

**1995 VALUATION ACTUARY  
SYMPOSIUM PROCEEDINGS**

**SESSION 10**

**Asset/Liability Management**

**Mark A. Davis**

**Frederick W. Jackson**



## ASSET/LIABILITY MANAGEMENT

**MR. MARK A. DAVIS:** I'm a consultant with Tillinghast in Chicago. Our other panelist is Rick Jackson. Rick is a vice president at Scudder, Stevens & Clark, which is an investment management firm in Boston.

When the Planning Committee first decided to have an asset/liability modeling (ALM) type of session, they called it "Duration and Convexity." I thought that the title was missing a step or skipping over some steps along the way, and so I simply renamed it "Asset/Liability Management." The focus here is moving from cash-flow testing to asset/liability management. I hope some of you are beginning to think that cash-flow testing is old hat and you're looking for new and exciting ways to take up your time, and also to make more use of or lever the efforts that have been expended in cash-flow testing, which in many cases is quite a resource commitment. I hope you can learn a little bit about moving on to the next step in terms of asset/liability management.

Frequently I see companies that pull out the cash-flow testing once a year, work very hard at it for a month or two, and then put it back on the shelf where it will sit until next year. I believe there is an opportunity cost where you're not fully realizing the benefit of that cash-flow testing exercise. Our primary focus, I think, is to talk about, when we're done with cash-flow testing, where can we go? If anyone considers himself or herself a real expert in asset/liability management, perhaps that person won't learn a lot from this session.

**MR. FREDERICK W. JACKSON:** I'm surprised that there are so many people here. I think it's indicative of where we are with cash-flow testing and the fact that we're ready to move on to the next step. I'd like to say a little bit more about myself before we go on. I spent about the first 20 years of my work as an actuary in product development and financial forecasting before spending the last two-and-a-half to three years concentrating on asset/liability management issues.

## 1995 VALUATION ACTUARY SYMPOSIUM

Our investment firm manages assets for over 100 insurance companies, and I work with the life and annuity clients. My main job is to help those clients who are interested to transform cash-flow-testing models into internal ALM tools. Typically, these clients have asset sizes in the \$100 million to \$3 billion range. In the last three years, I've seen a wide range of specific situations. It amazes me. I've seen a \$15 billion insurer that does virtually no asset/liability management work. It doesn't make much sense to me. I've also seen a \$200 million insurer that is trying to do everything possible. That company is really aggressively pursuing an internal asset/liability management capability. I think the target audience at this session is the medium-sized insurer looking to make the transition from cash-flow testing to internal ALM.

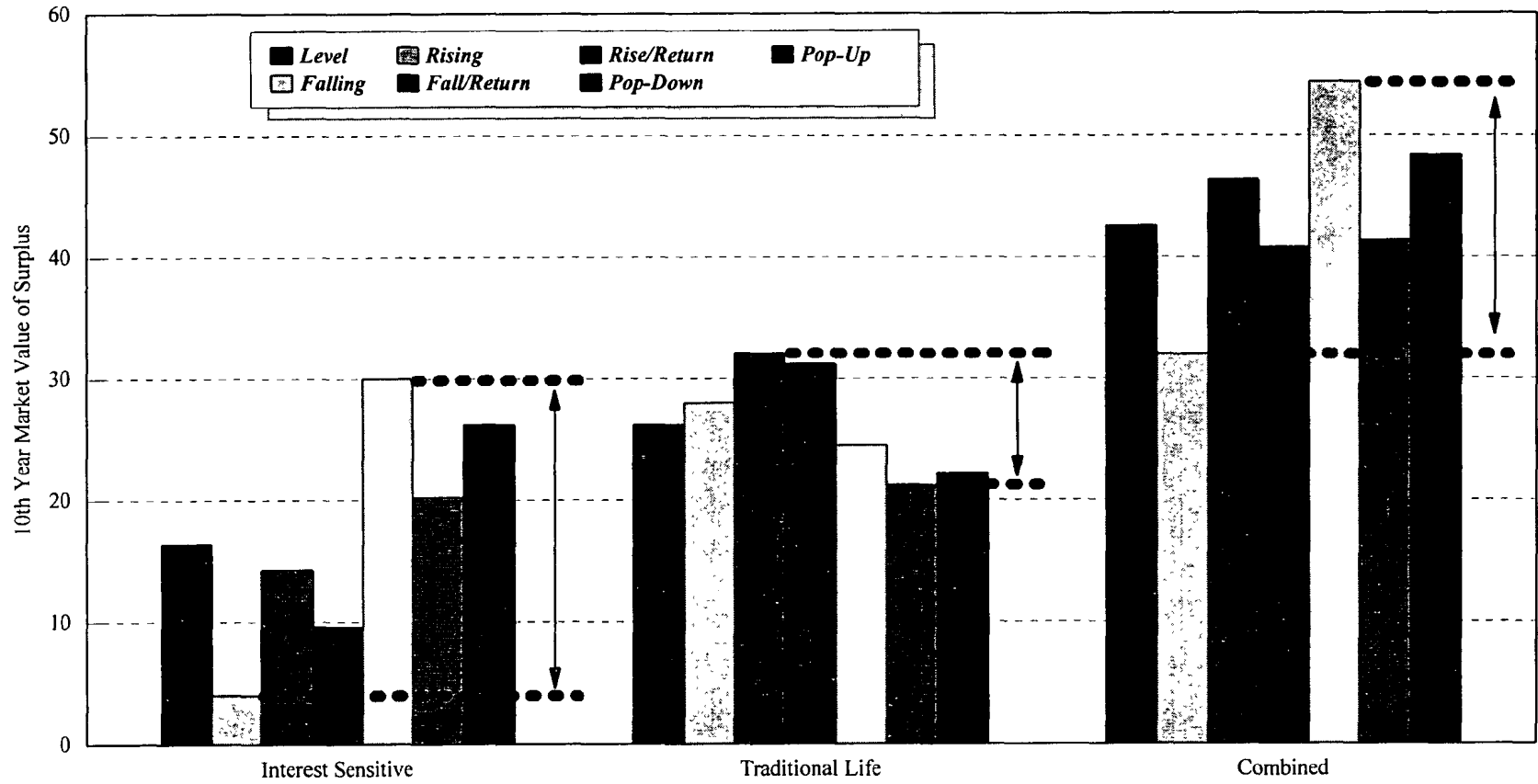
For the past three years, this has been my area of specialty and focus, and it has been kind of a luxury in that I've been able to focus on an area that I had tried to focus on for two or three years before; but I kept getting drawn back into product development situations and product filings. It's very difficult to do this kind of work part-time. I guess the most enjoyable part of the process is that here you see finance theory and increasingly statistical perspectives drive new applications for ALM. I think internal ALM is going to be an area that grows significantly for many years to come. I think we all know that.

First, we'll discuss how cash-flow testing models can be used to provide significant ALM information. I would make the comment that the models that are built for cash-flow testing are a good base to start from, but they require significant work to move forward to provide additional valuable information. If you take a look at what's out there, there is some information that is available from the asset adequacy work, even without doing anything. Chart 1 is a sample asset adequacy graph. I took a company that has interest-sensitive life and traditional life products and graphed the 1994 asset adequacy results.

I've used the New York seven scenarios that everybody is familiar with. The first column corresponds to the level interest rate environment. There are three rising interest rate environments.

# CHART 1

## 1994 Sample Asset Adequacy



Demonstrates: Profitability, Volatility by Product Line Liability Hedging characteristics, if any.

## 1995 VALUATION ACTUARY SYMPOSIUM

Those are the next three columns. The last three columns are the falling interest rate environments. Mainly I'll focus on the difference between the second, third, and fourth columns that show the rising interest rate environments and the last three columns that are the falling interest rate environments.

Chart 1 demonstrates a degree of volatility for this company. Where I have the dotted lines, if you look at the interest-sensitive product, there's more volatility. Here we're looking at the tenth year market value of surplus. The interest-sensitive line shows more volatility than this traditional block of business. The other thing that's important on this graph is that the traditional life line is providing kind of a dampening effect on the volatility of the interest-sensitive product. It's kind of an internal liability hedge.

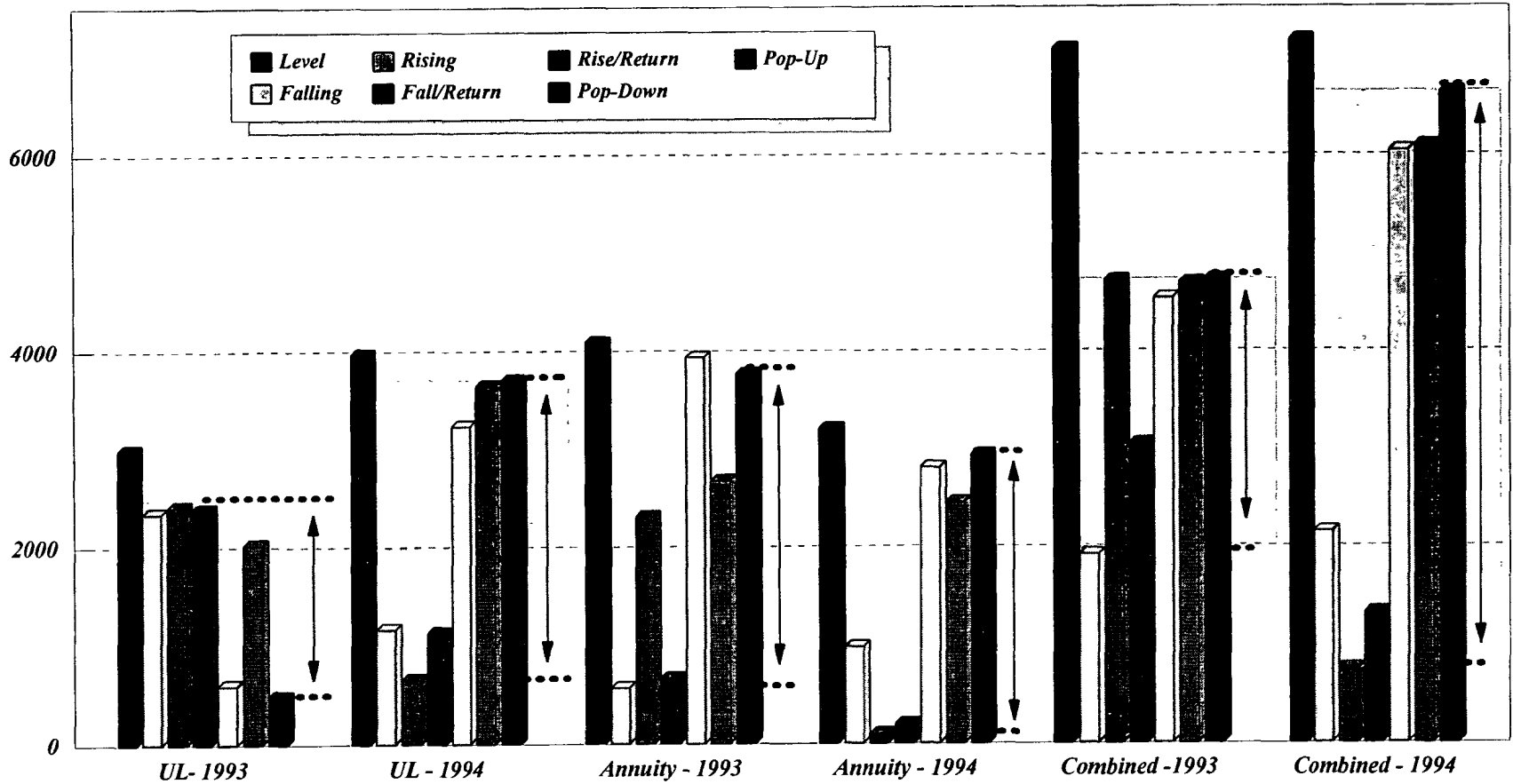
If this modeling work has been done correctly by the company, there is some internal liability hedging going on. You do have some hedging going on with diversification of assets. There can also be diversification of liabilities. It does provide some hedging internally already and that's important when you're thinking about things like actually putting hedges on your annuity line of business. Is there any internal hedging already going on? That's important to assess. So here, if you look at the combined columns over on the right, they show a little less volatility than the interest sensitive columns, but not quite as much control as the traditional block.

I have two companies for which I compared 1993 and 1994 asset adequacy analysis (Chart 2). One thing I want to say is you don't generally just trust your modeling efforts. You want to check them for reasonableness. I've used this as a jumping off point when I talk to clients or prospective clients. If you look at the 1993 and 1994 combined results, the thing that struck me about this company was that the 1993 results had a relatively tight range of profitability. Again, we're talking market value of surplus ten years out. But then, in 1994, there was a much wider range of profitability. This was disturbing to me. It didn't make any sense to me that, from one year to the next, you had such a wide range of volatility showing up, when 1993 did not show that same result.

I went back and I said, "Okay, what's going on?" The products were broken out into annuity and universal life (UL) in the asset adequacy statements, so I graphed them both. The annuity product

## CHART 2

### Company One Illusion of a Liability Hedge



Explanation for year-to-year inconsistency: None. 1994 Reasonable, not 1993.

## 1995 VALUATION ACTUARY SYMPOSIUM

profile looked pretty consistent from 1993 to 1994. The thing that looked different was the UL results from 1993 and 1994. There was a real change in the product profile or the profitability.

Look at UL for 1993 and the rising interest rate environments. Again, I'm ignoring the level because we never really see a level interest rate environment. We're going to see rising or falling or some combination of those. But if you look at the rising rates, the UL product in 1993 does relatively better than in the falling interest rate environments. The last three columns don't get the same level of profitability. The problem is in 1994 that the pattern switches around. If you look at 1993, the UL product does not perform well in rising interest rate environments, and it performs exceptionally well in 1994.

Now, I went back to the consultant who had done the work on this and said, "This doesn't make any sense to me." The profile I have seen with other UL and annuity companies was something more comparable to the 1994 profitability profile. We talked about it for a little bit, but I did not get a satisfactory answer. Because this was a life subsidiary of an insurance group, it was really too small for the consultant to dig too deeply on this issue. The bottom line was that this was left up in the air. It was not a satisfactory result from my point of view. There should be an element of consistency from year to year in the product profiles of the different lines of business. We kind of left that one -- that the 1994 results were reasonable and the 1993 results were not reasonable.

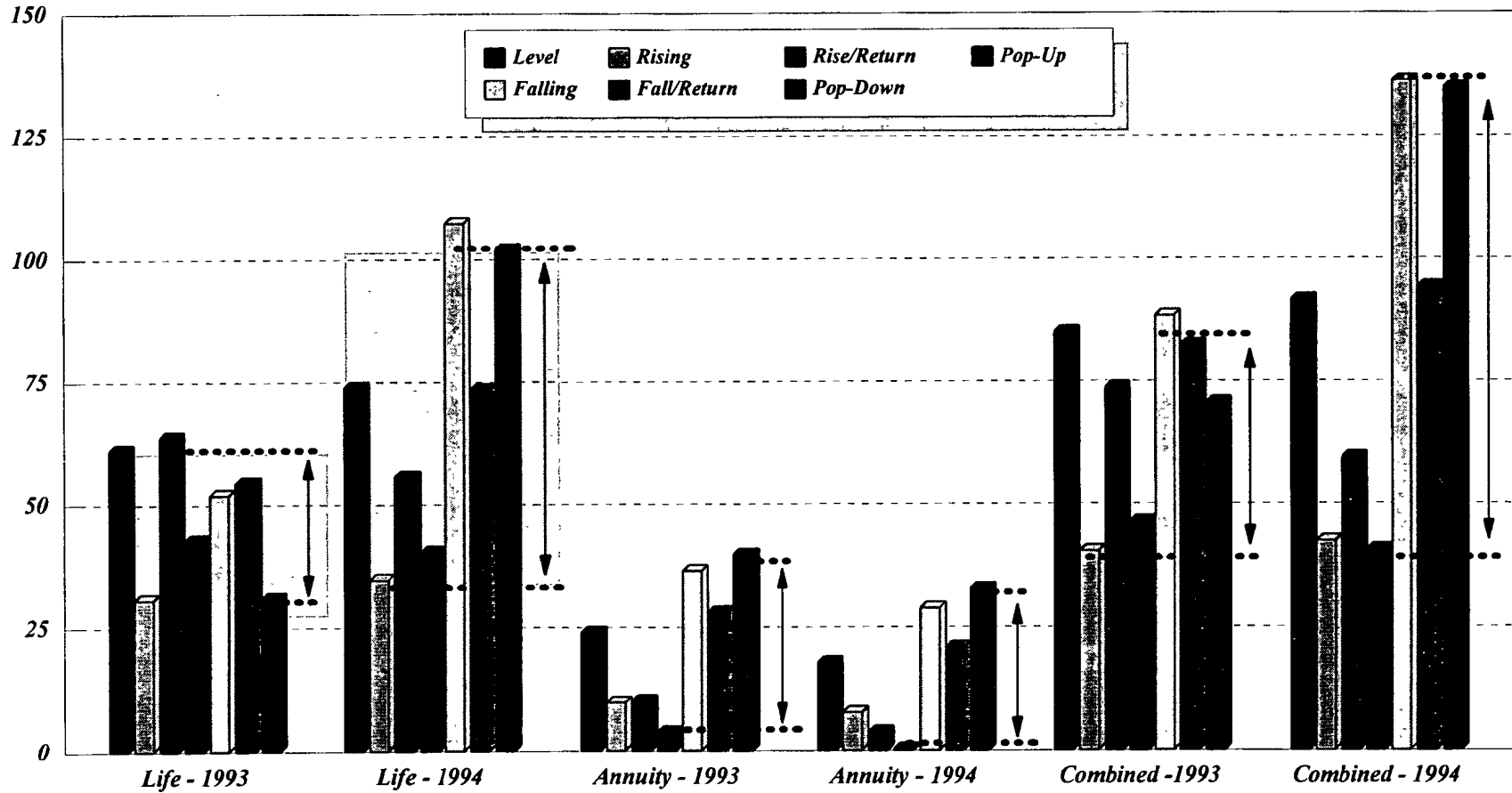
The second company I want to look at had an apparent inconsistency of life results (Chart 3). If you look over at the combined results, 1993 and 1994, you'll see a range of profitability that's not consistent from 1993 to 1994. Again, 1993 has a relatively narrow range of profitability. This is, again, looking out to the tenth year of market value of surplus. The combined 1994 results has a wider range of profitability. Fortunately, the change is upward. In the falling interest rate environment, the combined results actually show the potential for greater profitability.

I went back to the actuary who did the work on this and said, "This is inconsistent. Do you have a good explanation for what's going on here?" We were moving ahead with some more extensive analysis with this company and we wanted to make sure that the 1994 results we were working with



### CHART 3

#### Company Two Apparent Inconsistency of Life Results -- 1993 - 1994



## 1995 VALUATION ACTUARY SYMPOSIUM

were a good base to start from. He had some relatively good answers. We really traced it back to the fixed premium UL block (Chart 4).

The annuity profitability was pretty consistent from year to year, but the life results were the wider band. It really was this one product, fixed-premium UL product. It was a large part of the company's business going forward. What we identified was that in 1993 the fixed-premium product had two things going on. First, if you remember, the interest rates had come down significantly. Toward the end of 1993, we were at a lower interest rate level. So when the projection was done, one thing that was happening is that interest rate guarantees were triggered in this 1993 run. The fixed-premium UL product had a relatively high guaranteed rate of interest, so that profit spreads were compressed. This was part of the explanation for what was going on.

The other part of the explanation was that from 1993 to 1994, there was a reallocation of expenses to new business. We talked about that a bit. Since most companies have significant marketing operations, and 60-80% of expenses can be allocated to marketing, it was determined that these expenses did not belong on the in-force block of business. They should be allocated to the new business, and were removed from this in-force-only analysis.

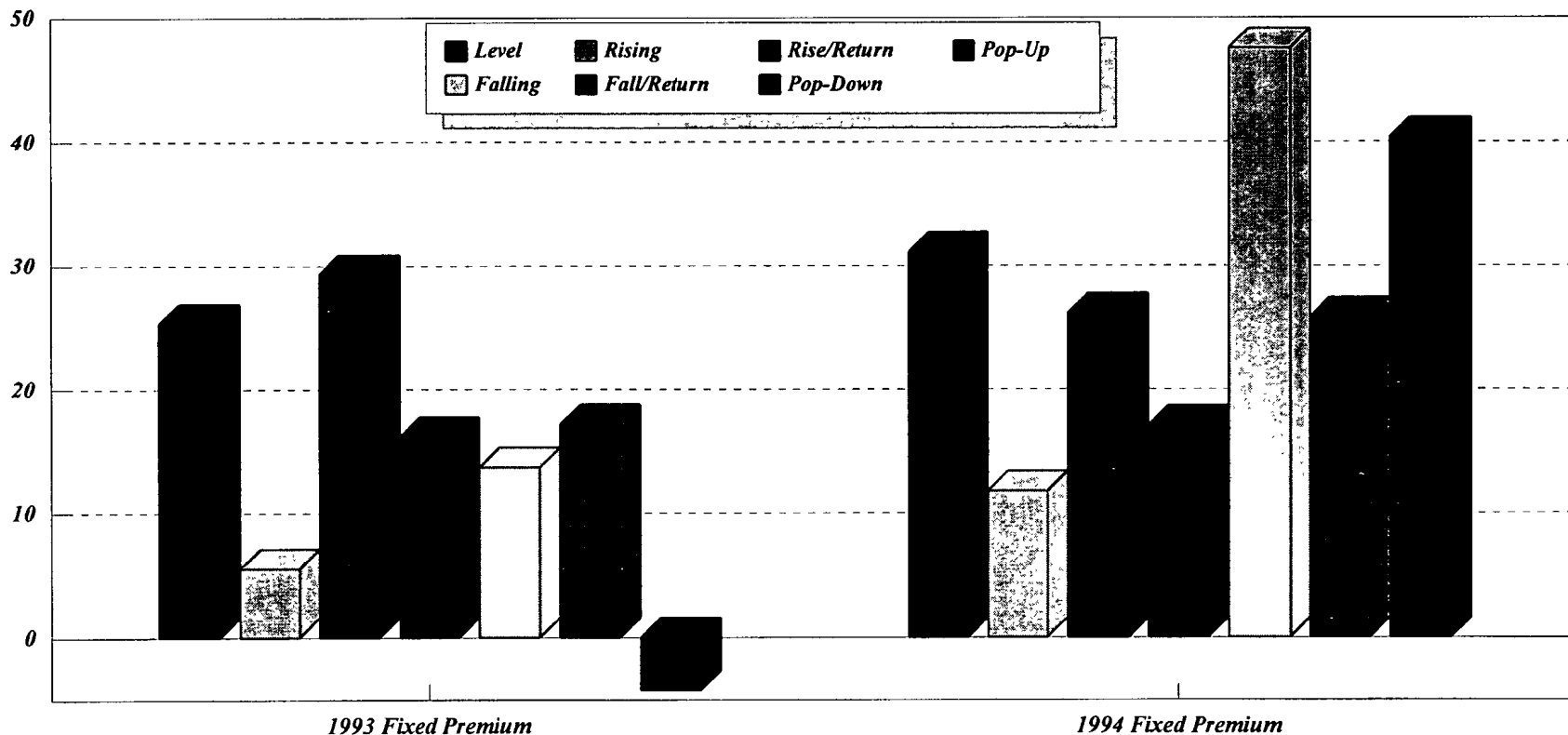
So on the basis of these two explanations, I really had no problem, and we went forward with further analysis for the company. The point here is that you should not automatically trust your models. Take a look at them and make sure that there is some consistency from year to year on what you've done.

The next section is the transition from cash-flow testing to asset/liability management. What changes to cash-flow-testing models may be required? Are additional resources required? The addition of a new business model is a must, as illustrated by the situation just discussed. The new business expenses were allocated away from that in-force block of business. They have to go somewhere. For a company that's looking to assess its profitability going forward, those expenses are going to be covered, and they should be included in a new business model.

**CHART 4**

**Source of Inconsistency  
Fixed Premium UL Block**

Thousands



Explanation for year-to-year inconsistency: Interest Rate Guarantee Triggered in 1993 run. Reallocation of expenses to new business in 1994.

One of the key questions is whether your marketing arm is providing profitable business going forward. That, I think, is an important element that's missing in the asset adequacy analysis. That's one thing that has to be done to extend the asset adequacy analysis to create an internal ALM tool.

Another area that's important to address is that there is some speed required for extensive what-if analysis. There's a possible need for condensed models, for software enhancements, for hardware, and networking improvements as you go ahead and do 100 to 200 scenarios versus when you get beyond the New York seven and you're getting involved in stochastic situations where you're testing that many scenarios, turnaround time becomes critical. With the two main asset/liability management systems out there, one is more time intensive than the other, but they both are challenged to have turnaround when you're doing a lot of stochastic scenarios, as well as testing different interest crediting strategies and testing different investment strategies.

One thing to consider is condensing your model. Some of these models have many thousands of cells, and they cannot run in a timely fashion. I have done some duration runs with one company, and it took over a month-and-a-half to get all the runs done. I heard a panelist at another session talking about the fact that each actuarial person at his company has two Pentium machines in their office. I have two in my office, and I am now getting a laptop that's a Pentium as well. I also have access to four or five other Pentium machines. You have to take care of the hardware considerations, and you have to also look at the size of your liability models. You generally have your assets fully modeled, but there is a need in most cases for condensed liability models for management-focused ALM work.

There are also software considerations. Some of the vendors out there are talking about the speed issue. Some of them are making a big issue of the speed issue. I think they're reaching an audience that's having some difficulty getting all the work done in a timely fashion where they can take the results that are done, do the analysis, provide it to senior management, and get some turnaround. So these are real issues. Speed is very important, and it will become increasingly important as more and more of you become increasingly focused on this type of work.

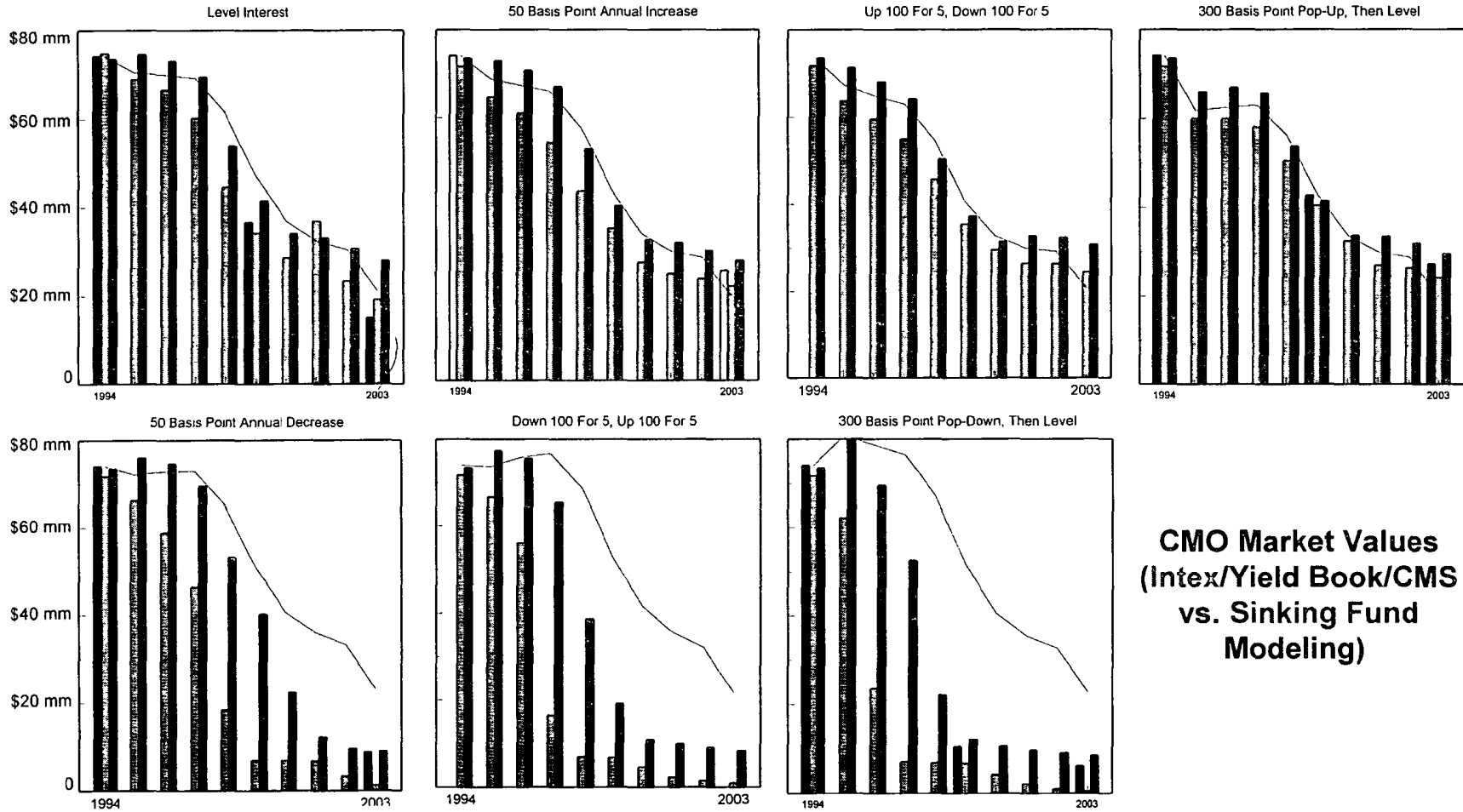
What I found is that the liability understanding and experience usually exists within most of our companies. The necessary asset adequacy work has required that these models be set up. The actuaries who are involved in this usually drive the process and the liability understanding usually exists. The investment professional participation in the ALM process seems to be less consistently committed, because there is a lot of time involved. I think it goes back to Donna Claire's point about the DFCA book never being opened. There isn't a lot of time available, given that you have other considerations and investment people also have other considerations. Unless there's a strong commitment from senior management or from the investment department, you may not get the same commitment to ALM that there is on the actuarial liability model side.

One last point on possible changes to the cash-flow testing model. The software should be rigorous enough to support all the types of assets and liabilities modeled. Chart 5 addresses this. Chart 5 looks at collateralized mortgage obligations (CMOs). Some of the companies that I've talked to have chosen to model CMOs as sinking funds. Now, for internal asset/liability management purposes, this is not a rigorous enough way to go. Companies that have modeled the CMOs as sinking funds will run into this problem. If you look at the first four graphs across the top, these all represent the New York seven scenarios for an in-force block. We have the level interest and the three rising interest rate environment situations across the top. What I've charted the sinking fund results against are what I consider more rigorous systems: the Intex System, Solomon Brothers Yield Book System, and Capital Management Science (CMS) Modeling for CMOs. The sinking fund approach is represented by the thin line; the more rigorous systems are represented by the bars.

In those first four scenarios the sinking fund approach is reasonably accurate. Interest rates are not falling. It's in these last three environments where interest rates are falling that the thin line stays well up there. Those market values do not run off very quickly. On every one of the other more rigorous systems, you have the market values dropping out of sight. That's consistent with the experience that we saw in 1993 and 1994 when interest rates really fell through the floor. The sinking fund is totally inadequate. It's a substantive modeling insufficiency.

# CHART 5

## CMO Market Values



**CMO Market Values  
(Intex/Yield Book/CMS  
vs. Sinking Fund  
Modeling)**

Some of the companies that we had talked to that were using this modeling technique came back to us and said, "Yes, you say that this is insufficient. Prove it to us." So this graph is something that they could take to their senior management and say that there's a modeling insufficiency. What this means is that we're going to be modeling for internal management purposes, CMO cash flows that we think are going to exist. In a falling interest rate environment, those CMO cash flows are not going to be there. What we're going to be faced with in these modeling runs is a situation where we think that we have assets that are in force with high yields. What we really will have instead is cash that we have to turn around and invest in lower yielding assets.

It's a misleading situation leading to very inaccurate modeling results. The bottom line here is that there are ways you can get management to spend the money to buy the systems you need or you can import other systems like CMS into modeling software. There are ways more accurate modeling is done.

Finally, let's discuss the additional resources required. Senior management commitment is crucial. In the last three years this trend is encouraging. Positive steps include the publishing of the *DFCA Handbook*. Used or not, it's out there. The "Market Value of Liabilities" paper has just been put out by an Academy task force chaired by Jim Hohmann. This paper has not yet had wide circulation, but it was issued in response to the *FAS 115* lunacy where only the asset side of the balance sheet is marked to market. We're now looking at market value of liabilities and there is some good, solid documentation from Jim Hohmann's task force. I believe other groups have some things that are being published. As we get out the fact that there are market values of liabilities, people will get more comfortable with the economic value concept, then we'll get increasing focus upon market value of assets and liabilities.

Another issue is rating agency language. My next point is that the asset adequacy work and rating agency pressure are raising the level of awareness in the board room. We have a phenomenon here where, unfortunately, I don't think there would be asset adequacy work done by most people in this room unless the regulatory bodies had first come up with Regulation 126 in New York and then

## 1995 VALUATION ACTUARY SYMPOSIUM

followed with the NAIC asset adequacy requirements. Regulatory initiatives put in place a discipline to find those companies that were about ready to go belly up.

Recently, I've noticed the rating agency language of A.M. Best and Standard & Poor's. Whenever they write up a rating of a company, and there are any interest-sensitive liabilities or any significant amount of interest-sensitive assets, there's always reference to the asset/liability management capabilities of that company, and whether the company has strong asset/liability management skills, or there is a need for improved asset/liability management skills. I see this pressure coming from the rating agencies, and this perspective is making its way into the board room. Company senior management is becoming more familiar with the fact that it has to address this issue. Unfortunately, management won't just listen to the actuaries.

Again, as I said, an understanding of the liabilities is usually present. What is lacking currently, and much of this has to come from top management, is a long-term actuarial staff commitment to ALM work, beyond year-end cash-flow testing. There also has to be investment professional participation in the ALM process on a more consistent basis. Many companies do not have a committed team approach yet. Internal ALM will not happen without strong top management backing. I have an example or two that point out a situation where ALM didn't work.

In Table 1 we have the duration of the liability portfolio. It doesn't seem to have a place in an asset adequacy environment. It isn't part of the law. A few years ago, Doug Doll of Tillinghast wrote that there are complementary roles for scenario testing and duration. Scenario testing has a longer-term focus and is really critical to what-if type analysis. Duration, on the other hand, has a short-term focus, and it's widely relied on by portfolio managers. I'm the only FSA with 2,000 investment people in my company. They're learning more about liabilities, and that they exist, but we tend not to talk about liabilities too much. Their question is, what is the duration of your liabilities? Their immediate thought is they know what the duration of the asset portfolio is and their instinctive response is, "We have to know what mismatch we have with the liabilities." Duration is an important way that we can communicate with the investment professionals. They're very familiar with duration concepts.



**TABLE 1**  
**Asset/Liability Management**  
**Duration Summary (Portfolio Crediting Strategy Assumed)**

Segment	Product Line	Liability Duration	Current Asset Duration	Current Mismatch	Alternative A		Alternative B	
					Target Asset Duration	Target Mismatch	Target Asset Duration	Target Mismatch
One: Traditional/UL/ Surplus	Traditional	5.5	3.3					
	Interest Sensitive	5.4	3.3					
	Aggregate Segment 1	5.5	3.3	-2.2	5.6	0.1	5.6	0.1
Two Annuity/Deposit Funds/Other	Annuity	2.0	3.3					
	A&H/ Deposit	0.9	3.3					
	Aggregate Segment 2	1.8	3.3	1.5	3.6	1.8	1.8	1.8
Combined				0.7		1.4		0.0

Mark is going to talk a little bit more in more definitive terms about definitions of effective duration, but for now I'll just say duration can be viewed as the change in market value of an asset or a liability, given a 100-basis point shift in interest rates. It's kind of a simplistic definition, but it's useful, and it's really the one that's most widely accepted and used. As market value of liabilities becomes more accepted as a concept, then duration relevance, I think, will continue to grow.

Having spoken in favor of duration analysis, I'll say that there's greater utility from small rather than large interest rate shifts. It kind of falls apart when there are large interest rate shifts. Convexity or asset volatility issues are not well-handled by duration. Table 1 is a duration summary. It summarizes the duration considerations for a company I've been working with recently. This company has no segmentation. If you look at aggregate segment one and aggregate segment two, those are shaded. What we chose to do for this company was to group the liabilities first by comparable duration so that segment one, which is the traditional UL and the surplus accounts, has an overall duration of 5.5.

The asset duration throughout is 3.3 for both of the segments. In this situation, when we group them that way, the mismatch is minus 2.2. Looking at the annuity and deposit funds, which have the shorter durations, they had a 1.8 duration; again, with an asset duration of 3.3. They have a 1.5 positive mismatch. When you weight the two together, the annuity block is larger. I haven't put down the number of assets here, but the annuity block is larger. The overall mismatch is 0.7.

Now, we put back to senior management of this company two alternatives to what we call a present lack of discipline. Segmentation is useful in imposing a discipline. Each of alternatives A and B suggest that liabilities of similar duration be grouped. If you look at A and B for segment one, we have basically the same proposal here -- that the target asset duration be extended from 3.3 to 5.6. Essentially, for this particular product line, we suggest they have a very small mismatch, a mismatch of 0.1 in this situation.

But where there's a difference between alternative A and B is in the annuity line. I'd argue that a lot of companies don't even know what their liability duration is on annuities. There was a study done for chief investment officers of the 25 largest companies. I'm not sure who did this study, but it was

said that there's not really a mismatch out there; that the duration of liabilities was somewhere in the range of five for these 25 companies and the asset duration was also in the range of five for these companies.

Where larger companies have large actuarial staffs, and you have duration work being done, there are economies of scale. However, a lot of the smaller insurers, and the medium-sized insurers don't know what their liability durations are. They don't know the degree of any mismatch.

It is important, where possible, to identify any duration mismatches that you have and then develop some alternatives. If you look at these two alternatives for the annuities, the two choices we put in front of senior management were to slightly extend the asset duration to 3.6, which would give us a mismatch of 1.8 on the annuities, or to completely match.

The second one is the less realistic alternative. The problem with that is you cannot match on the annuities and get the yield that you need to credit at competitive rates. Marketing considerations make this a very difficult thing to bring about. Competition results in many annuity mismatch situations that a lot of companies simply are not aware of, because they do not have the time or the ability currently to measure the annuity duration. You should identify the risk and then make a decision as to whether you're going to manage a mismatch or whether you're going to reduce that mismatch.

How are results measured for testing various interest crediting and/or investment strategies? There's almost an infinite number of ways to present results. The best approaches are visual and usually graphic. The key is, how does your company keep score? Is the focus on statutory results? Is the focus on GAAP, present value of future profits, return on equity, risk-based capital, value-added, or a bunch of these? Usually, you won't have all of these. You'll have one or two that are the primary focus.

A key in what makes this process unique for each company is how you keep score. The modeling process itself is important where you project out cash flows on the asset side and on the liability side.

## 1995 VALUATION ACTUARY SYMPOSIUM

I've been taking Chartered Financial Analyst (CFA) exams recently. I just passed the first one, but what is very clear is that the mathematics are identical to what is taught in the actuarial exams. The projection of the cash flows on the asset side and the projection of the cash flows on the liability side are the same processes applied on either side of the balance sheet.

The difference you have with investment professionals and actuarial professionals is the actuarial professionals get their hands dirty every day developing products and getting familiar with the liabilities. They work with these products for the most part. On the investment side, the people who work with the assets are trading every day. They're doing this work every day, and they understand the assets. It takes years of experience to develop expertise on either side of the balance sheet. It's an exceptional individual who has experience on both sides of the balance sheet.

Now, what I'm going to show you are examples of ways you can present ALM information to senior management and get their attention, depending on how you keep score (Table 2). The shaded portions show the ratio of available surplus to required surplus. I have net income, available surplus, and required surplus. I actually lifted this table from a Canadian friend of mine. Instead of our risk-based capital, it's minimum continuing capital and surplus requirements (MCCSR).

For this Canadian company, this fellow did his internal ALM work in this context because required surplus was very important to this company. The base scenario that most of us had become comfortable with as the forecast for the year shows for the next five years that the required surplus goes from a level of 114% to 103%. Senior management doesn't want to look at too many different options, but one of the options that his company was looking at was an extensive marketing campaign, a very aggressive marketing campaign that would result in high sales volume.

The required surplus ratio goes from 114% to 92%. In that second scenario, we're going to have high sales volume. The other thing the company was considering was purchasing a block of business from another company. My friend ran that through the company's models and the testing showed that surplus would go from the starting point of 114% quickly down to a required surplus level of 80%, and then start to build back up to 89%.

Now, the required surplus level was very important to this company. My friend knew enough to keep it simple. That was his thinking there, but his chart was informative enough that he could put it in front of management people and show them that their alternatives had impact in areas that the company really cared about.

Chart 6 gets into the area of product development. I did this work for a company a few years ago. I guess I have to tell you a little bit about the background of the product. The product that is shown is a single-premium deferred annuity (SPDA). It was a hot money product. The commission that was paid on this was in the range of 10%, which I think you all know is quite high, and it had a toaster interest crediting methodology associated with it. The spread that was looked for by the actuaries in the first year was 85 basis points, and they credited a relatively high rate in that first year. During the second year and later, the interest spread they were looking for was 235 basis points.

Now, if that's not a hot product, I don't know what is. Money was coming in the door like crazy. This particular example is interesting from the technical point of view, and it's also interesting from a political point of view. The investment department that we worked with and for came to us and said, "We're uncomfortable with this product. Can you help us take a look at it?" They had a system that was a similar system to what we had, and we took a look at it.

Now, what we identified is the circled area. This is what their product looked like. They had a market interest crediting philosophy. The duration of the assets backing the SPDA was 5.5. I haven't put down what the duration of the liabilities was, because we wanted the company to consider some alternatives. If they were crediting more of a market interest rate, then the duration of the SPDA would be around one, maybe less. If they went to a portfolio interest crediting methodology, then the duration of that portfolio would move up closer to two-and-a-half or three.

The company was looking at the circled area. You have the level interest environment (first bar) and the declining interest environment (second bar) where this product does quite well. When rates increase the product does not do well (third and fourth bars). On an economic value surplus after five years, the product would be getting hammered in a rising interest rate climate.

**TABLE 2**

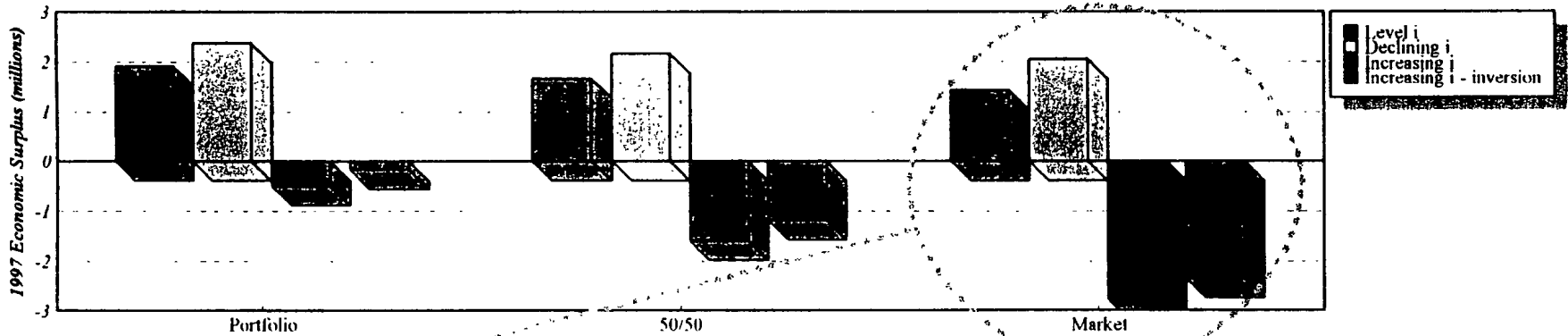
**Company XYZ, Segment ABC**

<b>Scenario 1: Base</b>						
	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>
Net Income	\$ 10,000	\$ 9,000	\$ 9,200	\$ 10,500	\$ 11,000	\$ 13,000
Available Surplus (Book Value)	200,000	209,000	218,200	228,700	239,700	252,700
Required Surplus (Risk-based Capital)	175,000	187,250	200,358	214,383	229,389	245,447
Ratio of Available Surplus to Required Surplus	114.29%	111.62%	108.91%	106.68%	104.49%	102.96%
<b>Scenario 2: High Sales Volume</b>						
	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>
Net Income	\$ 10,000	\$ 6,000	\$ 5,000	\$ 7,000	\$ 9,000	\$ 10,000
Available Surplus (Book Value)	200,000	206,000	211,000	218,000	227,000	237,000
Required Surplus (Risk-based Capital)	175,000	189,000	204,120	220,450	238,086	257,132
Ratio of Available Surplus to Required Surplus	114.29%	108.99%	103.87%	98.89%	95.34%	92.17%
<b>Scenario 3: Purchase Block from Company EFG</b>						
	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>
Net Income	\$ 10,000	\$(10,000)	\$ 5,000	\$ 15,000	\$ 25,000	\$ 30,000
Available Surplus (Book Value)	200,000	190,000	195,000	210,000	235,000	265,000
Required Surplus (Risk-based Capital)	175,000	227,500	243,425	280,465	278,697	298,209
Ratio of Available Surplus to Required Surplus	114.29%	83.52%	80.11%	80.63%	84.32%	88.86%

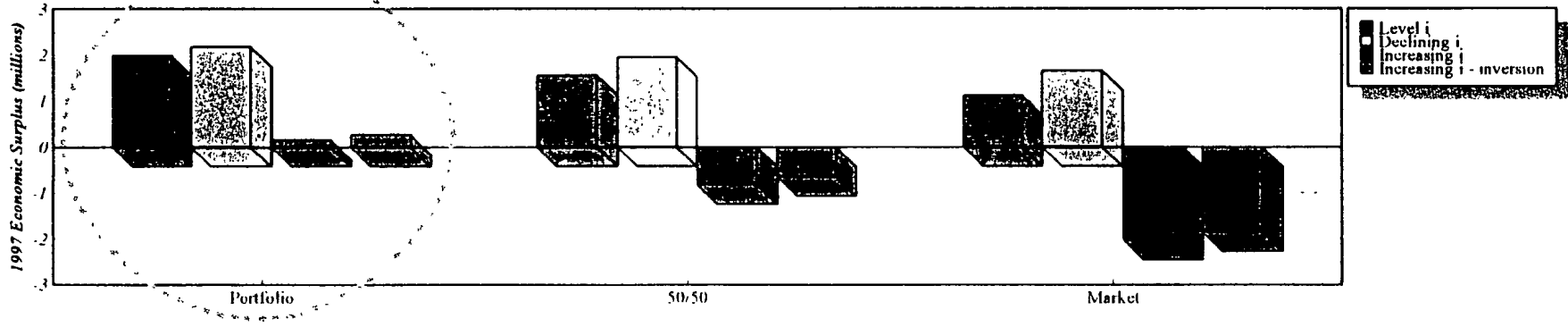
# CHART 6

## Asset/Liability Management

**1997 Economic Surplus  
SPDA - Duration 5.5**



**1997 Economic Surplus  
SPDA - Duration 4.0**



## 1995 VALUATION ACTUARY SYMPOSIUM

We looked at a couple of alternatives. We took the duration of 5.5. Let me first stay on this top chart. We said if instead of doing a market interest crediting strategy, you looked at a portfolio interest crediting strategy, the SPDA would still have reasonable profitability, or very good profitability if interest rates stayed level or were declining.

The thing that the portfolio-based crediting would do is impact the profitability of the product under increasing interest rate environments.

The other thing we did take a look at, if you move on to the next set of bars, was, what if you shortened the duration of the assets backing this block of business? We ended up circling and suggesting to management to consider a shorter-duration asset portfolio of four instead of five backing the product and going to a portfolio crediting approach. That way, there would be more stable profitability. Under level and declining interest rate scenarios, management would have reasonable profitability. Under increasing interest rates or increasing with inversion, management would either lose a little bit of money or actually make a little bit of money. It wouldn't meet management's profit goals, but they wouldn't lose a great deal either. Even with a portfolio-based crediting strategy, where the company may see a lot of business walk out the door, we saw a higher value of economic surplus. The company was not hurt as much as if it credited interest on a market basis. The company's other products could also help offset losses in these losing years.

The company's investment department people said this was great. So we set up a meeting with senior management to explain and present this. Well, the actuarial department postponed the meeting. We weren't sure at the time, but they didn't want to discuss this and so we postponed it for a month. Then it came time to get ready. We had all our materials ready and we were ready to go. It was postponed again.

The thing that we didn't realize -- the investment department we were working with and our firm -- is that we would be in a political position of making the department that had developed this product look bad. It was very important to them. It's not enough for you in this room to merely do the work. You also have to realize the political environments you're operating in. We miscalculated and we did



not get this information conveyed to senior management. The company was sold before this information was conveyed.

Fortunately or unfortunately, the reality was that in the sale process there was an evaluation done of this SPDA product, and an in-force product very similar to this. Before the product line was sold, the duration was reduced. There was a significant hit to the asking price, because the outside firm that was valuing this insisted, as did the acquiring firm, that the duration mismatch be reduced.

The actuarial department kind of got in the way, but our firm and the investment firm had to take some of the blame. We did not realize the political considerations can be as important as the technical work that you do.

I'd like to discuss a few key assumptions in ALM work. I bought a house in May. My mortgage broker called and left me a voice mail message today and said, "Would you be interested in reducing your payments \$200 a month on your new place, and there's no cost to you? You don't have to do anything. Just give me a call." I thought about that for two seconds and I said, "I'll give him a call tomorrow," but I'm also going to be talking to my mortgage people and asking, "Is that the best deal I can get?"

Interest rates have come down enough and no-cost refinancing is a change that the mortgage-backed securities people did not anticipate a few years ago. That's a new element thrown into the equation here. This is a much more volatile environment. Public Securities Association (PSA) speeds of 1,200 were seen a few years ago, and we may see them again. That's one very key assumption on the asset side.

Another key assumption on the liability side is the lapse algorithm. Like the prepayment assumption, this requires a lot of judgment. It requires actuaries who are familiar with the liabilities, and it requires a knowledge by your marketing department and others of what your distribution system is. Often it's not the policyholder who is going to drive a movement out of a product. It's going to be

the controlling agent depending on your distribution system. So there's part science and part art in setting the lapse algorithm.

The bracketing of possibilities is also useful for risk assessment. That's what we did in that other situation where I said we had maximums of 40% and maximums of 70%. Nobody could agree on the upper bound there, so we bracketed it and took a look at it from both levels. That's all I'm going to say about assumptions.

We talked briefly earlier about segmentation. Segmentation can link scenario testing and duration perspectives. A disciplined grouping of like duration assets and liabilities forms a common ground for investment management and the insurance profitability management process. It's important to match or know the degree of your mismatch.

In internal asset/liability management work, the first step is knowing the risk profile that your company has and communicating that effectively to the levels of management. If there's an annuity duration mismatch, you should define it and offer alternatives. You can go to no mismatch with all the implications for marketing that may have, or as some companies are even doing, you can identify a mismatch. I know some companies currently are using interest rate swaps to go from a fixed to floating rate that will reduce the overall asset duration. They feel that's a better management of the annuity problem or challenge. So there are some options, but the key is knowing the risk profile and communicating that.

One of the other things that's important is moving management from the one corporate plan to multiple alternatives. We're so used to giving management "the forecast" for the year. It's going to be a real educational effort that's already underway to get management to think in terms of multiple alternatives and find ways to bring stochastic possibilities into the equation. They'll fall asleep if you start talking statistics. There must be creative ways to get them to think in terms of more than one plan.

If we can do that and get them to realize that things like economic conditions, and other contingencies like mortality and morbidity can impact profitability, then they can realize that where they can make a difference is with alternative management actions: different interest crediting strategies, different investment strategies, different acquisition plans, and different marketing strategies. They can have an impact, but first it's our responsibility to lay on the table what the risk profile is and what you can then do about it.

A change I've seen in the last two or three years is that it's no longer acceptable for a medium-sized company to stay on the sidelines, throw up their hands and say, "It takes too much of our resources. We can't do it." There are many creative ways to get the work done. There is the pressure from the rating agencies that's forcing us to look at this, and I think it doesn't hold water anymore to say we can't do it, that we don't have the resources. There have to be creative ways to do internal ALM work.

The last thing I'll say here is that my pet peeve is the company that doesn't need an internal asset/liability management tool. I don't think that company exists. Every company, even the highest surplus company, owes it to itself and to its policyholders and/or its stockholders to know as much as it can about the risk profile of the company. If the company has a good, strong surplus situation, it's as important for that company to have this tool in place to maintain that surplus position as it is for the company that's struggling to stay afloat.

I guess I finally convinced myself that only the very smallest companies that don't do asset adequacy work, that don't have a model that exists, really have a right to say we can't do this. They don't have the resources for that. All others should be capitalizing on the tremendous effort that has already been made in asset adequacy modeling.

**MR. DAVIS:** I've been working on ALM projects since early 1993. I would say most of the work I do involves ALM in one way or another. I thought I would start my presentation by better defining what ALM is. There are a number of definitions, but my definition is that ALM is a comprehensive

process by which insurers assess and control their exposure to interest rate risk. That's what ALM is.

ALM is not magic. It does not solve problems neatly and make them go away. The key words are assess and control. Every company has interest rate risk of some kind that exists because market values of assets decrease when interest rates increase, and market values of liabilities generally increase if interest rates increase. So you have a problem there. ALM is a comprehensive process to monitor this, measure it, and then try to control it.

I'd like to discuss some things that I personally have done in the ALM area; and in some cases I did start with a cash-flow-testing model. Certainly, you can take the assets included in your cash-flow-testing model and project them by themselves in isolation and compute the duration and convexity of those assets.

We do that sometimes as a check of our input and then confer with a client's investment people and say, "We're coming up with a duration of 3.9. What do you have?" If they say, "Well, we come up with 3.4," that would indicate to me that either we have a problem in our asset input or our prepayment algorithms differ tremendously. You can calculate duration of your assets and check with your investment people just as a check on your own processes.

The option-adjusted spread to treasuries is another term investment people use. They work in terms of what's the spread to treasuries and the duration. That's a language they deal with and they understand. You can calculate the option-adjusted spread to treasuries of your assets. Again, that's another thing you could check out with the investment department as a check on what you're doing.

What I said earlier about the interest rate risk is very evident when you see economic pricing or surplus curves for interest-sensitive business. I think we've all seen these graphs where the present values of asset and liability cash flows are plotted under the current yield curve and for parallel shifts to the yield curve. The difference between the asset and liability present value is called economic, or cash-flow surplus. For higher yield curves, asset values decrease, while liability values tend to

increase. At a certain point, it will show you to be economically insolvent. Cash-flow testing models can be used to develop economic surplus curves, but takes a lot of work and a lot of computer runs to put something like that together.

One of the biggest projects that I've ever worked on was related to investment strategy, and that involved a company that was curious as to whether its segmented approach to assets was superior to a total company approach. Another aspect of the project was, in fact, the total company approach was superior, and what assets should we be investing in? This project started from a cash-flow testing model.

You can also evaluate hedging transactions with your cash-flow-testing model. Some of you, especially those in the deferred annuity business, may have been doing that at year-end 1994, because some insurers had to set up additional assets at year-end 1994 because of cash-flow testing. The ones that I'm familiar with were primarily deferred annuity insurers. In the week between Christmas and January 1, there was a scramble by some companies to put some derivatives on the books to avoid having to set up additional reserves.

Some hedges came into existence because of cash-flow testing. I saw a put-swaption, which is an instrument that, if interest rates were to rise by a magical 3%, they started to pay you all kinds of money. Well, why was it 3%? Well, we have a 3% pop-up scenario that maybe we were having trouble with.

Hedging transactions can also be evaluated as part of a reinvestment strategy. You could be choosing between investing in, say, a ten-year bond, or maybe a 20-year bond, which has more yield but greater mismatch, and with that 20-year bond we'll also purchase an interest rate cap or take on a swap where we are the fixed-rate payer and we receive floating. Caps and floating swaps have negative duration, so they bring down the duration overall. You could evaluate which of those two options is better. Now, hedges cost money. They reduce risk, so therefore they cost money. Otherwise, we'd all have our portfolios hedged, and we wouldn't have as many problems as we do. You can use the cash-flow-testing model to measure and test something like that as well.

## 1995 VALUATION ACTUARY SYMPOSIUM

Rick talked about making the transition from cash-flow testing to ALM. While our presentations are not exactly the same, it was amazing to me that we had so many of the same ideas and the same concerns, and we both thought that certain things were the hot spots. I guess that confirms that we both have had the same experiences, and we have seen similar things in industry vis-a-vis ALM or the lack thereof.

I've already mentioned the run time of computer models. I made a presentation in San Francisco two years ago where I talked about run time as well. I was trying to encourage people to build smaller models, because it's my experience that actuaries tend to build models that are way too big to get the job done. Now, that doesn't happen in every case, but in the ones that I've come in contact with, that's usually the situation. You end up with a model that is so detailed, it's a monster, and you really can't do much with it. You can run seven scenarios over the weekend, and when you're done, you're happy. Well, if you're going to move on to ALM, you're going to run 7,000 scenarios before you're done and maybe even more. So you need a condensed model, and I'll talk about that in a moment. In some of the jobs that we've done, I have run at least 10,000 interest scenarios. It's not that we needed that many to get the job done, but your first run is never right. Maybe it takes you five 200-scenario runs to get it right, and then you'll be evaluating different things.

For instance, we had a project where we started with 20 different reinvestment strategies and we were to determine which strategies were efficient. Well, 20 investment strategies mean 20 projections, and we were using 200 interest rate scenarios per projection. This was before Pentium computers existed. Needless to say, we rented every 486-66 machine we could get our hands on. This was only step one of the project and we already have 4,000 scenarios. So it really is important to condense a model.

How do you do that? How do you condense a model? Well, you remove things or combine them. You can remove certain things that just don't apply to cash-flow projections. They might apply to statutory accounting considerations. For ALM, you want best-estimate assumptions. You don't want to rely on any regulatory safe harbors. There is a regulatory safe harbor in Regulation 126 about call provisions that, until the difference between the current market yield and your coupon is 2%, nothing is called. But when it gets to 2%, everything is called all at once. That's not sufficient for ALM,

because that's not the real world. That's a safe harbor that the New York State Insurance Department put in to simplify the process before sophisticated models existed, but that's not something you want to make decisions on in the ALM world. So you really do want best estimates.

In most ALM applications, you are concerned about cash flows. You're not so much concerned with earnings on a statutory basis. There are certain noncash items included in cash-flow testing that impact statutory earnings and consequently statutory surplus; namely, interest maintenance reserve (IMR), asset valuation reserve (AVR), and reserves. Reserves? We can do this without reserves? Duration and convexity calculations do not need reserves, as reserves are not cash flow. Other ALM applications may need reserves in order to develop the reward measure. Well, you probably want to put reserves in your model, but it's a noncash item. Keep that in mind.

When we do cash-flow testing, we try to do exact reserve calculations. You may be able, in an ALM projection, to express reserves as percentages of account value. What that will do for you is reduce the calculations in the machine, which will speed up your run time a little bit. As you become familiar with running so many scenarios, you will always find these little ways to achieve a good enough result and speed up the machine a little bit.

Next we need perhaps different interest scenarios than you use for cash-flow testing. ALM work is kind of in two camps. One is strategy evaluation of investment strategy or crediting strategy. For that type of work, you would not want to use arbitrage-free scenarios. Then there are the other types of ALM work that are more option-pricing-technique oriented, calculating duration and convexity, and our option-adjusted spread. In those cases, you do use arbitrage-free scenarios.

The thing about arbitrage-free scenarios is that, depending on the opening yield curve, you can end up with a very strange set of interest rates and your liability projection could come out a little funny. If you started out with a very steep opening yield curve and you developed a set of arbitrage-free scenarios, you are going to end up with a very high number of interest rate inversions over the course of that arbitrage-free scenario set. So to use that type of a scenario and project liabilities, you may

end up with something that is not the best thing to use for evaluating reinvestment strategy or crediting rates.

How many scenarios should be used is always a good question, and there's no right answer. We were doing a job once where we were evaluating investment strategies, and we were using 100. Then the question came up, "Well, is this enough? Is this giving us the right information?" So we ran 200. What happened is that we were making efficient frontier graphs and, in moving from 100 to 200 scenarios, the points in our curve were moving, but they weren't moving in parallel. So we increased it to 200 scenarios. We did not test 500 to see if 200 was still a problem. We stopped at 200 because that was a limitation of what computing power we had. I would say that a rule of thumb for ALM work is that you need at least 100 scenarios. That's just a general rule of thumb. In some cases, I'd recommend more.

In an ALM projection model, you may be able to project without liabilities or without assets to speed things up. If you're calculating the duration of assets, you don't need liabilities. You project out your existing assets. All the cash flow that comes from those assets you reinvest in cash. Then you can compute duration, because, at least in our system, cash won't show up as an asset cash flow. It shows up as cash.

If you are using a new money crediting strategy or something that's based on competitor rates and you want to compute liability duration, you don't need to project assets. You can use cash as your only asset and reinvest everything in cash as it comes along. That will speed up your run time considerably, because you won't be doing any asset calculations or asset market value calculations. So you don't always need to run assets and liabilities together. However, if your crediting strategy is portfolio based and you're looking at the liability side, obviously you need to run assets and liabilities.

Rick also mentioned this, but let's say we're evaluating investment strategies for the future. We want to come up with an overall corporate policy and develop some guidelines for investing. Do we invest more in CMOs than we are? Should we go in the more volatile CMO tranches than we have been?



If you're doing this type of work, you have to put in new business issued, because that's what's going to happen in the future for your company. With cash-flow testing, you're looking at a closed block of in-force business, so you need to put in new business for many ALM applications.

If you pay shareholder dividends and you plan on paying them in the future, that should probably be included in this model; because that's a cash item. It's debatable whether it should be considered in cash-flow testing, and I've taken both sides of that debate and can defend either. In ALM work, you really have to have something like that in there.

Here I get back to condensing your model. In cash-flow testing, you focus on absolutes. What's my statutory gain each year? What does it accumulate to at the end of my time horizon? It's the absolute number you're concerned about. More often than not in ALM, you are talking about relatives. If we change this little thing, how does the result change? It's not so much that we're interested in the absolute result. We want to know the direction of the change. A condensed model will still allow you to evaluate the directional change of the results, and to focus on the relative merits of different strategies or alternatives.

Duration is a measure of the sensitivity of cash flows to interest rate changes. It's not based on earnings. It's based on cash flows. So if you have two similar products that you've modeled separately for cash-flow testing, because maybe there's a slightly different product parameter for one than the other, I'd try to link them together somehow for ALM, especially if they have the same interest rate sensitivity. They're both deferred annuities, but this one has a small load on the single premium and this one doesn't. Lump them together, because they should exhibit the same interest rate sensitivity.

In ALM, it's the change in results that we're interested in, that is, the change in the cash flows. So you can use a much smaller model. To give you an example, I worked on a big investment strategy project where we took a company's cash-flow testing model -- 4,500 in-force records or 4,500 cells, whatever you want to call it. The inventory was 4,500. I just started combining and eliminating and

## 1995 VALUATION ACTUARY SYMPOSIUM

we ended up with 275 cells. Now, granted, it wasn't as precise a model as what I started with, but it served the purpose.

We were trying to measure differences in investment strategies. We weren't looking at the absolute amount of the earnings. We were looking at one strategy result versus another. We were looking at relatives, not absolutes. The thing to keep in mind, when you're compressing your model, is that you have to try to retain the interest rate sensitivities. It has to be sensitive to interest rate changes. That's the key point, but you will need a smaller and faster model than what is normally used for cash-flow testing.

What are the key assumptions in ALM? I started writing them down and I came to the realization that these are pretty much the same assumptions that are key in cash-flow testing. I would agree with Rick that the prepayment function for assets is very important. That's also a thing that can get quite sophisticated. Some of the Wall Street asset projection systems have very sophisticated prepayment models.

When it comes to ALM, it sometimes can be difficult to take advantage of that technology, because that's a separate system and you need to run those 100 scenarios in maybe ten different ways and bring that into your other system. It can be difficult, but it's a key assumption.

Rick's other key assumption was the dynamic lapse function on the liability side, and that's something that we all struggle with. I don't know that anybody has ever done a dynamic lapse study of any value that says when we're 1% out of the market, we get this much extra lapse. Right now, it's based on actuarial intuition, and that's not necessarily bad. That's all we have. I'm not sure when the time will come when we'll have something more than that to hang our hats on.

Personally, I feel more now that deferred annuities and UL are less interest sensitive than I used to think they were. I think that the surrender charge, especially on deferred annuities, is a much bigger detriment to surrenders than I ever used to think that it was. In my own personal work, I don't quite

use as strong a dynamic lapse function as I used to. The reason I changed my mind was just some experience that I've seen from other companies.

For example, on an SPDA, will it lapse when the surrender charges run out? I don't think your credited rate plays that big a part in that decision. I think it's predetermined by probably the agent or the distributor years before you get to that point. What's going to happen to that policy? Also, some policyholders invest for a seven-year investment. I need that money in seven years to live on. As Rick said, it's much more art than science in setting that assumption. I don't know how we're going to get a study together. I think the Society is doing some work on UL lapse rates, but I would submit that UL dynamic lapse is very tame and lame compared to the deferred annuity business today.

There is another area where Rick and I have come up with the same concepts and same thoughts. When you start making all these ALM computer runs, it can be very time consuming, not only doing the runs, but also doing the amount of work it takes to set it up, interpret the results, and decide what to do next. It's not something you do in your spare time. It really isn't. Some people think that they can do this in their spare time, but they'll find out very quickly that it can't be done very fast. What will happen is that the momentum, if there ever was any momentum, will be lost, and the work will just kind of languish, especially if you're doing it on your own to present some information to your seniors and it's not something you've been charged with doing.

Really effective ALM requires an organizational thrust. There is not a lone wolf in actuarial saying, "I know the duration of my liabilities! Yes, I'm the man!" So what if you do? If you're not going to do anything with it, where is it getting you? It really is an overall process. This is one of the things we are telling to clients and prospects. We try to consult with them as much on setting up the proper structure in the organization to begin effective ALM as much as telling them, "Here's how you actually make these calculations." The two really go hand-in-hand.

I've written down a simplified and summarized cookbook recipe for calculating the liability duration. Basically, you make two sets of projections: one with an interest scenario set based on today's yield curve or the as of date of the study, and the other interest scenario set is developed by shocking that

## 1995 VALUATION ACTUARY SYMPOSIUM

yield curve up, call it ten basis points or whatever, and then generating another scenario set. So you have two scenario sets -- one current and one shocked up ten basis points -- and you make your projection of the liability cash flows.

I have another key comment if you're working on a system that just doesn't spit out the results to you automatically. You have to take the present value of that cash-flow stream for 100 scenarios and then average them together. Well, what's my discount rate? Well, your discount rate is the forward rates across all the scenarios in all the years. The forward rates are the 90-day rates. So you have to develop a column in a spreadsheet of the discount factor. The discount factor for each period is the corresponding forward rate for that period, which is the 90-day Treasury rate. So you discount.

You discount the cash flows at that forward rate plus an assumed spread. Well, that assumed spread is the option-adjusted spread, and for most deferred annuities, 50 basis points will be a reasonable guess or estimate of what that is. You could just leave it out and probably come up with numbers that are close enough.

For UL, it's really funny. For UL, what's the option-adjusted spread? Well, it actually depends on how much dump-in premium you assume in the first year versus what the stipulated amount is and versus what the target premium amount is. The amount of premium that you take in between stipulated and target is really kind of the SPDA premium, and that amount is not coming in in the future. Let's use an example. You have \$100 of stipulated premium. I'm going to pay \$100 a year, but I'll give you another \$100 in the first year. The target premium is \$200. You're paying 100% commission on a single premium that's only going to be paid once. The option-adjusted spread associated with that is huge. So the option-adjusted spread for UL depends on that very assumption. That's the key thing. If you don't take in any premium like that, the option-adjusted spread is typically negative.

So we're discounting these cash flows back to present value for our two scenario sets. You have 100 present values in each scenario set. You average them together, as you do with the other set. All duration is is the change in the present value on a relative basis, on a percentage basis. So it's the

change in our present values divided by the present value for the base case, divided by the interest rate change. In this particular case, the interest rate change was ten basis points. The interest rate shock to the yield curve is ten basis points. That's how you go about calculating a liability duration.

Now, I have my liability duration. What does it mean? Along with your asset duration, it can give you an idea of how well matched your portfolios are. On the other hand, I would urge caution in using liability duration values because they are totally dependent on what assumptions have been used. How are you going to credit interest? Rick gave an example. If you're crediting a new money rate, an SPDA liability duration is probably about one. If you're crediting portfolio, it could be three and maybe even as high as four.

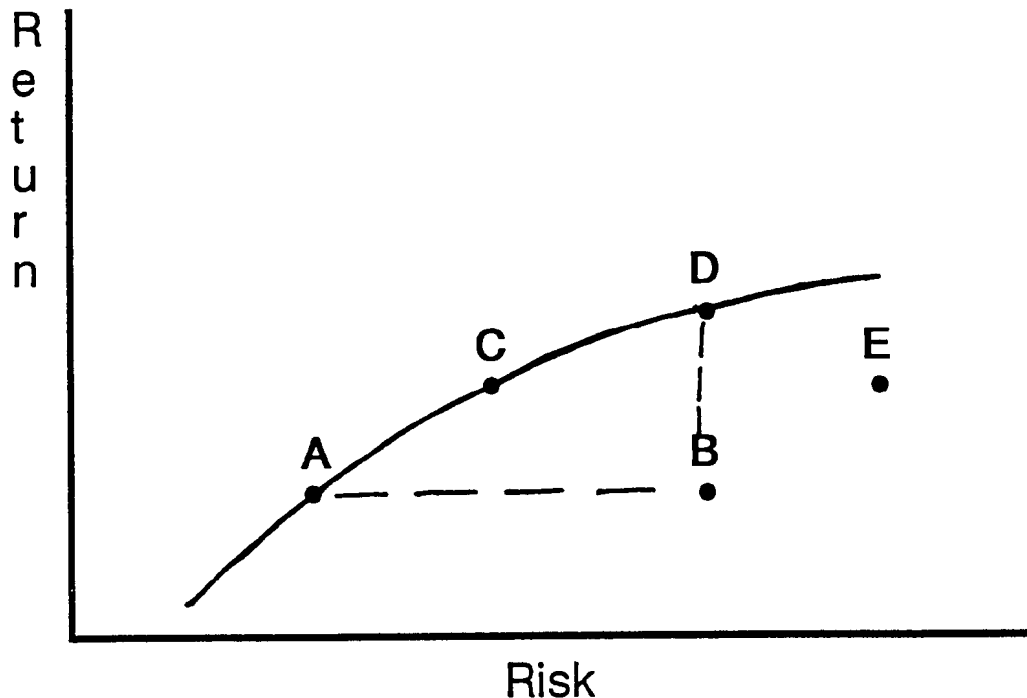
If somebody tells you my liability duration is two, I'd ask that person, "What's your crediting strategy?" They might say, "Well, it's portfolio." I'd say, "That's a fairly low duration for portfolio." So you really have to understand the assumptions. What's the dynamic lapse function? The stronger that function is, the lower the duration is going to be. You can come up with different liability durations by tweaking the assumptions. I'd do some sensitivity testing to my liability duration number to know what assumptions really are key here and what assumptions are really driving this value.

How do you evaluate results in ALM work? What I'm talking about here is for investment strategy or crediting strategy evaluation. You're not always just looking at the highest profit or present value of profits, because you have to consider the risk associated with achieving that highest return. Typically, the highest return is achieved by investing in the riskiest assets. But it's not a clear case. Well, that gives us a higher return. We'll go with that. You have to at least see what the risk is. So you need to come up with some risk measures, which can be the variability of the returns or the probability that the return is below an acceptable level.

Typically, at Tillinghast, we plot these results on this asset/liability efficient frontier diagram (Chart 7) which comes from Markowitz and efficient portfolio theory. The efficient frontier is the points A, C and D, because there is no point other than those that gives me a higher return for less risk.

CHART 7

The Asset/Liability Efficient Frontier (ALEF)



Efficient strategies: A, C, D

Look at the upper left part of the graph. It doesn't mean that D is the one we choose. We might say, "Well, C gives us almost as much return and lower risk, so we'll go with C." You just don't know. It also depends on corporate risk tolerances. It may depend on the current risk-based capital position. If it's really high, maybe you're willing to be a little risky.

**FROM THE FLOOR:** Have you seen a trend in companies using best-guess assumptions, even for cash-flow-testing work, to save time in the conversion and just interpreting the results accordingly, requiring a bigger margin than they would if they had built in cushions in the cash-flow-testing work?

**MR. DAVIS:** I would say no.

**MR. JACKSON:** I'd have to say no as well.

**MR. DAVIS:** I would say that with the proliferation of software packages there's less simplified assumptions made in the interest of, well, we can use this because it's easy to project. I think people are using best estimate more and more, and regulatory safe harbors are not used as often.

