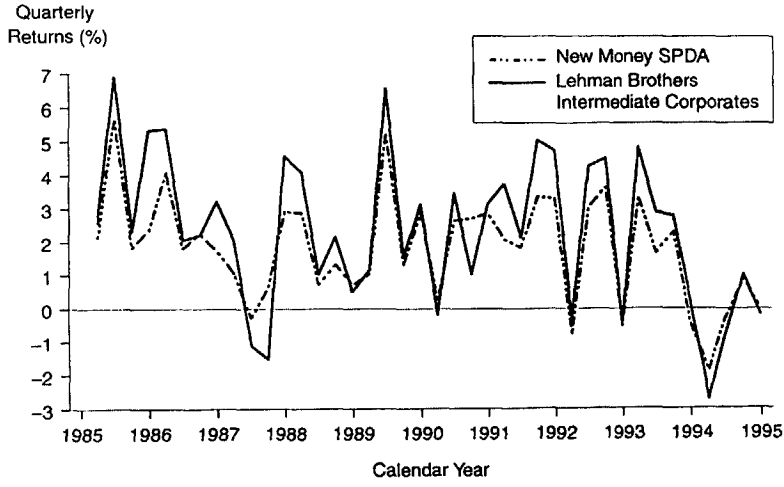
Now that we've looked at some of the liability side statistics and returns, Chart 7 actually compares the liability returns to the returns of an asset index. In this case we chose Lehman Brothers intermediate corporate bond index from 1985 through 1995. The whole index has a duration in the neighborhood of four or four-and-a-half. So it's not a bad example of what insurance companies might use to back an SPDA.

The quarterly returns are generally tracking each other as you expect. Fortunately, it looks as if the solid line, which is the asset returns, generally exceeds the broken line. However, in some cases, interest rates spiked and asset returns went way down. They get below the broken line. But remember the broken line does not incorporate amortizing acquisition costs or funding profits. So you need to be a little careful here when using an index such as this. Make sure you realize exactly what's incorporated.

In Chart 8, we've taken the quarterly returns from the prior graph and then tracked them on a cumulative basis. So we have cumulative returns for our 1985 issue, again both for the Lehman Brothers index and this new money SPDA product, hypothetically issued in 1985, but without acquisition costs. After ten years it looks as if we've done fairly well. We have on a cumulative basis approximately a 200-basis-point per-year spread that we earned had we invested in that index versus the liability; that looks fairly encouraging.

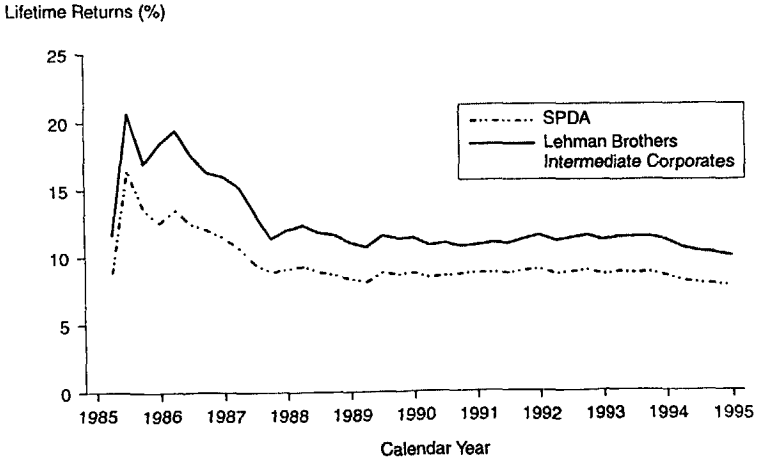
We now throw in 7% acquisition costs on Chart 9, which is not an unreasonable number. It's certainly in the neighborhood of what's spent to issue an SPDA product. Again, not surprisingly, your cumulative returns early on will not be enough to match the asset returns. But even with that I think we have something like a 60-basis-point advantage over time on the asset returns over the liabilities.

CHART 7
QUARTERLY RETURNS FOR JANUARY 1, 1985 ISSUES
NEW MONEY WITH LOW SURRENDERS



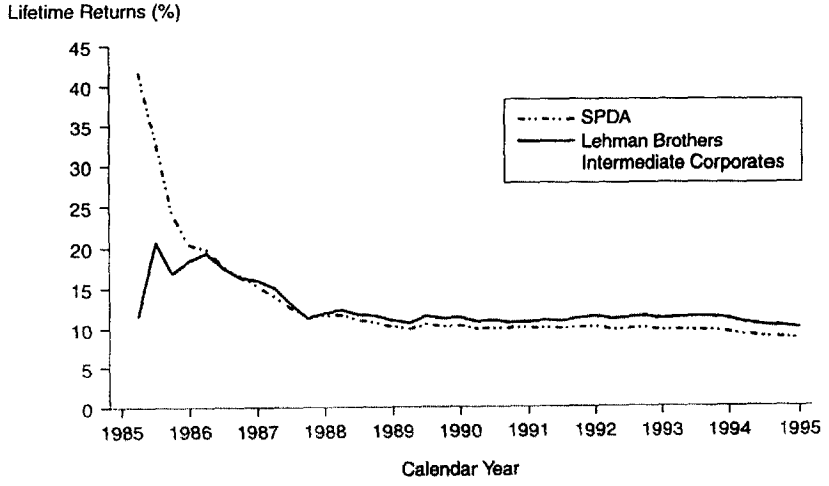
Source: Morgan Stanley, Lehman Brothers

CHART 8
LIFETIME RETURNS FOR JANUARY 1, 1985 ISSUES
NEW MONEY PRODUCT WITH NO ACQUISITION COSTS



Source: Morgan Stanley, Lehman Brothers

CHART 9
LIFETIME RETURNS FOR JANUARY 1, 1985 ISSUES
NEW MONEY PRODUCT WITH 7% ACQUISITION COSTS



Source: Morgan Stanley, Lehman Brothers

Are the profit margin or required profits able to generate an acceptable ROE? In this case, maybe. But remember that the interest rate environment cooperated quite nicely. We've had a bull market during most of this period. This asset index, with a duration of 4, 4.5, was invested against a product with a duration in the 1.5–2-year range. So for ten years in this hypothetical situation we're investing long, and the interest rates came down and worked to our advantage. While the result looks acceptable, I can imagine many environments in which the results would not have looked quite as good as this.

When we created these, we initially published some index returns as of December 31, 1994. We summarized them for the five products in Table 2. Actually, we have 3-month and 12-month returns as of that date as well as option-adjusted duration and convexity, again in both a low- and high-surrender environment. At the bottom we show some corresponding returns and duration and convexity figures for some Treasury instruments as well as that same Lehman index, plus a Lehman mortgage-backed security (MBS) index, which is something worth looking at because of the fact that the MBS is often used to back the SPDA or another interest-sensitive product.

Notice the convexities, for example. The SPDAs are a highly convex product. General convexities there are relative to the assets we show at the bottom. There's more convexity and you run the chance of having negatively convex assets in the MBS area. Again, you'll see higher durations for the low-surrender environment on the liability side. There is quite a bit higher duration on the typical assets that we've chosen for our comparison, which are not atypical of what you might see in an SPDA portfolio.

TABLE 2
DECEMBER 31, 1994 RETURN SUMMARY

	Total Rate of Return Percentage		Option-Adjusted Duration (Years)	Option-Adjusted Convexity (Years)
	Last 3 Months	Last 12 Months		
SPDAs with low surrenders				
New money	(0.14)	(1.02)	1.70	54
Teaser	(0.14)	(1.73)	1.94	67
Portfolio	0.25	(1.89)	2.98	62
Three-year reset	0.55	(1.02)	2.64	60
Five-year MVA	0.24	(1.49)	2.66	43
SPDAs with high surrenders				
New money	(0.14)	0.12	1.19	29
Teaser	(0.19)	(0.54)	1.37	41
Portfolio	0.03	(0.82)	2.13	44
Three-year reset	0.32	0.02	1.84	37
Five-year MVA	0.08	(1.19)	2.40	31
Assets				
Two-year U.S. treasury	(0.35)	2.72	1.82	4
Three-year U.S. treasury	(0.40)	(1.83)	2.52	8
Five-year U.S. treasury	(0.64)	(4.98)	4.08	20
Ten-year U.S. treasury	0.22	(8.24)	6.71	59
Lehman Intermediate Corporate Bond Index	(0.17)	(2.66)	4.10	24
Lehman Mortgage Backed Securities Index	0.43	(1.61)	4.40	(19)

Source: Data from Morgan Stanley, Lehman Brothers

Table 3 shows some similar data six months later as of June 1995. Notice at the very bottom right what happened to the MBS. The duration shortened by about a year. Convexity is now (118). Convexities of all the SPDAs shot up, so now you have a bigger convexity mismatch than you had before, which is symptomatic of the general problem of having SPDAs. You're giving away options and investing in assets where you're short options. It's working against you on both sides of the balance sheet here. In that particular case, if you compare the portfolio product with the Lehman MBS index, you were about 120 basis-points better or above the index return there based upon the duration that you started with at the start of the year, which was about 440. It's on Table 2 at the bottom for the mortgage-backeds. Interest rates declined 150 basis points during this first six months. You should have expected in excess of a 200-basis-point advantage on the MBS return relative to the portfolio product. But a shortening duration and negative convexity essentially rob you of the return that you might have otherwise expected on the mortgage-backs relative to the SPDA.

We've now broken out a particular product by issue year in Table 4. The previous table was basically a summary of 40 different issue age cohorts. Again, we issued each of these hypothetical products every quarter from January 1, 1985 going forward. Here we've not aggregated to quite the same extent. We've aggregated it just by issue year. So now we have return data on the right as well as credit rate data, duration convexity, and the indices

themselves by issue year. Obviously, to the extent you wanted to take some of the data from this and apply it to a specific portfolio, this would allow you to weight it according to the amount of business you had issued in any given issue year or the amount that you might still have in force based on issue year.

TABLE 3
JUNE 30, 1995 RETURN SUMMARY

	Total Rate of Return Percentage		Option-Adjusted Duration (Years)	Option-Adjusted Convexity (Years)
	Last 3 Months	Last 12 Months		
SPDAs with low surrenders				
New money	7.33	8.46	2.78	121
Teaser	7.86	8.93	3.28	142
Portfolio	9.53	11.34	3.89	86
Three-year reset	8.56	10.79	3.68	101
Five-tear MVA	8.90	10.99	3.58	98
SPDAs with high surrenders				
New money	6.05	7.35	1.83	72
Teaser	6.50	7.68	2.26	94
Portfolio	7.98	9.66	2.74	44
Three-year reset	7.15	9.26	2.50	52
Five-year MVA	8.40	10.48	3.04	67
Assets				
Two-year U.S. treasury	6.47	6.95	1.87	4
Three-year U.S. treasury	8.39	8.71	2.59	8
Five-year U.S. treasury	10.98	10.65	4.27	22
Ten-year U.S. treasury	15.69	15.68	7.19	65
Lehman Intermediate Corporate Bond Index	11.93	12.89	4.21	25
Lehman Mortgage Backed Securities Index	10.73	12.16	3.47	(118)

Source: Data from Morgan Stanley, Lehman Brothers

You see the products issued further back in time having higher duration and convexities relative to the more recently issued products. Again, the reason is that up through 1990 or 1991 there was a 5.5% guarantee assumed; then it became 4.5% and then 3.5% which is shown on Chart 10. We show the current duration by issue date as a function of the minimum guarantee on the product. You can see the same kind of effect we saw in the historical numbers that we observed for our 1985 issue. We're looking at ten different issue age cohorts. Based upon the minimum guarantee and the product, that has implications for the duration that might be associated with that block of liabilities.

Finally, the last sort of peripheral statistic here (Table 5) that relates to the liability requirements or their return requirements is what I refer to as required spread on assets. This will now more directly take into account acquisition costs that might be associated with a product.

TABLE 4
MORGAN STANLEY SPDA INDEX SUMMARY AS OF DECEMBER 31, 1994
NEW MONEY PRODUCT WITH LOW SURRENDERS

Issue Year	Credited Rate (%)	Duration (Years)	Convexity (Years)	Current SPDA Index	Total Return (Years)		
					Three-Month	One-Year	Annualized Lifetime
1985	6.35	1.75	64	1.97563	(0.07)	(1.26)	7.64
1986	6.35	1.80	67	1.76060	(0.05)	(1.34)	6.96
1987	6.35	1.85	69	1.65146	(0.03)	(1.43)	6.99
1988	6.35	1.93	71	1.55447	(0.02)	(1.61)	7.10
1989	6.35	2.04	72	1.46017	(0.03)	(1.80)	7.21
1990	6.35	2.15	74	1.33156	(0.02)	(1.96)	6.62
1991	6.21	1.62	46	1.20354	(0.21)	(0.57)	5.38
1992	6.16	1.47	37	1.08829	(0.27)	(0.21)	3.27
1993	6.16	1.17	18	1.02875	(0.40)	0.37	1.68
1994	6.78	1.05	9	1.00196	(0.42)	(0.05)	(0.05)
1995	7.84	1.31	8	1.00000			

Source: Morgan Stanley

CHART 10
DURATIONS AS OF DECEMBER 31, 1994
NEW MONEY PRODUCT WITH LOW SURRENDERS

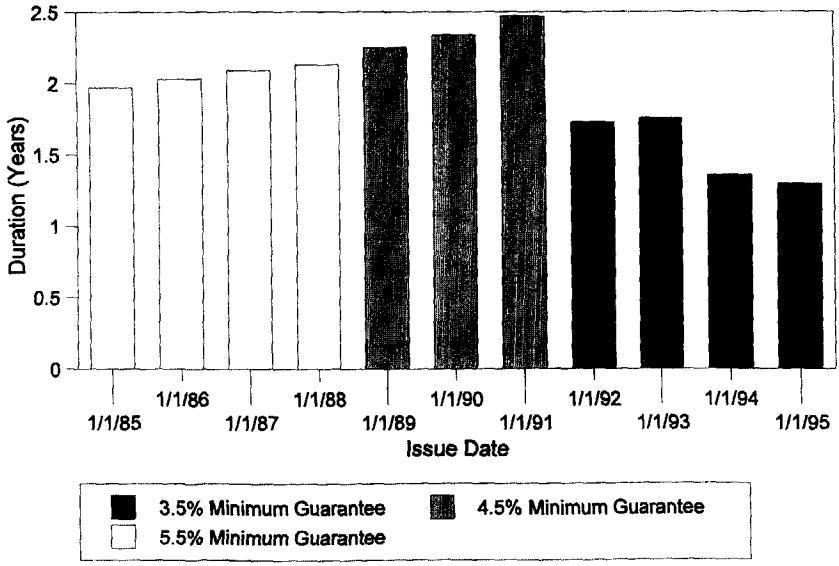


TABLE 5
REQUIRED SPREADS ON ASSETS FOR JANUARY 1, 1995 ISSUES
ALL FIGURES IN BASIS POINTS

Acquisition Costs/ Surrenders	New Money	Teaser	Portfolio	Three-Year Reset	Five-Year MVA
0%/Low	(13.3)	(35.5)	3.8	14.9	5.4
0%/High	(31.2)	(59.4)	(3.0)	13.7	(4.7)
7%/Low	58.8	34.3	79.6	91.6	81.6
7%/High	79.3	44.3	112.7	133.9	100.9

Source: Morgan Stanley

In the first two rows here we calculate RSAs without any acquisition costs. On the bottom two rows a 7% acquisition cost is assumed. So in the bottom row, we're saying that for the new money product in a high-surrender environment, we would need to earn 79.3 basis points over Treasury over the life of the product to just fund the expected liability flows. Again, that is in a high-surrender environment. That's just break even based upon the current yield curve as of that date and the implied forward rates. You can see the various other spreads required for the different products here. When looking at the zero-acquisition-cost case, you can see that the high-surrender numbers generate a lower spread requirement than the low-surrender environments, but it's just the opposite in the 7% acquisition cost case. Higher surrenders there imply higher liability costs. It seems to suggest that the surrender charges may be sufficient to deal with the effect of interest-sensitive behavior in terms of pure cost associated with that, but they can't handle that and the shorter amortization period that comes with higher lapses. Basically, the problem with high-surrender environments is not so much that you can't make the payouts per se or you have to sell bonds at losses, but you can't do that very easily and recover your acquisition cost, because now you have to amortize them over a shorter period. So some interesting results are embedded in Table 5.

Just one point: you will notice some variability in the required spread on assets (RSAs) on Table 5. Table 6 compares two products as of four different issue dates. As of January 1, 1986 the new money product and the three-year reset product had a fairly even expected funding rate. Then the new money product was deemed to be a cheaper product to issue as of January 1, 1989; it was just the opposite in 1992, and then back again in 1995. So that tells you where the yield curve is in terms of its current level. The shape of the curve has many implications for which products might be more expensive or less expensive to issue, at least on an expected basis.

TABLE 6
REQUIRED SPREADS ON ASSETS BY ISSUE DATE
7% ACQUISITION COSTS, LOW SURRENDERS
ALL FIGURES IN BASIS POINTS

Issue Date	New Money	Three-Year Reset
1/1/86	86.6	89.4
1/1/89	65.8	101.9
1/1/92	107.7	78.4
1/1/95	58.8	91.6

Source: Morgan Stanley

Having said all that, what are some of the applications for these or other indexes that could be created along these lines? For performance measurement you could take these indexes or something such as them and perhaps customize them for your own company's products and the relative amounts issued by issue year and come up with true liability returns that could become a bogey against which to measure a portfolio manager's performance.

For decomposition of liability returns you could project the liability returns assuming no change in interest rates and then essentially do an analysis that tracks the change in actual returns versus expected returns and, of course, the sources of such change. Would they want to change the yield curve or change yield curve volatility if you decide to use a higher volatility assumption when calculating your present value of liabilities as of any given date? That will have implications for the returns for that period. To the extent credit rate strategy actually changed versus what was planned or to the extent surrender behavior was different from expected, any of those could cause change in actual returns or expected.

For investment strategy you could take the required spreads on assets that are projected, duration or convexity figures, and use that information to piece together either an investment strategy or benchmark portfolios to which Marty alluded. That benchmark portfolio could become the actual vehicle for measuring the portfolio manager and actual returns against the hypothetical returns of such a benchmark portfolio.

To calculate indexes such as this, you have to estimate the fair value or market value of liabilities. Obviously, that concept is getting more and more attention these days. There'll be a lot of discussion going forward as to the right way to do that. Just going through the exercise is probably helpful to management to understand what the fair value liabilities is really estimated to be and how that changes over time so that you have a better handle on how the fair value of liabilities will change relative to the market value of your assets.

Finally, creating such indexes provides a foundation to do a total return liability swap. To my knowledge this has not been done yet, but given the existence of these indexes or something such as them, a bank could write or offer a swap whereby an insurance company could receive the total return of the index and pay LIBOR against it. The theory is if it can receive the total return of a specific liability index, that will hedge the company against its actual liability costs if the index is a fairly close representation of the products and the liabilities that it is writing.

FROM THE FLOOR: Marty, how many companies are actually using these indexes to measure portfolio management?

MR. KLEIN: I don't know specifically. Clearly, many companies use the "do-nothing" approach, but a number of companies use kind of the generic index type of approach I talked about and they look for some broad market index. Steve pulled out some of the components of these generic indexes. Some companies, for example, might look to a Lehman's index and pull out the intermediate corporate index. I think a number of companies do that. A smaller group tends to take it to the next level and better customize it. Many of our clients do that because it's something we help them work through. A couple have this more model-driven approach. This is something that's more in its infancy, but I think it's a very powerful approach, particularly if you have a base with a

cash-flow-testing model on which to build. I'm not really aware of many companies that do it, but I am aware of a handful.

FROM THE FLOOR: Just as a follow-up to that, I've noticed in our work that the process almost becomes driven from the actuarial side. We seem to have trouble getting buy-in from the investment department. Can you talk about that?

MR. KLEIN: Yes. Many issues really get out of analytical and technical types of issues and then get to the company's management structure and so forth. People can sit here and think, "Gee, some of these ideas are really good." Maybe some are and some aren't. But then to take them back and implement them in a company depends on the company's make-up.

Some companies are very segregated in how their investment departments work versus how the financial group or the actuarial group works. Others are much more integrated. There tends to be a trend toward more integration. Actuaries are trying to get more involved through some of the modeling that they have to do. But that's clearly an issue. For smaller companies that tend to outsource, it's easier because usually the actuarial group, the chief financial officer (CFO), or a financial group puts on some of these criteria to the outside investment management that is being hired. So it's actually easier actually for smaller companies that are outsourcing their asset management than it is for some of the larger companies with an internal investment department.

FROM THE FLOOR: Steve, when will Morgan Stanley come up with its liability swap?

MR. REDDY: As soon as somebody asks for it. Given the existence of the indexes, that's basically all we need at this point. Some pricing issues are involved in terms of our traders actually pricing a total return liability swap. They'll probably throw their hands up and say, "What is this?" But given the data we have on the indexes, we could price this out fairly routinely, I think. But it was not all that long ago that we sent our initial publication on the indexes. So I think there's a fair period of digestion here in terms of people understanding what these are or what they mean and how they could help their own companies. Some companies have come back and asked, "Well, could these be customized? Could we do this or that with them? What does this or that mean?" A period of digestion must occur here so that people become more comfortable with what the indexes mean. My guess is that will come in time.

FROM THE FLOOR: When looking at establishing a baseline, say, for an SPDA, you do your liability projection, so you're using your asset/liability model. You get an answer such as, say, 2.5–3.5 so you know you have a good baseline investment strategy. But with a product such as traditional life or UL and trying to calculate the liability duration, you get a rather stupid looking answer, say, anywhere from 2 to 13 or even negative numbers. To the best of my knowledge, nobody has come up with a good way to express a closed form measure such as duration of the traditional life liability. Is that still correct or has some work been done that furthers education in this matter?

MR. REDDY: I don't know exactly what work has been done in that area. I know we have not focused on that particular question or issue, primarily because SPDAs are where the money's at in terms of being a single premium product. Once the product's issued, essentially all the money's already invested. To the extent you don't have future

premiums coming in, you don't have this negative cash flow that's expected to occur in the future, which essentially is what future premiums are on traditional life.

FROM THE FLOOR: But you still must tell your investment department—in our case we're primarily a traditional life company—what its current inventory of traditional life-backed assets should look like and why.

MR. REDDY: In theory there's no reason you can't calculate duration of traditional life with the same process as for single premium with the additional step that future premiums are essentially negative cash flows. Future premiums may be interest-sensitive as well, so perhaps their payments to the extent it's a flexible premium policy, are a function of the interest rate path. That will have some impact on the resulting duration number. But you can use the same process for estimating duration. I haven't gone through the process that often, but the numbers certainly can swing a lot more than you'll see in single premium products.

MR. KLEIN: With some of these more model-driven approaches, you don't even necessarily need to know the duration of the liabilities. If you think about the financial constraints you're developing, the return goals of the risk parameters you're putting around that, you're optimizing either a set of earnings or growth and surplus or whatever and you're defining risk constraint not as duration mismatch constraint necessarily, but more as a volatility in earnings or a volatility in surplus. That sort of implicitly adjusts for duration mismatch, but an explicit assumption does not come out of it. So you can actually use some of those approaches without ever really knowing what the duration of your liabilities is. Having said that, you can use those same models to determine the duration of those liabilities if you'd like to.