SESSION 2

UPDATE ON THE RESEARCH ACTIVITIES WITH REGARD TO C-1 THROUGH C-3 RISK ANALYSIS AND CURRENT STATUS OF REQUIRED SURPLUS FORMULAS TO COVER THOSE RISKS

MR. STANLEY B. TULIN: I've been trying to figure out why I'm here. I think I might be here because of my work with the C-3 Task Force, and I think I also might be here because I've been doing a significant amount of asset/liability matching and reserve analysis in the recent past.

I'd like to talk a little bit, just generally, about the concept of the valuation actuary and how I view its evolution in the United States. First of all, I think that the concept of the valuation actuary is extremely important both to the profession and to our publics—the various publics that we, as actuaries, serve. Second, I think the valuation actuary concept creates an enormous challenge for the profession, because it injects all kinds of important things for us to do that some of us may have been doing but certainly have not been putting into forms that were going to go to nonactuaries. And third, perhaps for the same reason that the concept is important and challenging, it is also dangerous. I think that it's dangerous in the sense that if we do it wrong (and by "we" I mean the Society of Actuaries and the people in this room; by "wrong," I mean that we miscommunicate or allow people to believe that what the valuation actuary says means more than what, in fact, he does mean), we jeopardize our companies, we jeopardize ourselves as individuals and professionals and we jeopardize the profession. So I think that the valuation actuary symposiums that have gone on are important, if only to gain the attention of valuation actuaries or potential

valuation actuaries and to share some of the concerns that we all have about the issues involved: what we can say and what we can't say, and how people are going to interpret it. Just as an aside here, I have found in 16 years of consulting experience that my clients never hear exactly what I say and always hear exactly what they want to hear.

Risk tends to transfer itself from one place to another in a fairly portable way. As an example, in Session 1 Robert Hammond, the superintendent of insurance in Canada, congratulated the Canadian Institute of Actuaries (CIA) for taking more responsibility. "More responsibility" here does not mean in the sense of his job, but more financial responsibility and more responsibility for the solidity of insurance companies. This creates more risk for our profession, and I think it's important for us to understand that. I suspect just from the attendance here that everybody does.

The last point I want to make in this general area of my thinking about the valuation actuary is that, notwithstanding the danger and the challenge, the concept of the valuation actuary is critical to our profession. I think so because it's important, and also because it's completely consistent with the other work of the actuary. It is critical that we go forward with the concept of the valuation actuary. It's critical that we encourage its development, and it's also critical that we take care in how we do that.

What I intend to cover are some recent experiences that we've had in practical situations and a report on research that has been done by the C-3 committee this past year (and there hasn't been as much of it as I would have hoped there had

been). Then, finally, I want to develop some loose thoughts that I have on the area of assets and liabilities generally.

Let me start with those loose ends, and then I'm going to present some figures and tables. Right before I stepped up here, Ken Clark said something to me about the fact that we wouldn't have adequate balance sheets if we did what I was talking about. I said, "That's a perfect lead-in to where I'm going." The more analysis that I do on this, the more I might now understand about what Mike Mateja was saying 3 years ago. The more analysis that I do on this, the more convinced I become that we have set a series of constraints for ourselves, or they were set for us by generations before us of either accountants or actuaries. The problem that we have is that we have these assets and these liabilities, and I have concluded that your assets, generally speaking, are my liabilities, and vice versa. That is to say that an insurance company's GIC is somebody else's asset. And your bond as an insurance company is somebody else's liability. You certainly hope it is, or else it may not be one of your assets.

The point that I'm getting to, and that I think Mike has been getting to in a number of his presentations, is that looking at assets and liabilities by themselves—kind of putting them into boxes—creates problems in itself. In fact, we, as actuaries, ought to be doing more and more cash flow analysis and less and less compartmentalization of balance sheets. At least that's what I've come to believe. If that's what Mike's been saying, then I apologize for taking 3 years to understand it. If it's not what he's saying, then I apologize for thinking that it is. But it is what I'm saying. You will see that that concept has led us in

our research to another concept: We kept talking about the notion that what you had to do was match your assets with your liabilities.

I then started asking, why do you have to match your assets with your liabilities instead of the other way around? Why can't I match my liabilities with my liabilities? To put it another way, why can't I match the cash flows of one series of promises that I have with the cash flows of another series of promises that I have? Just to finish the train of thought, why can't I create an insurance company that has a cash flow that's always equal to epsilon, where epsilon is positive? In this company, the cash flow arises only from its operations, not from its investments. My query, and it's rhetorical, is that if I could create a company like that, what would its prudent investment policy be? The answer is anything. There is only one live example that I can think of, and it's not perfect. One insurance company that's like that is sometimes called the Mob or the Cosa Nostra. It's the betting that goes on in the United States and probably every place in the world on sporting contests. Those guys operate, in effect, as short-term insurers, one side or the other, and they make sure that they have positive cash flow so that they win no matter who wins the games if they are being well managed. In fact, to some degree, I think there is potential for that in the insurance industry.

I think that what we need and what we now don't have is a secondary market for liability trading. We have a secondary market for asset trading, and it has changed investment policy in the way investments are made and done in this country rather dramatically, really in a fairly short period of time. My notion is that if 10 years from now, I'm a company that finds myself with a serious amount

of disintermediation risk, I want to be able to go someplace and trade my disintermediation risk for some reinvestment risk that offsets or hedges against my disintermediation risk. In our research, we've been trying to show examples that are somewhat simple, and consequently are a little bit flawed, that deal with just that concept: the concept of a secondary market for liabilities—the concept of using your liabilities to reduce your risks and, in effect, adding liabilities to your portfolio with the notion of reducing your risks.

First, I want to step back a little bit and say that the general concept of all of the work of the actuary is that business enterprises should accept a risk with the notion that they're going to get a gain commensurate with that risk.

Second, businesses have limited capital. Certainly insurance companies that can't make up what their surplus is have limited capital, and they need to manage their risks in a manner that's consistent with that capital. Third, the insurance business has historically been an expected value business, which is one of my big gripes and one of the things that I'm hoping the valuation actuary will change. Along with that, little specific or hard-core attention is paid to the notion of how much is at risk, or what the boundary points of risk are.

Finally—and this is something that we've been finding is starting to change with many of the companies in the industry—investment strategies for interest-sensitive products are not clearly defined. Some companies say that what they're trying to do is make some predetermined spread that was back in their initial pricing, so that's kind of the concept of the expected value driving itself. Other companies say that what they're going to do is make sure that they never

again suffer what they suffered in 1980: the disintermediation crisis. These points are summarized in Table 2-1.

It seems to me that what insurance companies really try to do is manage cash flow. The cash flow arises from many different reasons: mortality, interest bets, commissions, and premiums. All these are the things that generate cash flow, but what insurance companies at their hearts do is manage that cash flow. They can get the cash flow from investments and from operations, and they can manage it by managing either the assets or the liabilities. This goes back to my point about a secondary market for liabilities. Most of the talk that at least the researchers have been doing in the recent past has been in the area of managing the asset cash flow (managing assets, given liabilities). You can manage the liability cash flow through the crediting strategy on your products, which is one of the things that is also not always clearly defined. You can also do it through product design. I think both of these are at least points that people have thought about a lot. Finally, you can manage the liability cash flow through product mix, which is one of the things that I think should take on much more importance as we go forward.

I want to talk about the preliminary research that we've been trying to do and the notion that you can try to do things to contain or reduce your risk by adding liabilities (or what we call liabilities)—adding new insurance contracts to your portfolio. I want to start with something that's fairly simple: a block of structured settlements, priced very competitively, that are very long-tail liabilities. As anybody who has these knows, it's hard to find assets that are long enough to match, on a cash match basis, those long-tailed liabilities that call

TABLE 2-1

GENERAL POINTS

o   Any business enterprise that accepts risk should do so with the expectation of gain commensurate with the risk assumed.

o   All business enterprises have limited capital and must manage their risks in a manner consistent with the capital available.

o   Insurance has historically been priced on an expected value basis with little specific consideration to the risk assumed; for example, interest-sensitive pricing assumes a spread between earned and credited rates.

o   Investment strategies for interest-sensitive products are rarely clearly defined; the goal of maintaining a predetermined spread may supersede disintermediation risks, or vice versa.

for payments to be made 50 or 70 years from now. GIC cash flows, in contrast, can be matched, but there is a problem with that: the GIC marketplace has become so competitive that unless you mismatch, you can't make money. Thus, you must take risks in order to make money. Good management should suggest, going back to that original principal, that GIC and structured settlement pricing reflect the risks accepted. I'm not sure that they always do, but it seems like the basic actuarial concepts would suggest that you should look at your risk and then price accordingly. However, the risks in GICs and structured settlements may offset one another. That's our thesis at this point. The simple concept is that GICs generally have disintermediation risk if you're mismatched by going long on a historic yield curve, and structured settlements quite often have reinvestment risks because you can't find assets to cover the tail. Finally, by selecting a mix of the GICs and structured settlements, it might be possible to decrease the risk associated with a given expected return.

Some assumptions underlie all of the analyses that I'm going to be discussing. These are the underlying investment assumptions. We assume that noncallable bonds would have a 50-basis-point spread to Treasuries—they would yield 50 basis points more than similar Treasuries—and the callable bonds would have a 150-basis-point spread. We assume that bonds would be called if rates fell 150 basis points, and we assume some detailed things about when different types of bonds would become callable.

This is a concept that I've been talking about for years. We've created a universe of possible yield curves that we're going to be dealing with in all of our analyses

(Table 2-2). These are 21 states in which you can land in the future, or 21 positions where interest rates can be. They range from a low of yield curve 1, which has a 1.4 percent 1-year Treasury and a 2.8 percent 20-year Treasury, to yield curve 21, which has an 18.3 percent 1-year Treasury and a 16.4 percent 20-year Treasury. To those of you who think that's too wide a universe, I'd like to say that it probably only encompasses about the last 30 years in terms of interest rate experience. It does not go as far back as 1950, when the long-term Treasury, I think, averaged about 1.

Remember that we're going to try to compare GICs and structured settlements both separately and then together. Table 2-3 describes a competitively priced GIC with typical GIC assumptions. The investment strategy was optimized, so it was the best strategy, given the underlying maximum loss constraint that was tested by the actuaries. They looked at the absolute worst case that they could experience and made sure that they didn't lose more than 10 percent of the initial premium, even if that worst case materialized.

Figure 2-1 shows the results for that product and strategy. Remember that this was a billion dollars of GICs. There were 50 random simulations here through the universe shown in Table 2-2. Figure 2-1 shows that the mean was very close to 0, which is not surprising to me, given that marketplace. A level scenario actually produced a fairly large loss, and that line that comes in at about -$30 million is the worst of the 50 cases tried. In other words, there was an overall constraint that in the very worst that they could imagine, they didn't want to lose any more than $100 million; in fact, in the worst case of the 50 that were tried, they lost $38 million.

TABLE 2-2

YIELD CURVE UNIVERSE

Curve Number	1 Year Treasury	5 Year Treasury	10 Year Treasury	20 Year Treasury
1	1.41	2.27	2.38	2.78
3	2.41	3.27	3.38	3.78
7	4.41	5.27	5.38	5.78
11*	6.41	7.27	7.38	7.78
15	10.41	11.27	11.38	11.78
19	15.34	15.27	15.15	15.10
21	18.27	17.27	16.92	16.42

* Current curve

TABLE 2-3

WELL-MANAGED LIFE
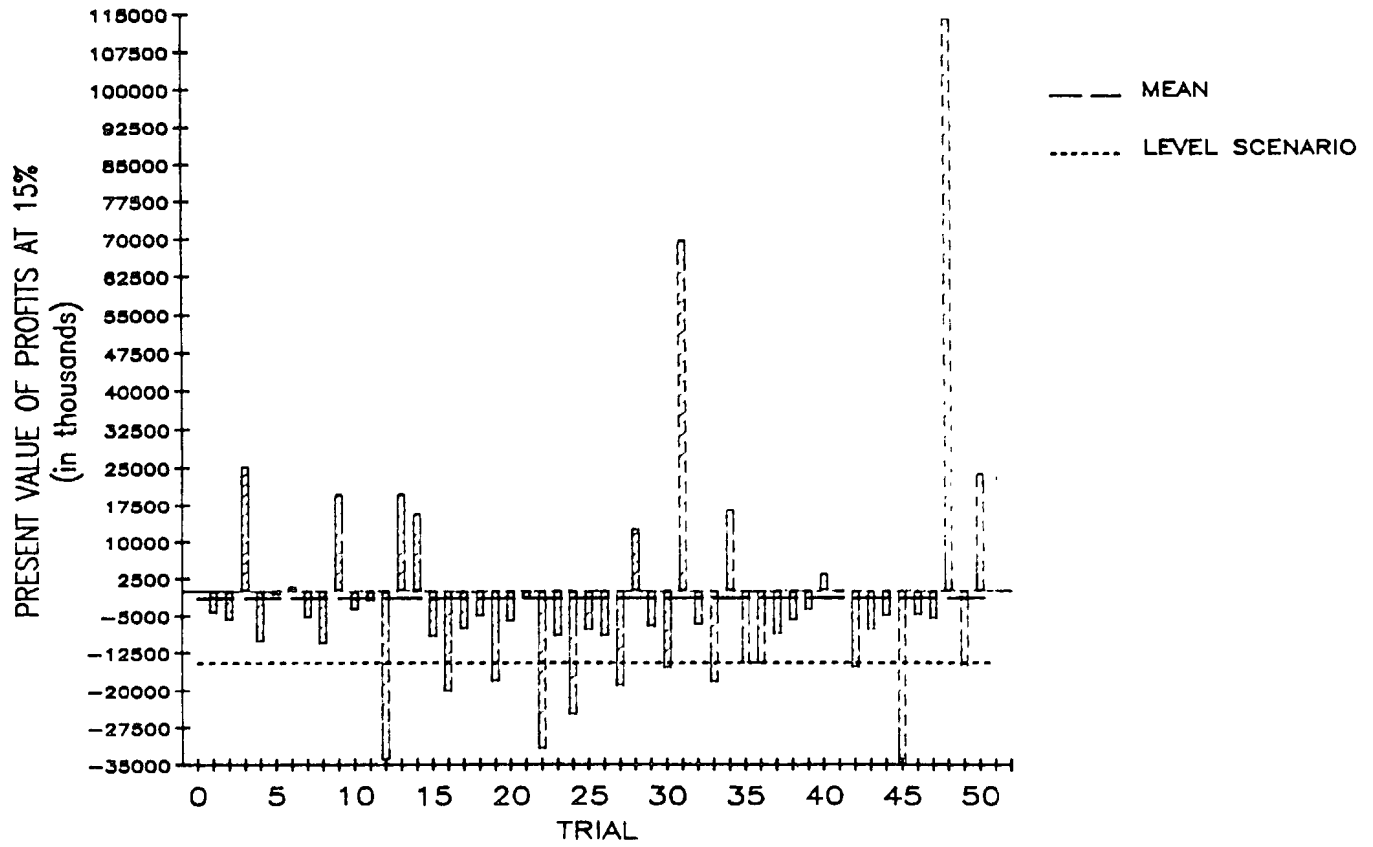
GIC NEW ISSUES

Premium: $1 billion

Contract: 5 year compound GIC

Credited Rate: 8.01%

Expenses: 60 basis points

Investment Strategy: Optimize

                              $100 million maximum total loss

                              $33 million maximum annual loss

WELL MANAGED LIFE
(GIC)
IMPACT OF INTEREST RATE SWINGS
ON EXPECTED PROFITS

FIGURE 2-1

Lest I forget to cover this before I finish, please, somebody, someday, tell me what "plausible" and what "reasonable" are in Figure 2-1. One of my concerns, going back to the risks that we all face here, is that before we have to sign an opinion that says something's reasonable and something's plausible, somebody should give me some help and tell me what it means when I do 50 trials—what's plausible and what's reasonable? I also, by the way, know that in this case, there was one scenario that didn't show, which is where interest rates went all the way up and stayed there forever; I'm saying that is not plausible, but it's the one where this company lost $100 million.

Table 2-4 and Figure 2-2 show a competitively priced structured settlement under structured settlement assumptions. This one is even a little bit worse. I don't know how many of you have been trying to deal with these kinds of things. This one was too competitively priced. Needless to say, the company's marketing people are having a very good year. At any rate, it may be a little bit difficult for you to tell, because everything is shown as a loss, but you see that our mean was about 4.1 million, and I guess the worst case was about 7.7 million.

Then we try to combine them, and we set the constraints so that they are less severe with the combination (adding them together) than they were for each by itself. In other words, we dedicated less capital to this one than we had to the other two in total (Table 2-5). In Figure 2-3 you see that our worst case is slightly better than the worst case was before (slightly worse than the worst case was on the GIC), but only slightly, and we have changed the mean or the expectation rather dramatically from negative to positive. We have not done

TABLE 2-4
WELL-MANAGED LIFE
STRUCTURED SETTLEMENT NEW ISSUES

Premium: $100 million

Priced so that present value of benefits at
8.3% = Premium net of expense

Valuation Rate: 8.2%

Expenses: 7% of premium plus .35% of reserve

Investment Strategy: Optimize
$200 million maximum total loss
$10 million maximum annual loss

TABLE 2-5
WELL-MANAGED LIFE
GIC AND STRUCTURED SETTLEMENT NEW ISSUES

Premium: $1 billion of 5 year compound GIC's
$100 million of structured settlements

Investment Strategy: Optimize
$200 million maximum total loss
$40 million maximum annual loss

WELL MANAGED LIFE
(STRUCTURED SETTLEMENTS)
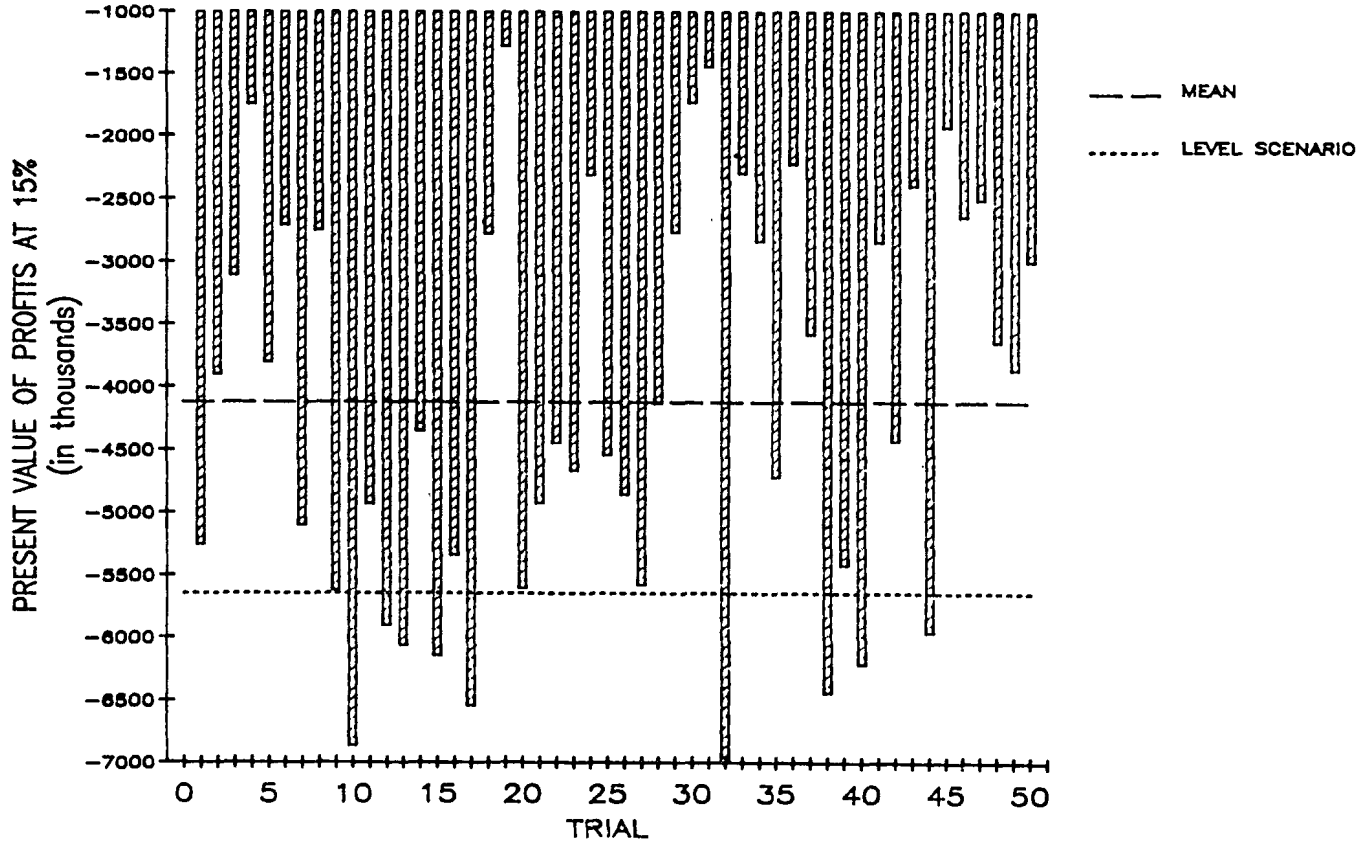IMPACT OF INTEREST RATE SWINGS
ON EXPECTED PROFITS

PRESENT VALUE OF PROFITS AT 15% (in thousands)

TRIAL

—— — MEAN

.... LEVEL SCENARIO

FIGURE 2-2

WELL MANAGED LIFE
(STRUCTURED SETTLEMENTS AND GIC'S)
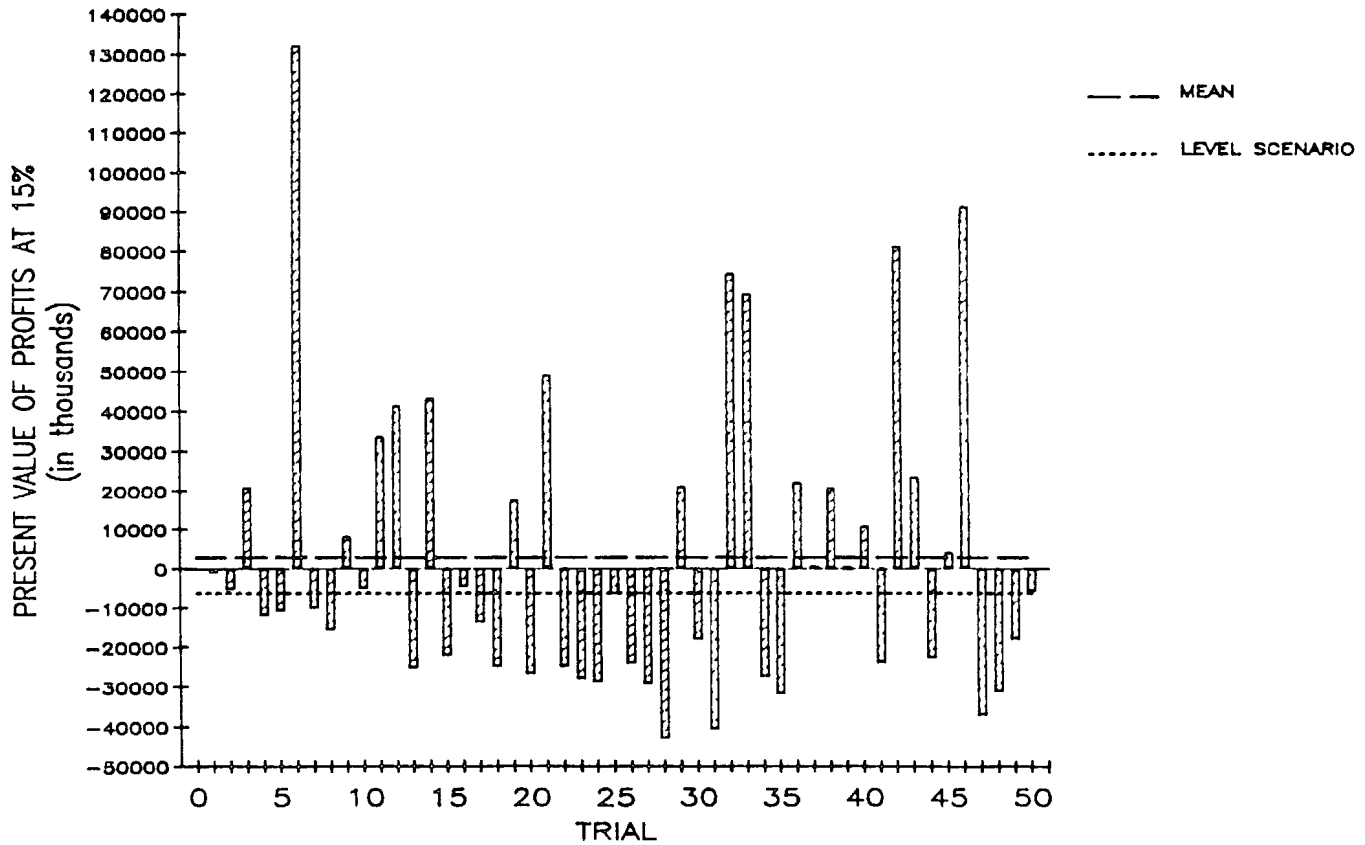## IMPACT OF INTEREST RATE SWINGS
ON EXPECTED PROFITS

FIGURE 2-3

this as much as we would like, and that's why I think there's a lot of work that has to be done in dealing with the mix. The point, however, is that this compares the various things. By taking two products that have somewhat offsetting liability patterns and putting them together, you can change your expectations from negative to positive, or from positive to bigger positive if you are in a more stable marketplace (Figure 2-4). You can do it without increasing your risk much. In fact, I believe we are going to be able to prove eventually that you can do it and reduce your risk.

We believe that in terms of managing the interest-sensitive liabilities and assets, management's objectives have to be to increase expected profits and to decrease risks. Some of our clients don't always see it that way, but our view is that you should be trying to increase your expectation and to decrease your exposure. Second, because these goals are in conflict, you need a management to create the balance. That should not be the job of the actuary. The job of the actuary or the valuation actuary ought to be the qualification of the risks and the rewards. The job of his management has to be making that balance work. Finally, we have found that many companies tend to go one direction or the other in terms of where they deal with these conflicting objectives.

When you go to try to achieve your objective, management can change its investment strategy. That certainly has been the focus of a lot of companies that, for instance, dealt with universal life crediting problems and SPDA problems by just buying the highest-yielding security that they could without respect to either quality or duration. The investment strategy itself is a series
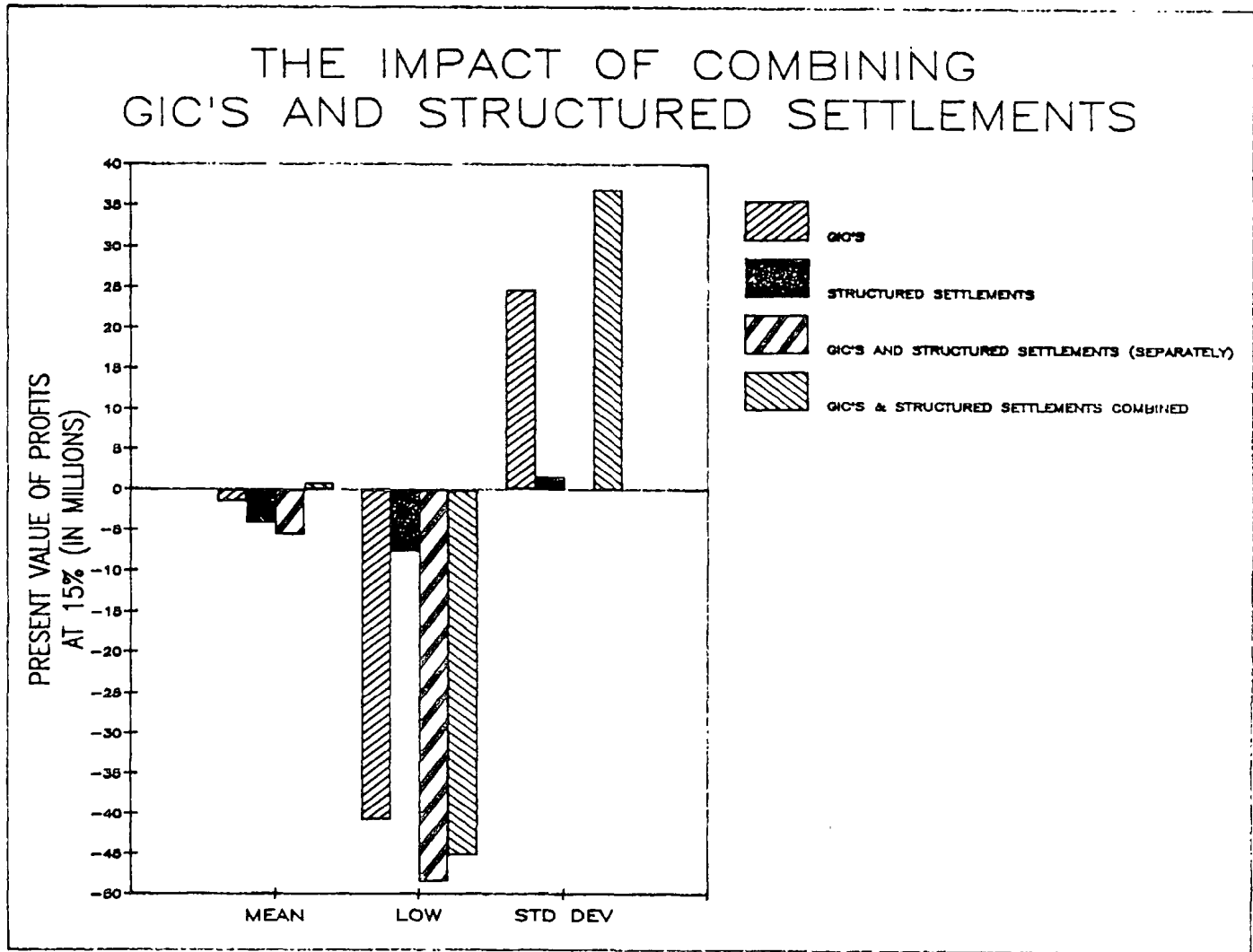
THE IMPACT OF COMBINING
GIC'S AND STRUCTURED SETTLEMENTS

Chart legend:
- GIC'S
- STRUCTURED SETTLEMENTS
- GIC'S AND STRUCTURED SETTLEMENTS (SEPARATELY)
- GIC'S & STRUCTURED SETTLEMENTS COMBINED

Y-axis: PRESENT VALUE OF PROFITS AT 15% (IN MILLIONS)

X-axis categories: MEAN, LOW, STD DEV

FIGURE 2-4

that includes both what you invest in and what you buy, as well as how you look at securities and when you trade. The key elements on the liability side are what your crediting strategy is and how your product is designed. In order to evaluate different strategies, you have to simulate and analyze both the risks and the expectations, which again goes back to the work of the valuation actuary and the fact that the valuation actuary needs to know a lot of things from management that he doesn't always know. For example, he needs to know what management is going to invest in, as opposed to just their telling you that they're going to be matched and make their spread. These points are summarized in Table 2-6.

The first example, in Table 2-7, is called Make Your Spread Life Company. It has a Best A rating. This is an example with SPDA new issues. All of these examples have similar assumptions for the amount of premium and average sizes—the basic design. This company is going to invest in 20-year callable bonds initially, and after that, it's going to buy 7-year callable bonds. A lot of companies are doing things like this right now, at least in that marketplace. The company is going to credit whatever it earns less 150 basis points, so it is the Make Your Spread Life Company. The market rate for its product—in other words, the rate that it sees competition crediting in the future—is the 5-year Treasury. The company has a variable lapse. You're going to see a lot of these, where the lapse rate is a function of future interest rate movements, which those of us who have been watching SPDA business know that it is. So the lapse rate can go up dramatically if there is an interest rate spike or else come down to a minimum of 3 percent.

TABLE 2-6

MANAGING INTEREST-SENSITIVE

LIABILITIES AND ASSETS

o   Management's objectives are to increase expected profits and to decrease risk.

o   Since these goals are often in conflict, management must balance the two against each other.

o   Many companies focus on one of the objectives to the exclusion of the other.

o   To achieve its objectives, management can change the asset strategy, the liability strategy, or both.

o   The asset strategy consists of rules for investing and liquidating assets.

o   The key elements of the liability strategy are the crediting strategy and product design (e.g., surrender charges).

o   Evaluation of competing strategies should be done on the basis of risk and expected profits.

o   Evaluation of liability strategies should also account for the impact of liability strategies on current and future sales.

TABLE 2-7

MAKE YOUR SPREAD LIFE

SPDA New Issues

Premium:	$200 million
Average Size:	$25,000
Surrender Charge:	7, 7, 7, 6, 5, 4, 3, 2, 1, 0%
Investment Strategy:	20-year callable bonds initially; thereafter 7-year callable bonds
Credited Rate:	Earned Rate less 150 basis points
Market Rate:	5-year Treasury
Lapse Rate:	$15\% + 2 \times (MR-CR)^2 - 3 \times SC$ Minimum =3%
Issue Expense:	$50 per policy
Maintenance Expense:	$25 per policy, inflated at 3%
Commission:	5%
Investment Expense:	.2% of fund
Bailout:	0
Guaranteed Interest:	4%

Figure 2-5 shows the results for Make Your Spread Life. The line of long dashes is the mean of 50 simulations. The dotted line is what you get if you assume a constant, stable interest environment—kind of expected value pricing with a spread. First of all, there's a dramatic difference between the two lines, and this is consistent with every bit of analysis that we've done in the area of interest-sensitive products—products with variable liability strings, like SPDAs; universal life; and things like that. Quite often, we have found that the initial pricing analysis, which is done on the level scenario line, is not looking at these variations. These are 50 random walks, given an investment strategy dictated by a management. The worst case that we tested had a present value of profits that was negative 38, or something like that.

The next case is what we call Never Again Disintermediation Life. As Table 2-8 shows, this company, for the investment strategy, says that it is going to invest very short. It is going to be in 1- and 2-year bonds all the time. Half their portfolio, conceptually, is going to be turning over each year. This company has the same lapse formula and market rate as Make Your Spread Life. It is going to credit the earned rate less 125 basis points, although initially it is going to be above that. It is going to bring it in at the market, and another name for this company might be Bait and Switch Life. What's interesting about this company is that it makes a lot of money, even with its lapse formula (Figure 2-6). The question that we ask first is, Can you really do that? Second, if you did do that, would you ever sell any more business? You'd be selling the business at 10 or 11 percent right now and dropping it to 6 percent next year, and then selling a new set of policies next year at 10 percent and dropping them to 6 percent the following year. Your marketing people might become somewhat disillusioned with you. But this company does make some money.

EARN YOUR SPREAD LIFE
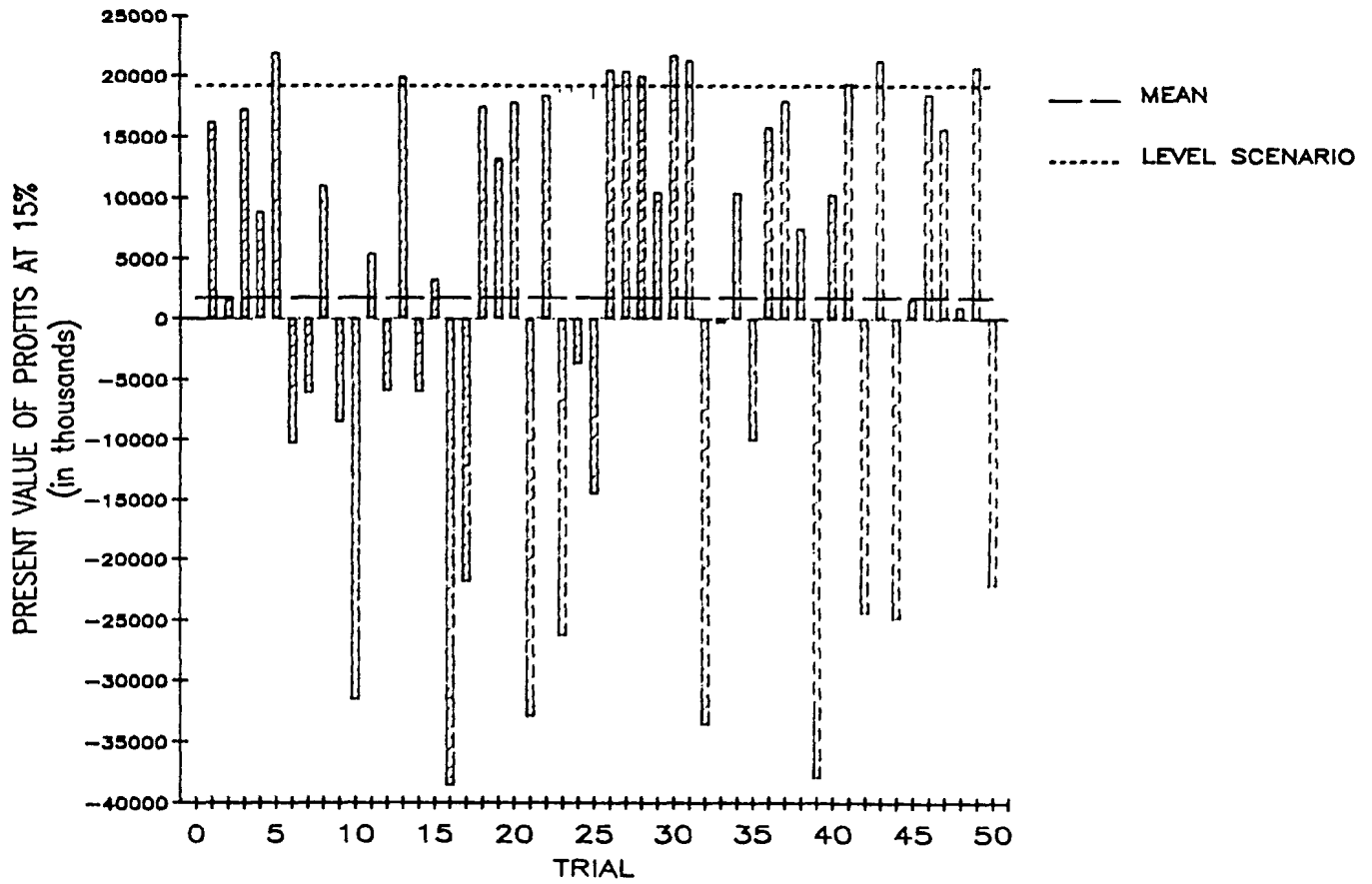IMPACT OF INTEREST RATE SWINGS
ON EXPECTED PROFITS

FIGURE 2-5

TABLE 2-8

NEVER AGAIN DISINTERMEDIATION LIFE

SPDA New Issues

Premium:	$200 million
Average Size:	$25,000
Surrender Charge:	7, 7, 7, 6, 5, 4, 3, 2, 1, 0%
Investment Strategy:	Initially 50% one and two years bonds; thereafter 2-year bonds
Credited Rate:	Earned Rate less 125 basis points
Market Rate:	5-year Treasury
Lapse Rate:	$15\% + 2 \times (MR-CR)^2 - 3 \times SC$ Minimum = 3%
Issue Expense:	$50 per policy
Maintenance Expense:	$25 per policy, inflated at 3%
Commission:	5%
Investment Expense:	.2% of fund
Bailout:	0
Guaranteed Interest:	4%

NEVER AGAIN DISINTERMEDIATION LIFE
(CREDIT BASED ON EARNED RATE)
IMPACT OF INTEREST RATE SWINGS
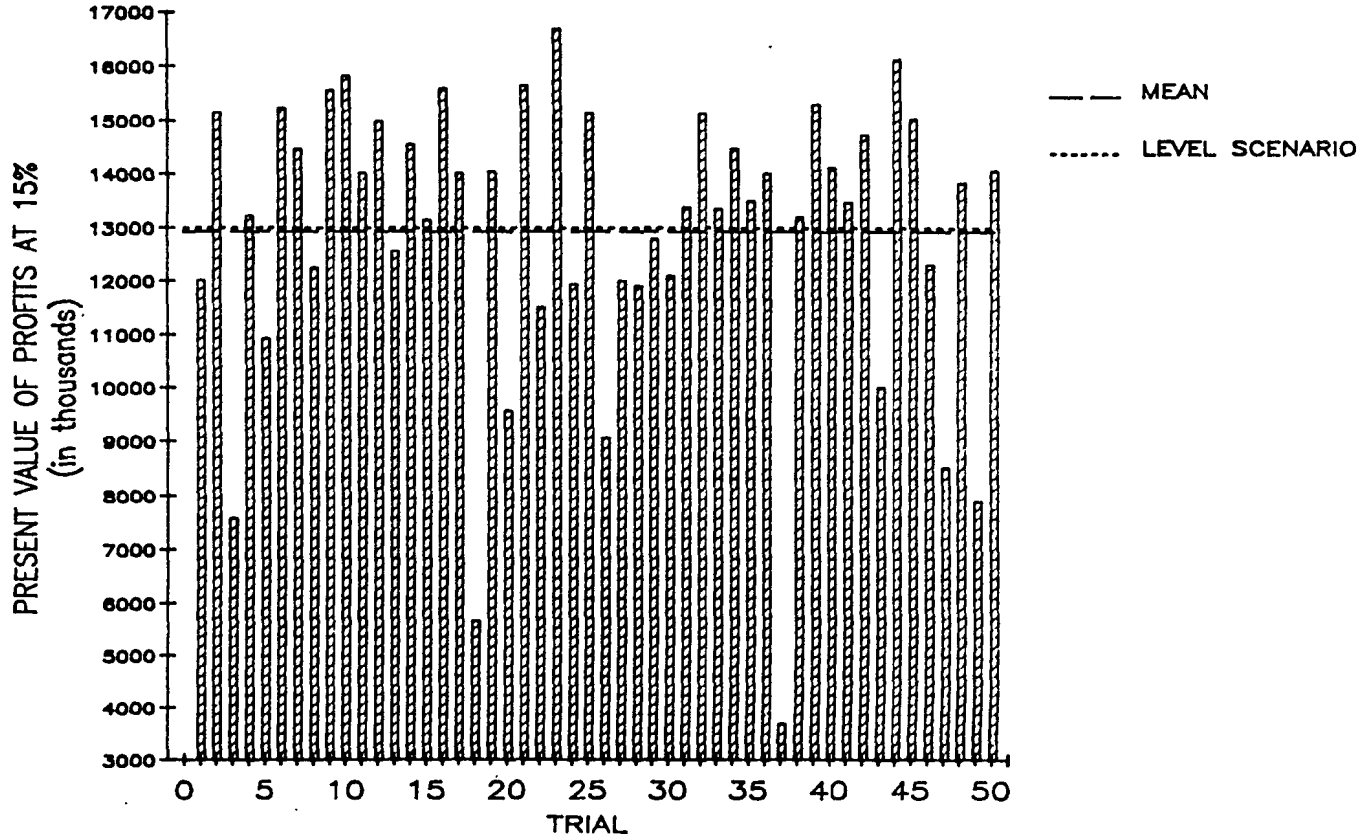ON EXPECTED PROFITS

FIGURE 2-6

We then said, "Let's say you had a company whose attitude was Never Again Disintermediation's and in fact, was run by its marketing people (which many companies are) and had its credited rates set by the marketing people (Table 2-9 and Figure 2-7). The middle of Table 2-9 says "Credited Rate: Market." So the only difference between Never Again Disintermediation Life No. 1, which is the one that made all the money, and Never Again Disintermediation Life No. 2 is the credited rate. No. 2 followed the market; listened to its marketing people. The point that I'm trying to make is that it's critical not to play tricks on yourself when you're making these kinds of cash flow analyses. In fact, this goes back to one of my concerns about the policy premium approach. My concern is that the actuary, in good faith, could easily get trapped into the Never Again Disintermediation scenario—the "we're going to credit whatever we earn less 125 basis points" scenario—and then gradually watch management time after time forget to credit what it earns less 125 and instead credit the market.

Table 2-10 and Figure 2-8 describe a company that we call the Follow the Market Life Company. On the investment strategy, it is a little bit different than the prior companies. This one just buys whatever has the highest yield on the yield curve. We have found that this is a very common investment strategy these days. The results in Figure 2-8 are kind of interesting; they go all over the place. Again, I want to point out the relationship between the mean of the 50 simulations, which is right above 0, and the level interest assumption line. The company took that spread and said, "That's what we can make forever." The level scenario line is way above the mean line. Again, the worst case here is line at about −48 million.

NEVER AGAIN DISINTERMEDIATION LIFE
(FOLLOW THE MARKET)
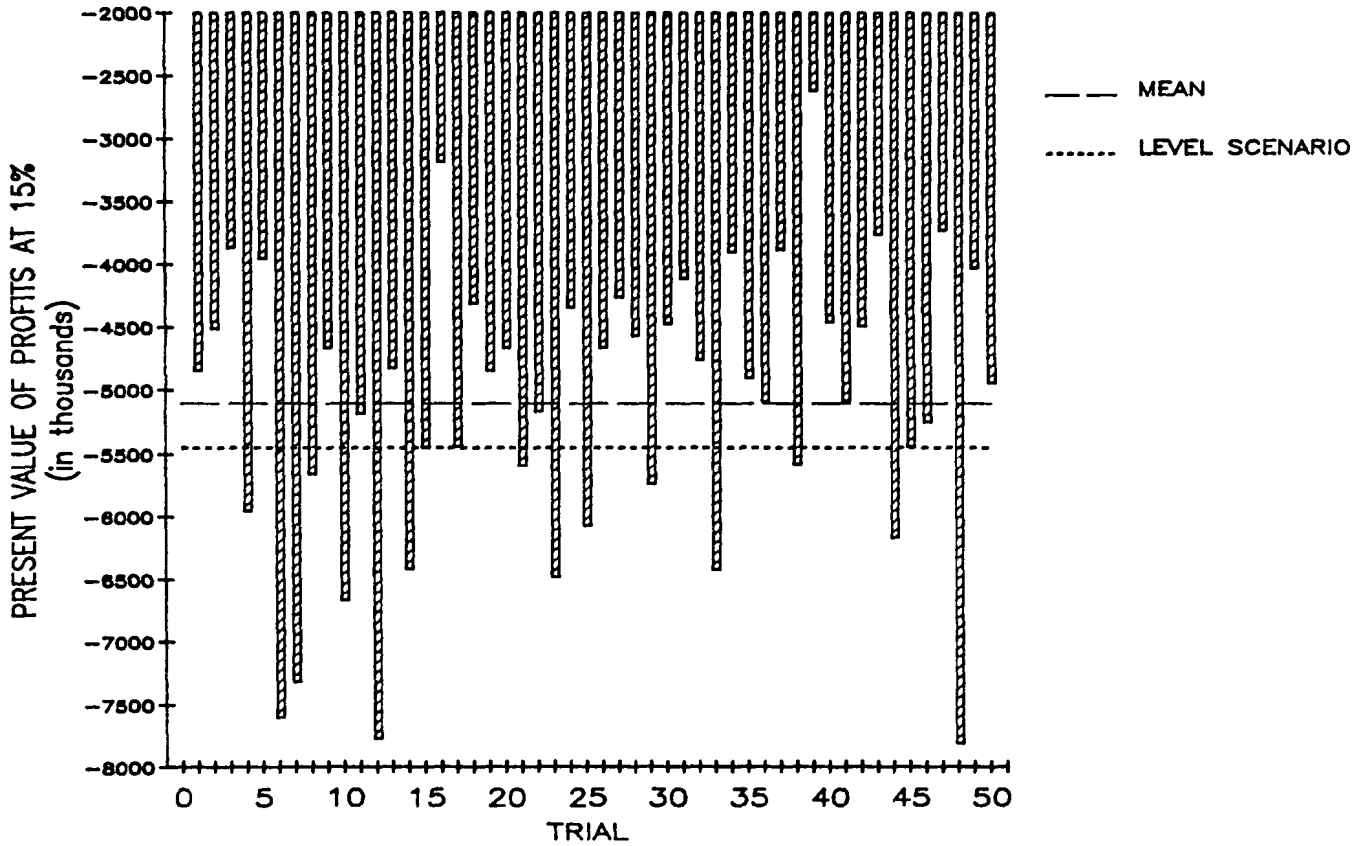IMPACT OF INTEREST RATE SWINGS
ON EXPECTED PROFITS

FIGURE 2-7

TABLE 2-9

NEVER AGAIN DISINTERMEDIATION LIFE

SPDA New Issues

Premium:	$200 million
Average Size:	$25,000
Surrender Charge:	7, 7, 7, 6, 5, 4, 3, 2, 1, 0%
Investment Strategy:	50% each in 1- and 2-year bonds initially; thereafter 2-year bonds
Credited Rate:	Market
Market Rate:	5-year Treasury
Lapse Rate:	$15\% + 2 \times (MR-CR)^2 - 3 \times SC$ Minimum = 3%
Issue Expense:	$50 per policy
Maintenance Expense:	$25 per policy, inflated at 3%
Commission:	5%
Investment Expense:	.2% of fund
Bailout:	0
Guaranteed Interest:	4%

TABLE 2-10

FOLLOW THE MARKET LIFE

SPDA New Issues

Premium:	$200 million
Average Size:	$25,000
Surrender Charge:	7, 7, 7, 6, 5, 4, 3, 2, 1, 0%
Investment Strategy:	Buy whatever has the highest yield
Credited Rate:	Market
Market Rate:	5-year Treasury
Lapse Rate:	$15\% + 2 \times (MR-CR)^2 - 3 \times SC$ Minimum = 3%
Issue Expense:	$50 per policy
Maintenance Expense:	$25 per policy, inflated at 3%
Commission:	5%
Investment Expense:	.2% of fund
Bailout:	0
Guaranteed Interest:	4%
Surrender Charge:	7, 7, 7, 6, 5, 4, 3, 2, 1, 0%

FOLLOW THE MARKET LIFE
IMPACT OF INTEREST RATE SWINGS
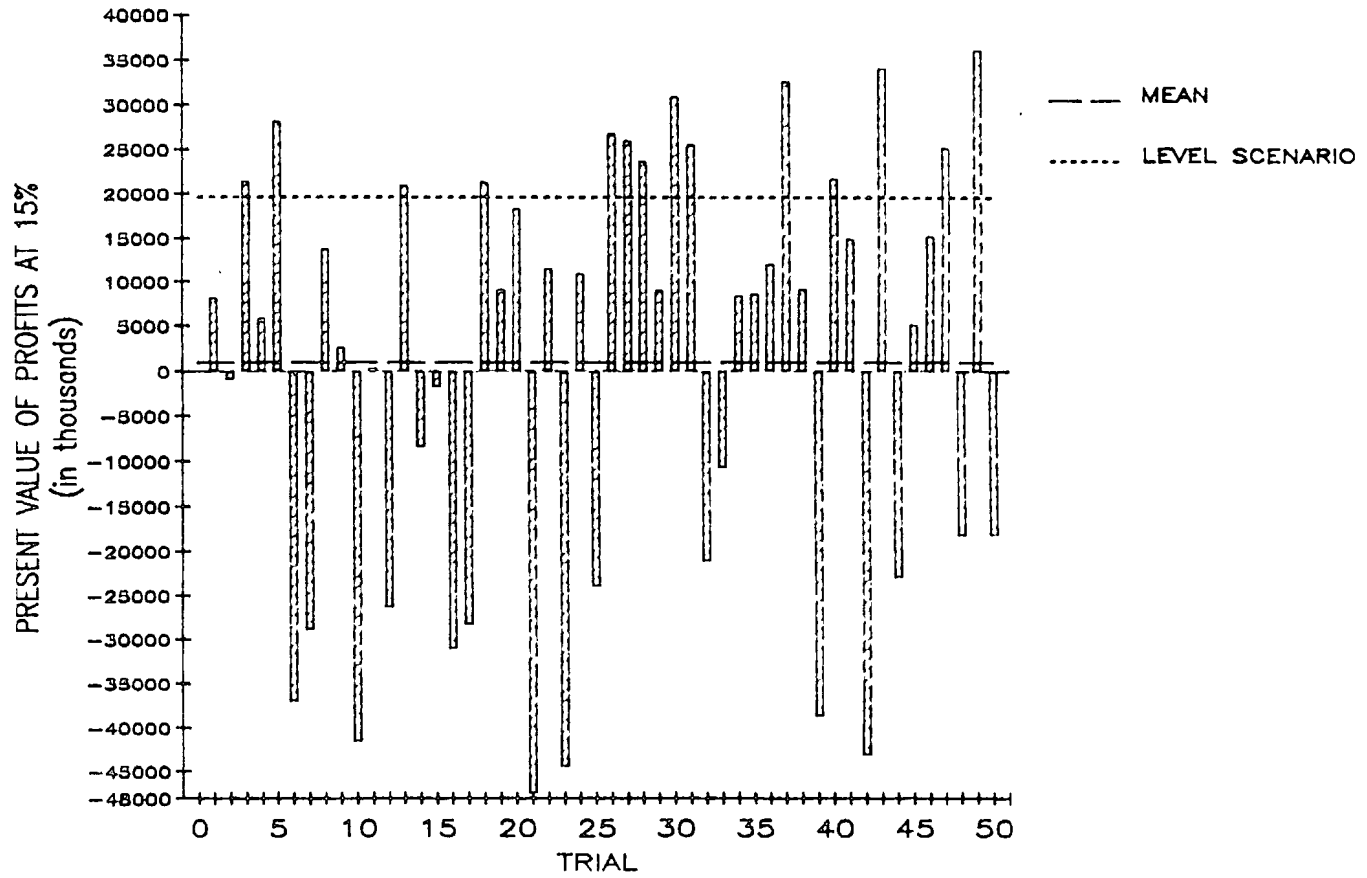## ON EXPECTED PROFITS

MEAN

LEVEL SCENARIO

FIGURE 2-8

Table 2-11 and Figure 2-9 show the Matched Life Company, so called because the company is buying medium-term bonds, and that's their attempt to match. That's probably better than Chase Your Yield Life, but Matched Life is initially buying 7-year bonds and then changing those gradually. Again, all of the other assumptions are the same, and the company is following the market. Figure 2-9 shows the results. Again, there is a dramatic difference between the level interest rate scenario and the mean of 50 trials. In all of these examples, the 50 trials are the same, so there is no bias being created by the 50 random trials being different.

Table 2-12 and Figure 2-10 show Well-Managed Life Company, which is trading its portfolio (which is really what the optimization is generally about) starting with a little bit of a barbell portfolio, but trading it as interest rates move up and down to try to put itself back into a balance based on another cash flow projection. Its credited rate follows the market. Everything else is the same, and the results are not too difficult than the prior ones in that there still is the potential for a loss. The loss is much smaller, and this is the only case where the mean exceeds the level interest projection (Figure 2-10).

Figure 2-11 is a comparison of all of these strategies together. You can see that the one that makes the most money and has the best worse case and the best expectation is Never Again Disintermediation, which I claim is, in fact, the true match for an SPDA block, but probably with an unrealistic set of assumptions. In other words, you can have a company that was perfectly matched, that was

TABLE 2-11

MATCHED LIFE

SPDA New Issues

Premium:	$200 million
Average Size:	$25,000
Surrender Charge:	7, 7, 7, 6, 5, 4, 3, 2, 1, 0%
Investment Strategy:	Intermediate bonds; initially 7-year callable bonds
Credited Rate:	Market
Market Rate:	5-year Treasury
Lapse Rate:	$15\% + 2 \times (MR-CR)^2 - 3 \times SC$ Minimum =3%
Issue Expense:	$50 per policy
Maintenance Expense:	$25 per policy, inflated at 3%
Commission:	5%
Investment Expense:	.2% of fund
Bailout:	0
Guaranteed Interest:	4%

MATCHED LIFE
'DURATION MATCH'
IMPACT OF INTEREST RATE SWINGS
ON EXPECTED PROFITS
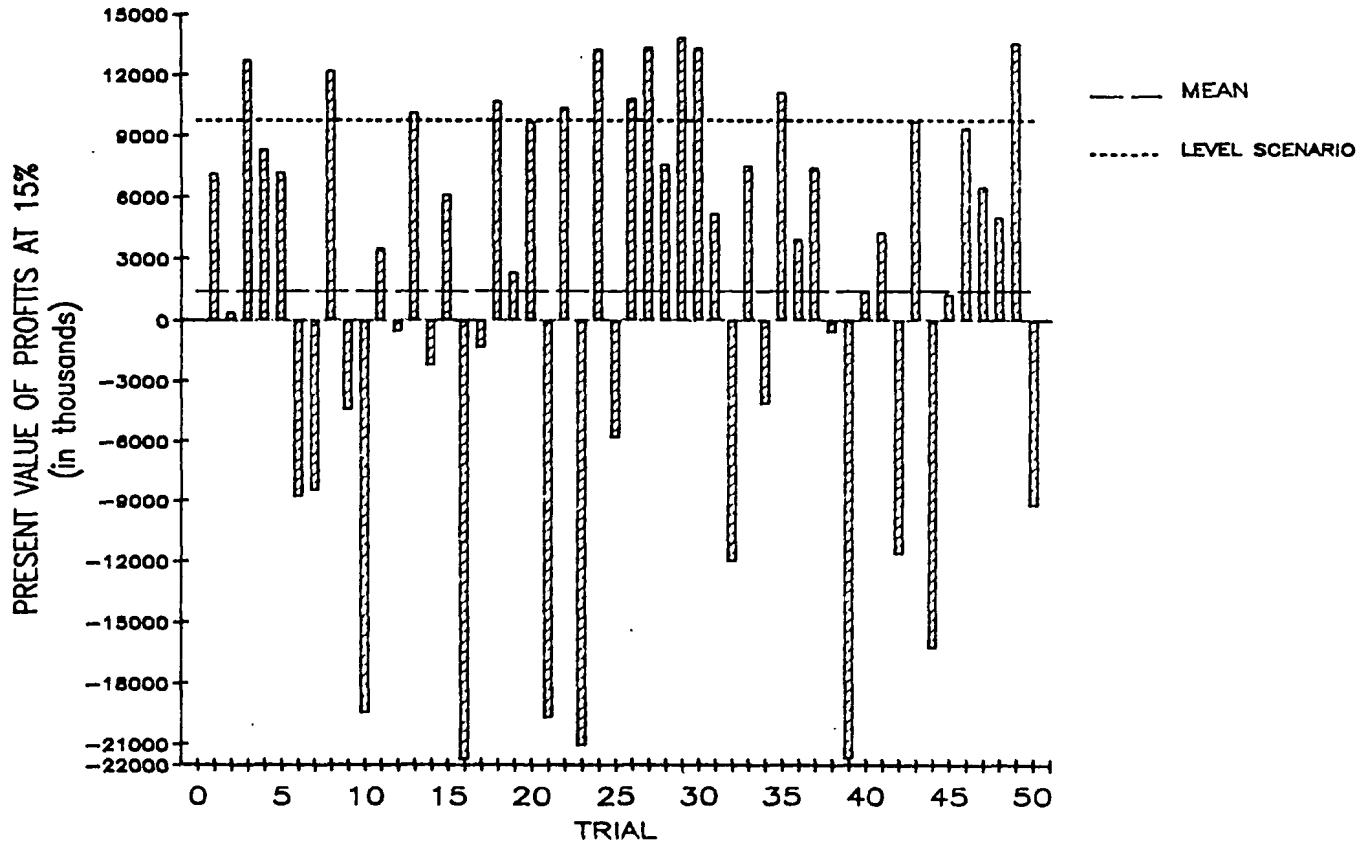
FIGURE 2-9

TABLE 2-12

WELL-MANAGED LIFE

SPDA New Issues

Premium:	$200 million
Average Size:	$25,000
Surrender Charge:	7, 7, 7, 6, 5, 4, 3, 2, 1, 0%
Investment Strategy:	Optimize with a $44 million total loss constraint and an $11 million annual loss constraint
Credited Rate:	Market
Market Rate:	5-year Treasury
Lapse Rate:	$15\% + 2 \times (MR-CR)^2 - 3 \times SC$ Minimum =3%
Issue Expense:	$50 per policy
Maintenance Expense:	$25 per policy, inflated at 3%
Commission:	5%
Investment Expense:	.2% of fund
Bailout:	0
Guaranteed Interest:	4%

WELL MANAGED LIFE
NEW SPDA
IMPACT OF INTEREST RATE SWINGS
ON EXPECTED PROFITS
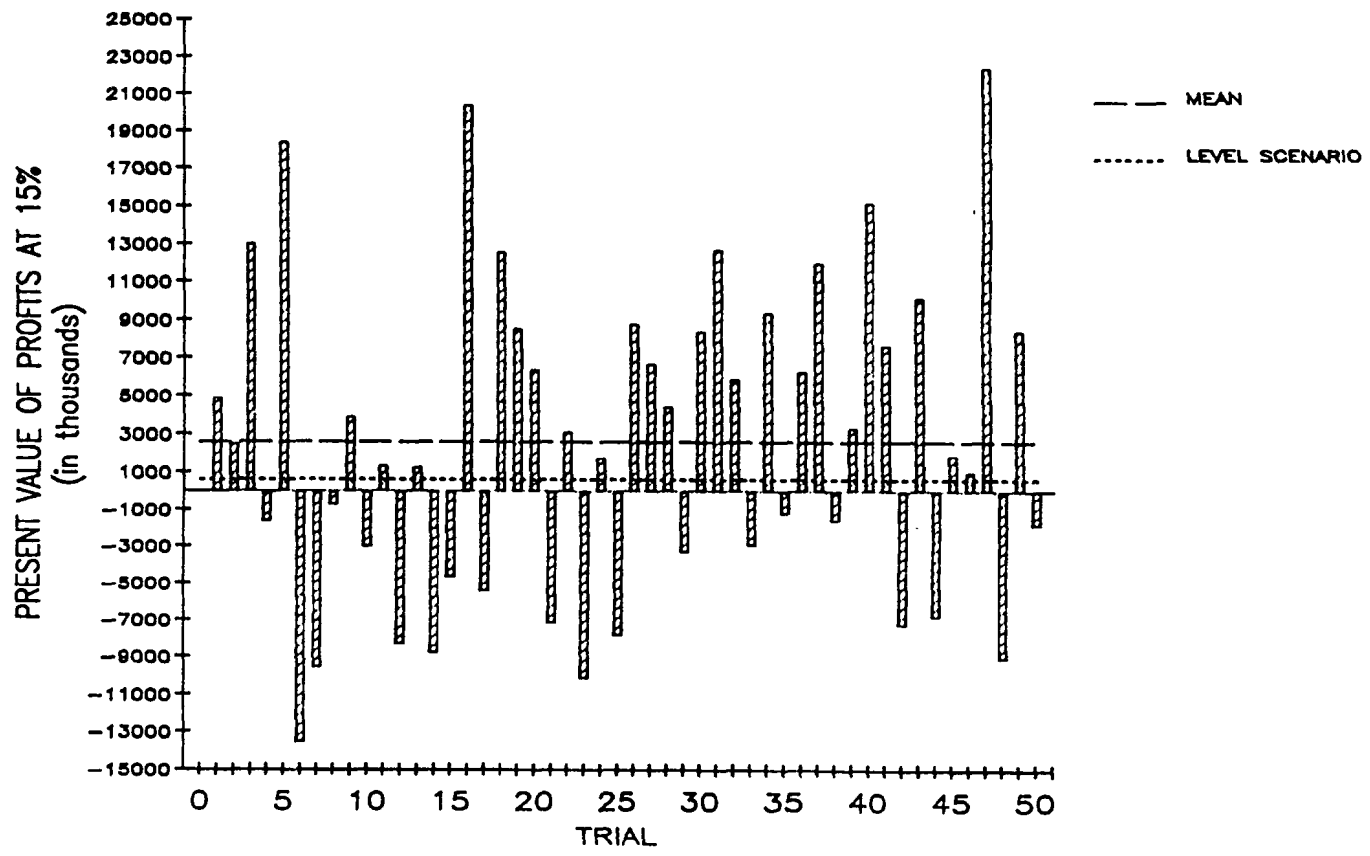

_____ MEAN

········· LEVEL SCENARIO

FIGURE 2-10

investing very short for what is in fact a short liability business. If you just said that it was going to make its spread, you could make fair actuarial assumptions about everything else, including lapses, and produce large expected profit and very low required reserves. In contrast, one line links up with that, and that's Never Again Disintermediation following the market.

The whole point of this is that the valuation actuary must be sensitive to all of these different assumptions and the way they interact. He needs to tie down management both on what it is going to credit and its crediting philosophy, and on how it is going to invest. The danger is of the valuation actuary's sometimes being confused with the person who is making those decisions. These are all issues that we've got to think about.

Table 2-13 and Figure 2-12 show a universal life example with a company that's investing in 10-year callable bonds with a credited rate that moves with the market. Here's the market on the product the company thought was a 7-year Treasury, and it has a lapse rate that again is a formula. This one is 17 percent plus 1½ times the difference between the market rate and the credited rate, squared, minus the surrender charge, with the minimum being 4 percent. Commissions, loads, and mortality charges are all pretty reasonable. Maybe the commissions are a little bit high, but that's why they sell so much.
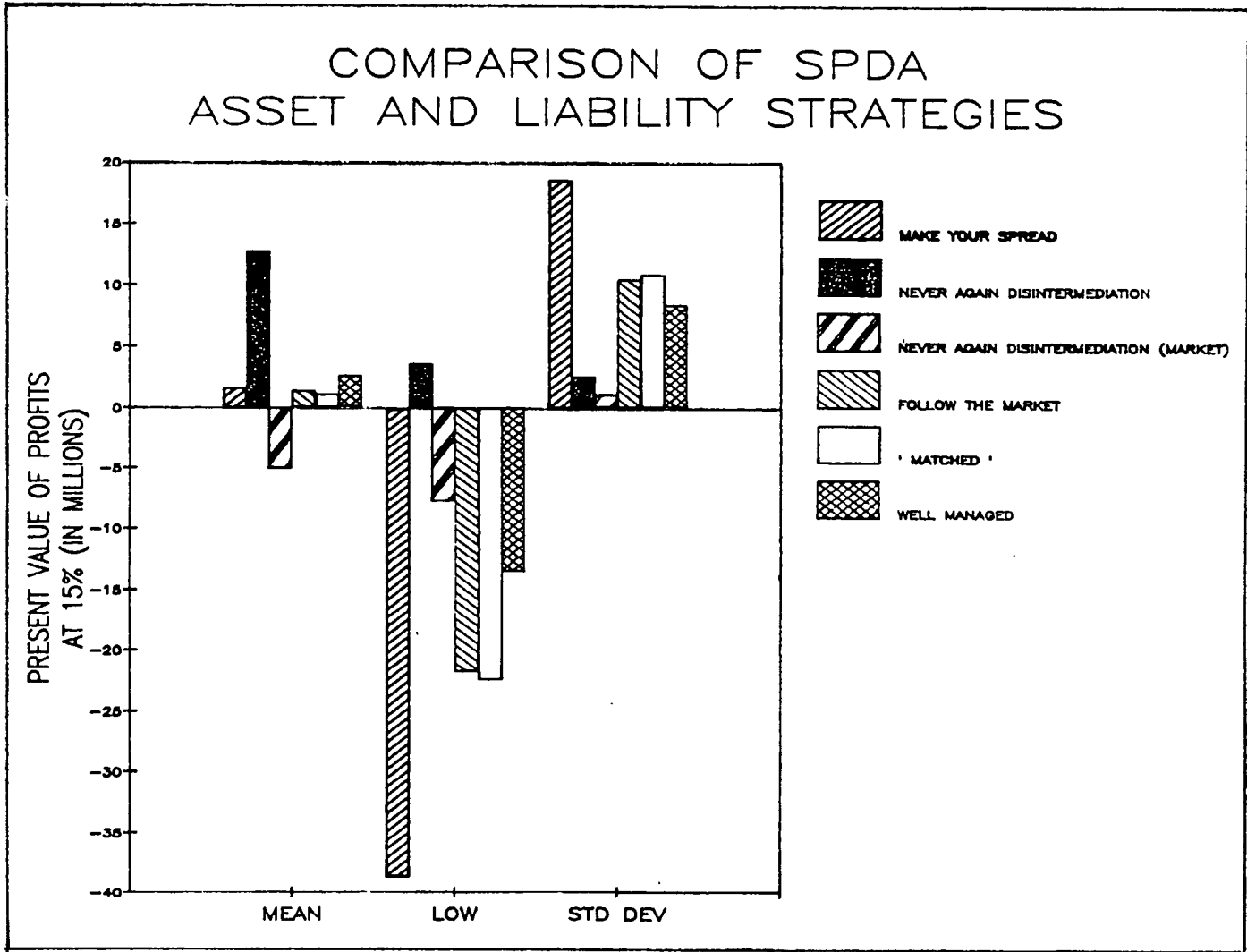
COMPARISON OF SPDA
ASSET AND LIABILITY STRATEGIES

FIGURE 2-11

TABLE 2-13

UNIVERSAL LIFE COMPANY

UNIVERSAL LIFE NEW ISSUES

Premium:	Initially $5 million per year
Average Size:	$100,000
Investment Strategy:	10 year callable bonds
Surrender Charge:	100% of first year target premium grading to zero in year 16
Credited Rate:	Market
Market Rate:	7-year Treasury
Lapse Rate:	$17\% + + 1.5 \ (MR-CR)^{2.5} - SC$ Minimum $=4\%$
Suspension Rate:	15% first year, 5% thereafter
Issue Expense:	$150 per policy plus $1.75 per $1,000
Maintenance Expense:	$50 per policy
Investment Expense:	.15%
Premium Tax:	2.25%
Commission and Allowances:	115% of first year target premium; 15% of 2nd year target premium; 5% of all other target premiums and excess premiums
Loads:	4% of target premium
Mortality Charge:	85% of 65/70 Ultimate
Actual Mortality:	75% of 65/70 select and ultimate
Guarantee:	80 CSO and 5.5%

UNIVERSAL LIFE COMPANY
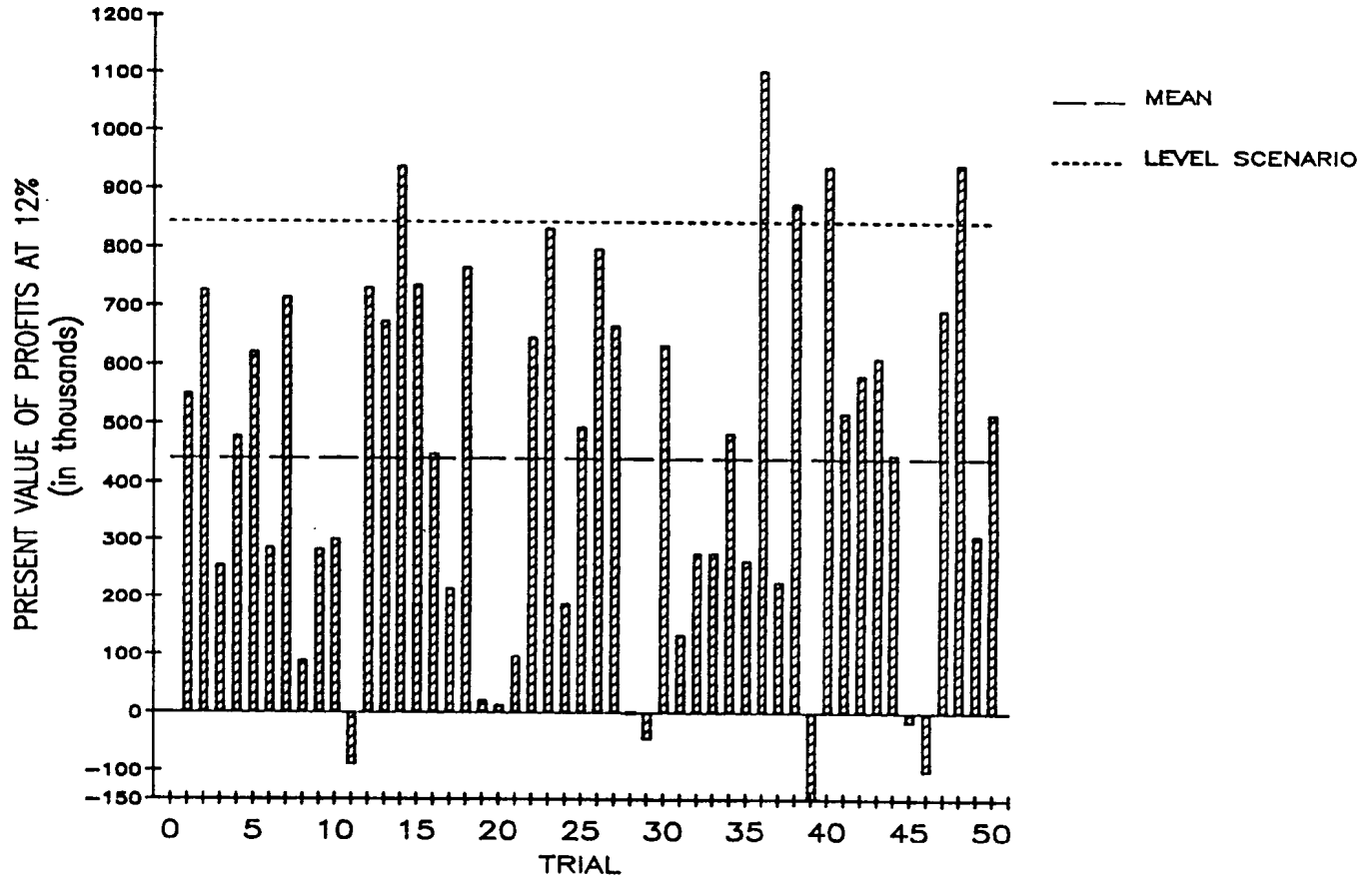IMPACT OF INTEREST RATE SWINGS
ON EXPECTED PROFITS

FIGURE 2-12

Figure 2-12 shows the results that came out. What we found here is interesting. First of all, we again have that theme of the difference between the mean and the level scenario lines. The level scenario line, which is probably what's in your pricing, is generally below the mean line, which I think is a much more realistic measure of what your expectation ought to be. The good news on this one, I think, is the fact that we got relatively favorable worst cases in the 50 random trials. The reserves were adequate, and maybe there was something we could do to control the problem with prudent management of the assets.

I want to emphasize two points. First, the thing that I still find most perplexing about the valuation actuary concept is the use of the words "plausible" and "reasonable," which I, personally, will not tolerate. I am not going to sign an opinion that says reasonable and plausible unless I can quote the law as defining reasonable and plausible, because I am not sure what's reasonable or plausible in this situation.

Second, the relationship of reserves to surplus and assets is intuitive rather than algebraic. This is to say that in our balance sheet framework, surplus is basically equal to assets minus liabilities. If we fail to recognize that surplus is only as good as the underlying reserves, then we missed the point on all of these things.

That leads me back to where I started, which is that I think you need to do cash flow analyses, and the valuation actuaries' work ought to be driven by cash flow analyses. The valuation actuaries' work should then be able to be translated into appropriate balance sheets by people who do that—regulators, the accounting profession, or somebody else.

MR. W. E. BERGQUIST: I have attempted to tailor my remarks to an audience that is generally unfamiliar with Canadian developments with regard to required surplus formulas. At the same time, I hope my remarks will be of some use to those Canadian valuation actuaries who have not been close to the development of the Canadian Life and Health Insurance Association (CLHIA) Test Formula for Minimum Continuing Capital and Surplus Requirements (hereafter called the Test Formula) and the deliberations of the Canadian Institute of Actuaries (CIA) Committee on Solvency Standards. I would remind attendees that Session 7 will be an update of the activities of the CIA Committee on Solvency Standards.

I believe I was invited to speak at this symposium primarily because of my association with the development of the Test Formula as a member of the CLHIA Subcommittee on Solvency Testing. As a consequence, I will spend most of my time talking about the development of the Test Formula. For those interested, we have available copies of the final report of the CLHIA Subcommittee on Solvency Testing. The final report includes the Test Formula and considerable background discussion on the Test Formula's development.

In Canada, we have attempted to avoid a separate set of books for solvency measurement by the regulatory authorities and another set of books to serve as general-purpose financial statements that emphasize the realistic measurement of annual net income. With the new valuation laws that became effective in 1978, policy reserves have fallen as low as U.S. GAAP policy reserves calculated using Type 1 valuation premiums. In other words, policy reserves always include a full provision for adverse deviations of reasonable magnitude, even if this occasions recognizing a financial loss at policy issue. Policy reserves calculated

on the basis of Type 2 and Type 3 valuation premiums, which have no provision for adverse deviations or only partial provision, respectively, are not permitted. A level of policy reserves that uses only a reasonable provision for adverse deviations, by definition, provides insufficient experience margins for solvency purposes. A similar problem emerges with other items in the balance sheet.

If one is now to devise a solvency test, one has basically two choices, both of which are theoretically correct:

1. To do another valuation of assets and liabilities, building in higher provisions for adverse deviations where the operative level changes from "reasonable" to "plausible." The meaning of these words would be determined either by statute or by the profession through actuarial standards.

2. To determine add-on amounts to the asset and liability amounts in the general-purpose financial statements.

We have opted for the "add-on" approach for a number of reasons:

1. We don't want the confusion associated with two full-fledged sets of books, as we see happening in U.S. GAAP versus U.S. Statutory.

2. Although separate calculation of "general-purpose" (GAAP) and "solvency" (statutory) asset and liability amounts is the best way to proceed from a mathematical viewpoint, it is very hard to use such an approach in practice

when one is communicating with nonactuaries and "practical actuaries" both inside and outside the company.

3. Other financial institutions such as banks and trust companies have used the add-on approach. (By way of definition, a Canadian trust company is akin to a U.S. savings and loan association with the addition of a trust department. By law, Canadian banks cannot have a trust department.)

4. Most life insurance companies have used the add-on approach in their internal definitions of risk equity requirements.

5. The add-on approach is more accommodating of simple or arbitrary estimates of risk.

This is especially important, because the main risks to solvency, as viewed by the subcommittee, are these:

1. The C-4 risk, especially high-risk business plans of nouveau riche entrepreneurs, incompetent management, and fradulent or irresponsible management found either alone, but especially in combination with, other management risks.

2. The unforeseen and the impossible happening. Classic examples might be hyperinflation; dramatic changes in prices of commodities such as oil; and changes in laws and in the interpretation of laws, such as the recent growth in the frequency of large tort awards for damages.

Early in its deliberations, the subcommittee opted to make use of a prescribed formula approach that involved as little judgment as possible. In the longer term, as the industry got experience with surplus requirements, the subcommittee foresaw the transition from a prescribed formula approach to a professional standards basis prescribed by the CIA. However, it was very much easier to start with a prescribed formula than with professional standards for a number of reasons:

1. Nonactuaries (who are a majority of the Canadian population) were expecting a prescribed formula approach, as a prescribed formula approach presently applies to other Canadian financial institutions.

2. Prescribed formulas are viewed as fallible, while professional standards are viewed as being close to infallible. Consequently, it takes a very long time to develop a good set of professional standards. We didn't have the time to do so.

3. Prescribed formulas, be they policy reserve requirements or minimum surplus requirements, provide valuation actuaries with a needed crutch and allow them to function as technicians rather than true professionals. In this instance, we hope that the crutch needs to be used only for a limited period of time.

4. Prescribed formulas can be much more easily changed than professional standards.

5. A number of CLHIA member companies have already had a number of years of favorable experience with the use of their own internally designed required surplus formulas.

6. Prescribed formulas ensure more comparability between companies, even if a lot of the comparability is only in appearance. The appearance of such intercompany comparability is important in getting political acceptance of any new scheme. Over time there will become a general realization of the inadequacies of the prescribed formula approach, and there will be a general consensus, it is hoped, among both actuaries and nonactuaries, to move gradually to a professional standards basis.

In order to gain some appreciation of why the Test Formula was developed, let me review some of the recent Canadian developments in the fields of life insurance company financial reporting and some of the political fallout from recent insolvencies of Canadian financial institutions, none of which, incidentally, were life insurance companies.

The Canadian Department of Insurance recognized that with the operation of the new 1978 financial reporting rules, the implicit surplus margins provided by the previous conservative statutory policy reserve requirements which were akin to those of the U.S. Standard Valuation Law, were eroding with every passing year as companies gradually switched to less conservative valuation bases as the importance of reporting realistic earnings increased. The Department of Insurance was also faced with the anomalous situation of there being minimum capital and surplus requirements for banks and trust companies but none for life

insurance companies, yet all three types of financial institutions competed for the term deposit savings dollars of Canadians.

The Department of Insurance also wanted some breathing room in the way of required surplus, as it was concerned that if it were not allowed to intervene in the affairs of an insurance company until such time that the company showed no surplus, the company would be hopelessly insolvent in real economic terms. The general experience has been that an insolvent company uses the courts to delay or impede Department of Insurance intervention, and the insolvent company has been overstating its net worth in its financial statements.

The Department of Insurance, as a consequence of these concerns, commissioned Allan Brender, PhD, FSA, of the University of Waterloo, to do a research study on what would constitute reasonable minimum continuing capital and surplus requirements for life insurance companies. Dr. Brender's study was published in March 1985, which was also about the time of the appointment of the CLHIA subcommittee. The Brender Formula was found by the subcommittee to be a good foundation on which to build the Test Formula. Dr. Brender's research was mostly in the area of the life insurance mortality risk, and in this area, the Test Formula basically follows Dr. Brender's recommendations.

In November 1985 the House of Commons Standing Committee on Finance, Trade and Economic Affairs, under the chairmanship of Don Blenkarn, published a comprehensive report with 135 recommendations on the regulation of Canadian financial institutions. One of the most influential members of the standing committee was Paul McCrossan, who happens to be our speaker in Session 3.

This report followed on the heels of the April 1985 government discussion paper (Green Paper) on the regulation of Canadian financial institutions. The discussion paper and the Blenkarn Committee Report both recommended minimum capital and surplus requirements for life insurance companies to be established by the superintendent of insurance through the issuance of regulations. What the politicians clearly had in mind was a formula add-on approach that would have reasonable consistency with the formula capital and surplus requirements of other Canadian financial institutions.

As a consequence, in August of this year, the federal government introduced into Parliament legislation to give the superintendent of insurance the right to promulgate minimum continuing capital and surplus requirements for life insurance companies. With a new session of Parliament subsequently being proclaimed, this legislation died on the order paper, but it is expected to be reintroduced, probably as part of a general overhaul of federal insurance legislation. The province of Quebec has already passed legislation allowing its government to promulgate minimum continuing capital and surplus requirements for Quebec-chartered life insurance companies.

The industry push for minimum capital and surplus requirements for Canadian life insurance companies came from the proposal to institute a compensation plan for policyholders and claimants suffering financial losses as a consequence of a life insurance company insolvency.

At the current time, Canada has deposit insurance akin to that of the United States Federal Deposit Insurance Corporation to cover deposits in banks and

trust companies. There are currently no guarantee funds or other compensation schemes to assist policyholders or claimants of insolvent insurance companies. In the last several years, the Canadian financial services sector has been rocked by the 1985 failure of two banks (the first bank failures in Canada in over 60 years) and the previous failures of a number of deposit-taking trust companies and property and casualty insurance companies. The failure of two banks must be taken in the context of the fact that Canada has no more than a dozen domestic banks.

The absence of any consumer protection scheme for insurance company policyholders became a political issue. Both the provincial and federal layers of government encouraged the property and casualty and life insurance industries to set up their own consumer protection schemes by saying those magic words: "If you don't do it, we will!" The trade associations of both industries reacted by putting in motion the development of their own separate consumer protection plans. In the life insurance industry, there was a particular fear that any government-implemented plan would have insufficient emphasis on the prevention of insolvencies. The industry wanted the best possible consumer protection plan—that is, one that never had any claims. The keystone of continually achieving this goal is to ensure that the owners of insolvent life insurance companies would first have to risk a significant amount of their own funds. This would most importantly deter risky management. Second, it would reduce the probability and the severity of any actual claims against the consumer protection plan.

The CLHIA, in 1985, appointed a subcommittee on Solvency Testing under the chairmanship of L. Blake Fewster. Although the nine committee members held a variety of jobs in their own companies, all were actuaries by professional training. The subcommittee was given the mandate of developing solvency tests, including early warning tests. The subcommittee looked at the National Association of Insurance Commissioners (NAIC) IRIS early warning tests and concluded that they or any similar tests were next to useless in the Canadian environment, where there were only about 150 companies in total and where the financial condition of at most 15 companies would ever give anyone a reason for concern. In such a small population, any developing problem situations could be easily identified without having to apply a battery of tests, many of which would be irrelevant, to the total population.

The subcommittee looked at the more common tests being used by the federal and Quebec insurance departments. These common tests were found to be too general, as they were in the nature of aggregate ratios such as surplus to liabilities, surplus to premium income, and net income to surplus.

The subcommittee based its Test Formula on two main sources—first, the previously discussed study made by Dr. Brender, and second, the risk surplus formulas empirically developed by member companies.

The committee's basic approach was to put down some parameters and associated numbers and to arrive at a consensus. This may sound very unscientific, but I suggest, given the nature of the risks, the relatively small number of players, and the need to establish a workable consumer protection

plan within a relatively short time span, that it was an approach appropriate to the circumstances I believe that the resulting Test Formula produces fairly stringent minimum capital and surplus requirements for the generality of life insurance companies operating in Canada.

The subcommittee was cognizant of the fact that the introduction of fairly stringent minimum capital and surplus requirements would have the side effect or driving out any voluntary additional conservatism in the policy reserves.

One problem that the subcommittee continues to wrestle with is that of maintaining a formula that is not viewed as overly complicated and, at the same time, is not overly simplistic. Several times we have had to pare the formula down to the essentials. We still have a formula that runs 12 pages, with another 5 pages of introductory and explanatory notes. We have tried to maintain simplicity, as nonactuaries both within and without the member companies would simply not accept an overly complicated formula. These nonactuaries can have a lot of influence, especially when they happen to be the chief executive officers of member companies. As actuaries, we too often fail to realize that simplicity is often the price we must pay for political acceptance of our recommendations.

The subcommittee believed that its simplified formula would be functional for the following reasons:

1. Even the most elaborate formula would not address all the special situations of member companies.

2. Elaborate surplus formulas cannot be easily understood except by actuaries who work day to day with them.

3. The calculation burden of the formula to the great majority of companies with adequate surplus resources is not overly large.

4. Companies not meeting the Test Formula requirements are given the option of proposing a modification of the formula to the relevant regulatory authority if they view the Test Formula as being inappropriate.

5. Companies are expected to increase their Test Formula surplus requirements if their own particular circumstances expose them to more risk than that contemplated in the establishment of the Test Formula.

6. The subcommittee anticipates that guidelines will be developed as necessary by some interested party—perhaps by the subcommittee itself—to assist companies in assessing their Test Formula requirements, including any additional requirements due to special risk circumstances not foreseen by the Test Formula. This will assist in ensuring that the spirit of the Test Formula is followed rather than its literal words.

The subcommittee has requested member companies to calculate their surplus requirements on the Test Formula for the years 1982 to 1985 and to give their comments on the appropriateness of the formula. The subcommittee has been pleased by the Test Formula results and the associated commentary from member companies. Very few companies are failing the Test Formula, and the

general pattern of results looks very reasonable. Several of the failures are Canadian branches of foreign companies where special circumstances apply. In the commentary from member companies, we have had a lot of suggestions for change, but they were mainly of a tinkering variety. No one has said that we were doing the wrong thing or that the Test Formula gave overall unreasonable results. Based on preliminary discussions with both federal and provincial departments of insurance, the subcommittee is optimistic that the regulatory authorities will accept and administer the Test Formula. There may well have to be a few modifications in the Test Formula to gain such acceptance.

I would now like to say a few words about some of the problems faced in the development of the Test Formula. The Test Formula section covering the C-3 interest rate change risk is not very satisfactory, since appraisal of the C-3 risk requires a detailed review of the interest rate term of a company's asset and liability portfolio plus a full understanding of the company's operating philosophy and its likely operational responses to the various changes in the interest rate environment.

A very important factor in the assessment of a company's C-3 risk is the amount of inertia and friction in the system. For a multitude of reasons, there is far from perfect selection against the life insurance company by its policyholders. Depending on the circumstances, this can be due to the lack of financial sophistication on the part of policyholders and their advisors, the modest amounts involved, the administrative work involved in transferring funds to another company, pure procrastination, plain laziness, and adverse tax effects. These factors will substantially reduce the real C-3 risk of a company.

Moreover, the significance of these inertia and friction factors will vary dramatically by company, as well as by policyholder and distribution system characteristics. I am not aware of very much research that has been done in this area.

I might add, as a parenthetical note, that for some products in the U.S. market, one cannot competitively price without taking substantial credit for the lack of effective financial antiselection by the policyholder in respect to the C-3 interest rate change risk.

Faced with such unknown and variable factors, the subcommittee took the course of recommending some arbitrary surplus requirements by general product type. In doing so, the subcommittee was implicitly assuming that the C-3 interest rate change risk would be managed to a common level by all companies from very good for single premium immediate annuities to very little for guaranteed cash value life insurance.

The assessment of the C-1 asset default risk for mortgages, common stock, and real estate is very difficult. For common stocks and real estate, the solution is to prescribe very conservative surplus requirements. At the current time, this meets with very little resistance, as companies generally have large excesses of market value over book value for common stock and real estate investments. Moreover, there is pretty close to general agreement that equity investments can be very risky investments for life insurance companies. For mortgages, one must set reasonably low requirements. It is very hard to identify higher-risk mortgages and to assign them a higher surplus requirement, since the security of

the mortgage depends on the income and value maintenance potential of the pledged property or, in the case of recourse mortgages and owner-occupied residential property, on the income potential of the mortgagor—items that often are not subject to common objective measurements.

By way of interest, the subcommittee has also identified a C-2 pricing inadequacy risk with respect to the interest margin. This C-2 investment risk can be defined as investment risks other than those of the C-1 asset default risk or of the C-3 interest rate change risk variety. Examples of such risks follow:

1.   Communication problems between investment and pricing personnel.

2.   Lack of sufficient volumes of new bond and mortgage investment opportunities.

3.   Changes in the interest rate spread relationships between different investments.

It is intended that companies that pass the Test Formula would operate without restriction. As a company fell below 100 percent of the Test Formula requirements, operating restrictions would begin to apply to the company, and such restrictions would increase as the percentage dropped. The first requirement on a company failing the 100 percent test would be the filing with the relevant regulatory authority of an acceptable plan of action aimed at bringing the company's actual capital and surplus in line with the Test Formula requirements. Fifty percent of the Test Formula requirements is viewed as the

general level at which the company should be placed in receivership or in liquidation. The important point here is that there is no cliff situation. It should take a company a period of time to pass from the 100 percent level to the 50 percent level, so the company, the industry, the consumer protection plan, the regulatory authority, and the politicians have a period of time in which to cure the company's surplus deficiency.

In 1985 the CIA appointed a Committee on Solvency Standards. The committee has unofficially indicated its acceptance of the Test Formula for temporary use in the measurement of solvency of Canadian life insurance companies. In the short run, the committee will help valuation actuaries and regulatory authorities in the practical operation of the Test Formula only indirectly, such as encouraging the production of actuarial papers on solvency standards. In the longer run, the committee will concentrate on the development of professional actuarial standards for the determination of minimum capital and surplus requirements without reliance upon an arbitrary formula such as the CLHIA Test Formula. I might add that the CLHIA subcommittee and the CIA committee have had an excellent working relationship to date, and we haven't had any problem of stepping on one another's toes.

One of the recommendations contained in the November 1985 report of the CIA Special Committee on the Role of the Valuation Actuary, which was subsequently adopted in principle by the CIA Council, was that the valuation actuary should have the added obligation of reporting to the relevant regulatory authority on the ability of the company to meet its future obligations with respect to the company's existing business and its anticipated future new

business. The concept that the valuation actuary should eventually determine minimum capital and surplus requirements based on professional actuarial standards is, in my opinion, generally accepted in Canada, provided the valuation actuary doesn't have to look over the horizon to consider anticipated future new business. The consideration of new business is seen as interfering with the rights of management to plan and execute future business decisions. However, the government may well want the valuation actuary to look over the horizon in the same fashion as the appointed actuary does in Great Britain. Consequently, this point remains a contentious issue.

The development of the necessary professional actuarial standards may appear to be an impossible task to many of us. However, I am more optimistic, since minimum capital and surplus requirements are very similar to policy reserve requirements, the essential difference being that policy reserves are calculated with "reasonable" provisions for adverse deviations, whereas minimum capital and surplus requirements are calculated with provisions for adverse deviations set at "plausible" levels. If we can define "reasonable" levels in professional standards, we should be able to define "plausible" levels, although with more difficulty and with less certainty.

It should be noted, however, that when provisions for adverse deviations are increased to "plausible" levels, various contingencies adjudged immaterial for purposes of determining policy reserves will become material for purposes of determining minimum capital and surplus requirements. As well, the actuarial technique used to analyze any particular contingency or combinations of contingencies may change between that used for determining policy reserves and

that used for determining minimum capital and surplus requirements. As a consequence, the calculation basis for minimum capital and surplus requirements may be very different from that used for determining policy reserves.

These are problems of technical application rather than of establishment of professional standards. However, technical application questions must be resolved if professional standards are to have any practical meaning.

The Test Formula should only be interpreted as a point-in-time stopgap solution subject to normal evolutionary processes that will enhance rather than diminish the professional role of the valuation actuary.

What lessons from these Canadian developments might find application in the United States? I don't know, but I can do some speculating:

1. If the Standard Valuation Law is ever substantially relaxed so that the implicit built-in minimum capital and surplus requirements begin to disappear in substantial measures, there will then develop a general movement to impose statutory minimum capital and surplus requirements on U.S. companies, just as has happened in Canada.

2. At the current time, the management of a considerable number of U.S. companies would take the view that the magnitude of capital and surplus is a prerogative of management. This view is very much influenced, in my opinion, by the conservatism of U.S. statutory policy reserves and will change if this conservatism disappears.

In closing, I would like to address the question, Have we in Canada rejected or questioned the value of research findings, past or future? I would answer definitely no. We accept research findings as being instructive, but not all-conclusive, in that research findings are often derived from simplified models of reality. We need more research to improve and widen the actuary's information base. The ever present problem is that reality cannot ever be satisfactorily modeled, especially for those products involving policyholder decisions based on considerations other than pure mathematical logic. As a consequence, professional informed judgment remains of paramount importance in assessing the surplus requirements of a life insurance company.