

# RECORD OF SOCIETY OF ACTUARIES 1989 VOL. 15 NO. 2

## THE STATE OF THE ART FOR THE VALUATION ACTUARY

Moderator: ALAN W. SIBIGTROTH  
Panelists: C. LORNE CAMPBELL  
DONNA R. CLAIRE  
THOMAS G. KABELLE  
R. STEPHEN RADCLIFFE  
Recorder: ALAN W. SIBIGTROTH

- o What technical developments have occurred that will be useful to valuation actuaries?
  - Cash flow techniques
  - Market value techniques
  - Modeling C-2 risks such as epidemic risk

MR. ALAN W. SIBIGTROTH: This session will be a practitioner's view of the state of the art for actuarial valuation. This session will be from the perspective of what company actuaries are doing, those who work and live within the system they create, and not a theoretical treatise on esoteric practices. I had some difficulty finding company actuaries who would be willing to participate on this panel. Many of the people I spoke to felt that they would inject too much controversy, or felt that they did not have much that was new to add to the subject matter. I am very grateful to the panelists who have chosen to speak who come from varied backgrounds including mutual companies, stock insurance companies, and a small Canadian company.

I am President of Sibigroth and Consultants, Inc. and Sibco Securities, Inc. I have consulted with insurance companies regarding capital management, investment risk, and other general financial issues which pose problems to the insurance business.

Our first speaker will be Stephen Radcliffe. Mr. Radcliffe is Senior Vice President and chief actuary with American United Life (AUL) in Indianapolis. His background includes corporate and management issues including cash flow testing. Prior to his current responsibilities, he was in the reinsurance area and has had extensive experience with regard to term insurance products and lapse risks. Mr. Radcliffe will focus on the practical aspects of cash flow testing.

The next speaker will be Donna Claire. Ms. Claire is Assistant Vice President at Equitable Life. She has chaired the task force regarding New York Regulation 126. She has background in the valuation standards for structured annuities.

Tom Kabelle is Senior Vice President with Guardian Life. He is a tax specialist and reinsurance strategist. He will describe new financing techniques recently deployed by a bank to support an agency operation. He will further describe some of his concerns regarding term insurance scaling.

Lorne Campbell has worked most recently with Seaboard Life implementing a new valuation system. He will discuss the computer-related concerns and the Canadian valuation scene. Prior to his work with Seaboard, Mr. Campbell had a unique perspective working with a life insurance agency.

MR. R. STEPHEN RADCLIFFE: The title of this session is pretty intimidating, isn't it? Since I am just a poor, old chief actuary, the best I can do is give you some of the practical aspects in making valuations using some of the modern techniques.

As a matter of fact, in preparing this presentation, we considered two choices: 1) a lofty consideration of theoretical leading-edge ideas which nobody yet fully comprehends, or 2) telling you what is really happening. We chose the second course and my part of the presentation is to tell you a little bit about what we are doing at AUL. At least it's state of the art for our company. Hopefully, it will be more meaningful for you to hear about some of the real live war stories

## PANEL DISCUSSION

instead of some fanciful new techniques that we have not tried yet. As far as I am concerned, the practical aspects of valuations get to the really important issues of valuation anyway.

I think it is time for all of us valuation actuaries to get out from among the trees and look back at the forest. It is time for a consolidation, review and analysis of the mountains of data that we have accumulated. We have all the tools we need and most of these tools now actually work. So, instead of finding new ways of extending our microanalysis, we should start thinking more about the macroanalysis of reserves and valuations. Probably about 75% of our time spent at AUL on the valuation actuary problem so far has been spent on developing, learning and analyzing the new software programs that study cash flows. Now it is time to spend 75% of our time figuring out what the data really mean. That does not mean to say that we won't be running lots of new scenarios, but it means that it is time to use the technology we have to evaluate the strategic issues of managing interest-sensitive products.

Even with all of our new state-of-the-art tools, the major themes that the valuation actuary has to deal with have not changed much over the past few years. In my opinion, an opinion I have had since the early 1980s, we do not have a valuation problem in the United States. Instead, we have a pricing and design problem that has been dumped on the valuation actuary. The design problem is that with most interest-sensitive insurance products we allow a "put" option to our customers which in turn allows them to antiselect against us. That is the design problem. The pricing problem is that we do not charge anything for this valuable right. It should be no big surprise that if interest rates rise and stay at high levels for any period of time, that companies offering this product are going to have serious problems with this design feature. It does not take a lot of fancy valuation to figure that out.

Handling interest-sensitive products is like handling dynamite. You have to know what you are doing and handle it very carefully or it will blow up in your face. Even the most experienced handlers are at some risk of accident.

Another perspective on this basic theme is that you cannot match the duration of the liabilities with the duration of the assets when there are book value guarantees in the product (which is the free "put" I mentioned before). The reason for this is that the duration of the liabilities changes when the interest rate changes. The duration is long when interest rates are low, and the duration can be very short when interest rates are high. Usually when interest rates increase, the duration of assets gets longer while the duration of liabilities gets shorter. This makes it impossible to find an asset duration that will move in exact tandem with the duration of the liability.

These are basic and obvious truths that really have not changed much since we began studying the problem. However, the new tools have provided a better perspective and understanding of the risk that we are dealing with. Furthermore, the new tools have allowed us ways to evaluate new methods of hedging the interest rate risk which I will cover later in this talk.

I would like to talk about my preference for using stochastic scenarios with randomly generated interest rates. In studying cash flows at AUL in the past year, we have migrated from studying simple deterministic scenarios to studying stochastic scenarios. As far as I am concerned, using the stochastic scenarios to analyze this risk is state of the art at AUL. I have come to this conclusion for the following reasons:

1. The only way to observe the effects of volatility in the interest rates is to use randomly generated numbers. One of the most important elements of the interest rate risk is the volatility of the rates. It is very hard to study the effects of volatility using controlled deterministic scenarios.
2. Studying several runs of randomly generated scenarios paints an overall picture of the risk. The tendency in studying deterministic scenarios is to focus on the scenarios that give bad results. This causes management to take action that may fortify against the effects of adverse scenarios to the exclusion of seeing opportunities for profit in some of the other scenarios. This tendency with the study of deterministic scenarios is to always fight the last war and miss some possibilities for winning the next war.
3. Deterministic scenarios often wind up proving foregone conclusions. For instance, in Reg. 126 there is one suggested interest rate scenario where the interest rates increase by 500 basis

## THE STATE OF THE ART FOR THE VALUATION ACTUARY

points over 10 years, and then there is a forced liquidation of the entire portfolio of business. That is like running a Mercedes into a brick wall at 60 mph to see if it will dent the fender. It should come as no shock that this scenario will not produce positive results.

4. Random trials often produce surprises that enhance the study of risk. These surprises often lead to new ideas to investigate. One thing that we have found is that lots of small variations can add up to big problems; more problems than we would have suspected by just looking at deterministic trials. When interest rates pop down and then back up or vice versa, the policyholder has two chances to select against you. In deterministic scenarios that do not have that "wiggle," the policyholder may have no chances to select against you. When you come right down to it, we are really in the process of discovering risk through these random and uncontrolled trials. One thing that we have discovered is that the probability distribution function may not be a normal curve. The negative tail is more pronounced than the positive tail, and we have seen peaks in the curves with skewness toward the negative tail that we would not have suspected.

Now that I have shared with you some things I really like about random trials, let me tell you about some of the practical problems. The main problem is that you have to run so many trials and it takes a lot of computer time. Let's suppose that a failure is defined to be a trial that ends up with a negative cash position after all of the business is liquidated at the end of 20 years for a given block of business. If you would like to test reserves for a failure rate at the 10% level (which means your asset cash flows will be adequate to cover the liability cash flows 90% of the time), then we have determined that you have to run about 200 trials to make a valid test. If you are testing reserves at a 5% failure rate, you have to run over 400 scenarios. If you are testing surplus at a 1% level, you have to run 2,000 scenarios.

Of course, all of these figures assume that the model is perfect and all the assumptions are correct. If you only have 70% confidence in the assumptions, it doesn't make much sense to look for 95% confidence limits in the results of the model. The main assumptions in the model are very tenuous. Do we have the interest rates modeled right? And is the relationship between lapses and interest rates correct? It makes you wonder if we can even have 70% confidence in our assumptions.

The first time, we ran 200 scenarios for only a 10-year test. It took 62 hours. We literally started the program on a Friday afternoon, and it didn't finish running until Monday. We now think we can run that same test in 24 hours but think we should look at a 20-year test instead of a 10-year test.

The problem is that we have 1,400 assets in our asset base. We used to have only 400 assets in the model but found that the interest rate ranges on coupons in the model were too broad to study the call protection on our assets. We have a very simple program on the mainframe which groups our assets into cells based on type of asset, quality, maturity year and interest rate category. It then downloads these assets to a PC for our interest rate trials. This downloading process proved to be quite a tricky problem. It was actually the first download program that our company had written, so we had first to learn how to do it. Then we found we had to update the downloading program when the software package changed, and the whole process took about six months.

This question of run time versus accuracy in the asset model brings up one of the most important modeling problems that we have to face. We have to choose between accuracy versus speed and complexity versus flexibility. At one extreme, we could download the entire asset portfolio on a seriatim basis, but the asset model would be so complex that we could not effectively study anything about the portfolio. On the other hand, we could run a model with only 10 assets with the flexibility to test about anything we wanted, but then we could not have confidence in the accuracy of the results.

Another minor modeling problem that we have had is to more appropriately reflect a lag in withdrawal rates caused by increasing interest rates. Our studies of past experience have indicated that increased withdrawals are delayed by as much as four to six months after an increase in interest rates. The lag time is a function of both the severity of the increase and the number of increases that have occurred in the past. As you can imagine, this is a very difficult parameter to model, but we are investigating ways to study this problem.

## PANEL DISCUSSION

Now, here is something for you to consider that really is far out in outer space. Consider the fact that even though the model we actuaries design may be extremely complex, it is still only a model of linearly connected functions. Therefore, we have missed out on anything that might be discontinuous or nonlinear. I have been reading some books lately about the "theory of chaos." The message in these studies is that if we ignore nonlinear and discontinuous functions, we may be missing the most important observations of all. There are models now for projections in trends in weather and for biological systems that are using the mathematics of chaos to make their models more robust. Maybe that is where we valuation actuaries will be headed in the next decade or the next century with models to project solvency.

Let me shift gears now and discuss some of the benefits of having all these new tools to analyze the C-3 risk. Namely, that we have been able to test new ways to hedge or manage the risk. We are now investigating a concept at AUL that has shown some promise in the testing that we have made so far.

As we have analyzed our experience in the period from 1981-1984, we along with many other companies have discovered that it is possible to finance the disintermediation risk by attracting new cash through new business by offering annuities at the prevailing interest rates. We are discovering that this method of financing the heavy cash flow of high withdrawals may be better than either borrowing from the banks or liquidating assets with the ensuing capital losses.

We have found that with our strategy we should avoid capital losses to protect our capital and surplus position. This is especially true because we use a "make-your-spread" strategy. As a side note, I should mention that we use a "make-your-spread" strategy combined with a new money crediting method which appears to be the optimal situation for AUL. There can be very high lapses in the increasing interest rate scenarios, and it is important to protect the capital position to be able to attract new customers when interest rates are high. I will return to this point later.

So I don't want to take capital losses, but borrowing from the banks can also be costly. However, the borrowing will subside if interest rates return to normal levels, and you might be able to manage your way out of the problem through appropriate crediting strategies in the future.

Keep in mind that there is no way to avoid risk in interest-sensitive products. The best that you can do is manage the risk to an optimal situation. The important point to keep in mind is that financing the C-3 risk by attracting new business may be the cheapest of several choices, none of which are very attractive. At first blush it does not make sense to sell more business when you are having problems, but it may be a cheaper alternative than taking capital losses or borrowing. You have to make four assumptions to make this strategy of financing the C-3 risk successful:

1. "Borrowing" at the rate you credit to new policyholders will be lower than borrowing from the banks at a short rate that is probably off an inverted yield curve.
2. Interest rates are cyclical and what goes up must come down. And when interest rates return to a normal level, you will have the opportunity to recover your interest rate spread.
3. The best alternative of all the choices is to maintain a stable base of customers by attracting new ones so that at least you have some opportunity to manage your way out of the problem. In other words, you will have the opportunity to make your expected margin over a long period of time. This implies that you will have to make more than your expected margin during the good times to make up for losses during the bad times.
4. You will have enough capital to attract new customers when interest rates are high.

The third and fourth assumptions are probably the most important points to emphasize. The key issue is that a way to hedge the risk is to maintain a large, diverse and stable fund for the customers in order to have the opportunity to spread the risk through the portfolio and successfully manage the product.

There could be some questions of equity raised by the purists with this approach. This strategy can call for some draconian changes in credited interest rates to the customer. However, when you are managing for survival, the question of equity takes a second priority. Is that fair, one might ask? My question in return, is it fair to let the fund go insolvent? The key issue with

## THE STATE OF THE ART FOR THE VALUATION ACTUARY

regard to fairness is to make sure that the risks inherent in the product are fully communicated to the customers. But that's another speech.

Of course, the downside of this strategy is the risk of getting the fund into a deeper hole and subjecting the firm to larger losses. That will happen if the rates never come down. However, if the rates stay high long enough to force losses in the portfolio, you are probably in serious difficulty no matter what you do. The appropriateness of the assumption that interest rates increase and do not return to normal levels in a reasonable period of time really questions whether we should be in this business at any level.

If we think that there is a high probability that interest rates are going to increase and stay at high levels, we should not sell any interest-sensitive products. The only way that we can rationalize the sale of interest-sensitive products as they are designed is to assume that interest rates have cycles around some normative rate.

This strategy may not be for everyone. You have to have enough capital to support the sale of new business required, and you have to have a large, diverse and stable fund which will not create any large and unusual outflows of cash that need to be capitalized. Our block of business has these properties so the strategy seems to work for us.

Another way to hedge the risk is to hedge the liability side of the balance sheet. Stan Tulin coined the phrase, "beaker theory," for this concept a few years ago. The basic idea is to offset the disintermediation risk of deferred annuities with the reinvestment risk on retired life annuities. In other words, a beaker of short duration liabilities when mixed with a beaker of long liabilities would produce a stable solution. Pete Deakins recently published some research on this idea in the December 1988 issue of the Financial Section's newsletter, *The Financial Reporter*. As far as I know, this is the first research done in this regard.

At AUL, we are beginning to study this concept as it applies to our block of business. The idea is to put the insurance company in the role of a "bookie" at Las Vegas who will hedge one side of a bet against the other side of the bet so that no matter what the outcome of the event, he takes his fee for making the bets without great exposure to a loss on either side of the outcome. It is possible to do that with the short duration deferred annuity liabilities against the long duration retired life annuities. The real question is, "What is the proper ratio of one kind of liability against the other to balance the bet?" Originally, I thought that this might be an easy problem to solve because the concept is so easy to describe. However, the technical problems of mixing the cash flows on these diverse liabilities has proved to be more difficult than I thought. I hope that the trend in the valuation actuary movement which currently seems to be headed toward segregation of all product types in reserve adequacy testing does not prevail. Even if we cannot prove the concept mathematically, it is inherently obvious that it is proper to mix diverse liabilities when testing the adequacy of reserves. Holding reserves that are adequate for each separate block of business could lead to substantial overreserving in the aggregate.

Now that brings me to the conclusion of my presentation. Donna Claire is the "guru" on Regulation 126. Based on my talk, I would like to leave with her four considerations to help make compliance with Regulation 126 more state of the art. Can we consider the following for "improvements" in Regulation 126:

1. What is the status of scenarios with randomly generated interest rates instead of deterministic scenarios? Do many companies use this alternative?
2. Can we avoid liquidating the entire portfolio at the end of 10 years? Maybe we should run our tests for 20 years or make some other provision at the end of 10 years which will avoid liquidation with large capital losses.
3. Can we allow the use of future premium in our projections? Maybe we could show the results both with and without new business.
4. What are the current restrictions on the combination of results on different blocks of business in making our opinion on adequacy of reserves?

## PANEL DISCUSSION

**MS. DONNA R. CLAIRE:** As Steve said, when putting together this panel, we thought that much of the last year probably was spent by the typical valuation actuary refining, rather than revolutionizing, what has been going on in the past few years. As ex-chair of the New York Regulation 126, which is still an evolving document, actuarial industry advisory group, I get a lot of questions from actuaries on valuation topics, and I thought it might be useful to go over some of the more common questions.

First, let me address Steve's questions, which have also been asked by others. I represent myself in these answers, not necessarily the New York State Insurance Department or my company, so my answers are certainly not the last word on any of these subjects.

### SCENARIO TESTING

With regard to scenario testing, there are some people in the New York Insurance Department, although it is not unanimous, who support stochastic scenario testing. The problem with it, looking from a regulator's viewpoint, is that we actuaries have not yet agreed to what form stochastic testing should take, so it would be hard to judge reserve sufficiency when given just stochastic results. My own prejudice is still for deterministic scenarios, but more than the so-called New York 7; I like to see where the interest rates are giving us the most trouble so I can judge whether any actions can be taken on the asset side to lessen any exposure.

I think the industry has to do more research for the stochastic modeling to become universally acceptable, but I know of at least one company that did submit its New York Regulation 126 tests using both deterministic and stochastic scenarios.

### PROJECTION PERIOD

The projection period to be used in testing has caused much controversy. The reason the period is 10 years for deferred annuities is that the Insurance Department was getting projection periods of all lengths used and it was hard to judge whether unrealistic results were being introduced with these periods.

My suggestion is that if you do get results that you don't feel are representative at the end of the 10 years, show both these results and the results you think are more realistic as an explanation as to why you feel extra reserves aren't needed.

### FUTURE PREMIUMS

With regard to future premiums, one actually can use renewal premiums in the testing, although they are not used in the determination of reserves. We do our base testing without renewal premiums, and sensitivity testing with renewal premiums.

A problem with new business being included is that it makes it harder for a regulator to judge the adequacy of current reserves. However, consideration of new business can certainly be included in reports the valuation actuary prepares for internal management.

### COMBINATION OF BUSINESSES

New York requires that each block of business be tested separately. This was another controversial provision. However, New York will allow the combining of the results to determine the overall adequacy of reserves.

In my own testing, as Peter Deakins concluded, the risks of a block of deferred annuities offset risks on longer products, which improved the overall results for testing the adequacy of reserves.

### SOURCES OF INFORMATION

The most common question I get is where information can be obtained. The first source of information would be the publications from the Canadian Institute of Actuaries and the Actuarial Standards Board (ASB). The CIA has been at it longer, and has published a number of relatively detailed guidelines. They are required reading for Canadian valuation actuaries. For those in the U.S., I would also recommend reading them. They are informative and they also serve as a resource when regulations or guidelines are written in the U.S.

The Actuarial Standards Board is a relatively new organization, but they have published several papers applicable to the valuation actuary. For U.S. actuaries these are not just recommended, but required reading, as not following them may result in exposure to legal actions. Two that are

## THE STATE OF THE ART FOR THE VALUATION ACTUARY

specifically applicable are those on cash flow techniques and reinsurance. The second has not yet been published in final form.

The *Valuation Actuary Handbook*, edited by my co-panelist, Steve Radcliffe, is still an excellent source of background information as is the publication of the *Proceedings of the Valuation Actuary Symposium*.

New York Regulation 126 is also a source of information. The regulation was written with the help of 20 or so industry actuaries who reflected the state of the art of the valuation actuary at the time it was written.

The *Financial Reporter*, the newsletter of the Financial Reporting section, publishes the most up-to-date findings regarding the art of valuation.

A sometimes overlooked source of data is the ACLI. It publishes an investment bulletin which provides industry data on such things as default rates on mortgages and information on policy surrenders.

### REGULATORY ACTIONS

Another question I am asked is what the regulators require with regard to certifying the sufficiency of reserves. Guideline 14 in the *Financial Examiners Handbook* gives any regulator or examiner the right to ask for cash flow testing if he or she feels it's necessary. The American Academy of Actuaries sponsored a seminar for regulators on the valuation actuary. Several regulators have asked certain companies for cash flow analyses, so it is not just in New York where you have to do the testing.

New York, as any of you who have filed under Regulation 126 know, is very serious about cash flow testing. It is not just supposed to be an academic exercise; the filings are carefully reviewed. If you get a letter from the Insurance Department questioning an assumption or asking for further tests, don't feel bad. Virtually every company, including the biggest New York companies, get similar letters.

The Tweedie Committee, also known as the Special Advisory Committee on the Valuation Actuary under the auspices of the NAIC, has developed recommendations for cash flow testing. These have been distributed in draft form to most actuaries, and that committee's report will be given to the NAIC next month. It may further strengthen the importance of the valuation actuary.

### CALLS AND PREPAYMENTS

Another popular question is: What call and prepayment assumptions should be used when testing the assets? This question has been asked so many times, that when New York Regulation 126 was revised, we put in a simple example of calls and prepayments assumptions that may be used. This has backfired a little on us. Now many companies are being asked to comply with the example. If a company has what it considers to be a better formula, that can be used, but be forewarned that justification may be asked for. It would be helpful if the research actuaries would publish a paper on the subject so other valuation actuaries would have something in writing to point to, to justify their assumptions.

### STRUCTURED SETTLEMENTS

Structured settlements, which are the settlement of court cases on liabilities, is a big business, with over \$2 billion issued last year. This is not an easy product for the valuation actuary to assure reserve adequacy. A number of people have asked me about the cash flow testing on this product and there is no unanimity on reserve adequacy levels. Three areas that take judgment on reserve adequacy are the lump sums on the products, the long payout period, and the treatment of substandard annuitants. Let me discuss each area.

The typical annuitant is 35 years old, with a relatively large policy. Lump sums, or excess payments made typically at the end of quinquennial years, are used as either "mad" money or as replacement of medical equipment needed. About 15% of the cases are issued on substandard lives.

This product was not being sold in large volume when the dynamic valuation law was developed, so the NAIC had to come up with a reasonable reserve method consistent with other products. The

## PANEL DISCUSSION

statutory minimum reserve rate is the single premium immediate annuity (SPIA) interest rate for most of the expected payout, but is a Type A (in New York) or Type B deferred annuity for excess lump sums? I don't think a conservative method is necessary for lump sums in the first 20 years, because these can be properly matched with assets which mature at the end of quinquennial years. However, the conservatism in the lump sums may be more than offset by what I think is a liberal assumption in the SPIA interest rate for the rest of the payout. This SPIA rate can probably be supported by the assets bought for 20 years or so, but assuming an SPIA rate of 9-13% is reasonable to discount payments expected to be made 40 years or more in the future may be excessive.

Steve mentioned the offsetting of one type of liability against another. This is probably a good candidate to offset against an interest-sensitive liability such as deferred annuities.

Another controversial issue is the treatment of substandard annuitants. This applies to all SPIAs, although the majority are issued as structured settlements. This again was an area that hadn't really been addressed in reserving. Table 1 shows the reserves for \$1 of monthly income for an annuitant aged 20 with a life expectancy of 20 years using the 1979-1981 U.S. Population Mortality and 8% interest.

TABLE 1  
STRUCTURED SETTLEMENT RESERVES FOR SUBSTANDARD ANNUITANTS

Example: True Age 20  
Life Expectancy 20 Years, 8% Interest

<u>Life Annuity</u>	<u>True Age Mortality</u>	<u>Rated Up in Age to 60</u>	<u>True Age Plus 43 Deaths Per 1,000</u>	<u>True Age Plus 83 Deaths per 1,000 in years 1-10 Grading to Standard in Year 20</u>
At Issue	150	109	97	81
10 Years	146	87	96	114
20 Years	139	62	94	139
 <u>Life 20-Year Certain</u>				
At Issue	151	129	130	131
10 Years	147	101	111	130
20 Years	139	62	94	139

As you can see there are major differences depending on the assumption used for future mortality. Most companies were reserving for substandard annuities using the rated-up-in-age-basis which produces low reserves in future years. This is good if the underlying reason for the substandard rating was expected to cause this pattern of mortality. However, there is some work which shows that with certain causes of substandard ratings, such as paraplegia, the mortality of the survivors approached normal mortality after some years. Therefore, Mr. Callahan put into New York Regulation 126 that substandard reserves must grade into standard reserves after 20 years for annuities. He suggested this be adopted by the NAIC. There was strong industry sentiment recently against it. An industry group spearheaded by Steve Smith of First Colony Life came up with a compromise measure, which is the "constant extra deaths basis." This is expected to be approved by the NAIC in June.

The person responsible for the adequacy of the reserves is the valuation actuary. If your company does not have many substandard contracts the statutory assumption of constant extra death is probably reasonable. However, if your company is a large substandard annuity writer, you may want to check the underlying causes of the substandard ratings to determine if the constant extra deaths type of reserve is adequate.



## THE STATE OF THE ART FOR THE VALUATION ACTUARY

### REINSURANCE

Another area valuation actuaries have questions on is reinsurance, because there are not clear-cut answers to the treatment of reinsurance when determining reserve adequacy. My basic response is to look through the reinsurance agreement to determine the effect on cash flows and therefore reserve adequacy using the actual wording in the agreement. The ASB publication on this is only 4 pages long, but it may have a tremendous impact on the work of the valuation actuary. Therefore, I strongly recommend valuation actuaries read this. As a sidelight, Amendment 5 of Regulation 20 in New York requires mirror reserving for accredited, but not licensed and some unauthorized, reinsurers dealing with New York licensed companies. This will also affect the valuation actuary's work.

Surplus relief reinsurance is designed for the ceding company to hold lower reserves as a statutory *minimum*. The operative word here is *minimum*. The valuation actuary is still responsible for assuming the adequacy of the remaining reserves held. If the valuation actuary can prove that these reserves are adequate then all is fine. If the reserve may not be sufficient it is the valuation actuary's responsibility to look at the reinsurance agreement and determine if it provides adequate coverage if the ceding companies' reserves are not sufficient. Sometimes the reinsurance agreement is structured in such a way as to make it very difficult to get money from the issuing reinsurer. If so, the valuation actuary may have to put up additional reserves.

Another interesting case is coinsurance. We saw one deal where the assuming company proposed buying a block of SPIA liabilities for a fair price of the present value of liability cash flows under reasonable assumptions plus \$25 million. On the surface, it was a good deal. However, the market value of the assets backing the deal was \$20 million under water. In addition, the assuming company was not paying an expenses allowance and present value of expenses for the product was \$15 million. The treatment of the expenses as a statutory reserve is a gray area. However, the ASB recommendation states that the actuary should review all material potential cash flows under the agreement, which implies expenses must be considered. New York Regulation 126 more explicitly states that expenses must be considered in doing cash flow testing. Because of these factors, the deal did not go through.

I strongly recommend that the valuation actuary be involved with potential reinsurance transactions before they are consummated, so that the company is not placed in the position of paying for reinsurance, but *not* having it treated as expected on the statutory annual statement.

### ROLE OF VALUATION ACTUARY

The role of the valuation actuary is becoming more important, but it is still developing in most companies. One area where a valuation actuary can be important is pricing. The valuation actuary can point out potential pitfalls in a product before it's issued and can wind up having unexpected statutory effects, perhaps reducing the surplus of a company.

Another area where the valuation actuary may be of help is in asset allocation, where cash flow testing can point out which asset strategies are better and what the potential surplus strain is if the economy changes.

A third area where the valuation actuary can be useful is in the determination of interest crediting strategies. Cash flow testing can show the "pros and cons" of, for example, a strategy of crediting rates based on portfolio earnings versus crediting a market rate. If the strategy the company is following can have substantial volatility risk, the valuation actuary must set up appropriate reserves.

### LEGAL AND MORAL ISSUES

My last topic is the legal and moral effects of being a valuation actuary. One thing is certain in this litigious society, some valuation actuaries are probably going to be sued if a company gets into trouble. It is recommended that if the company carries officers' liability insurance, the valuation actuary check to see if his performance of the job will be covered. My company specifically carries liability insurance on the qualified actuary.

There is still a lot unclear in this area. It is easier to be moralistic from a distance. In actuality, some issues can be harder to judge. For example, someone told me his boss said that if this person insisted on putting up the extra reserves, the company would not be able to pay bonus checks to the employees. There's not a clear-cut need for the reserves; the reserves are adequate in the

## PANEL DISCUSSION

current interest rate environment, but are they inadequate if interest rates decrease?" My answer is to put up what you feel are adequate reserves in order to sign the statement and quickly prepare a resume.

A consultant had a case where he did not feel the reserves were adequate, but the client company refused to put up additional reserves. He refused to sign the opinion. The question was, though, did he have an obligation to report to the Regulator that he felt the reserve the company was holding was inadequate? My answer was, "Good question."

The regulators are having similar problems. There was one case where a regulator wanted to have an actuary censured by the Academy, but it couldn't be tried because no standards had yet been set by the Academy on the specifics of cash flow testing which a valuation actuary must do.

Clearly, the valuation actuary has come a long way, but there is still a long way to go.

**MR. C. LORNE CAMPBELL:** I intend to introduce the American visitors to a few of the topical aspects of life insurance valuation in Canada. Hopefully the Canadian actuaries present will allow me some time to acclimatize our guests. In addition I will be discussing in detail a developing automated valuation system.

First I have a critical question. Is life insurance valuation art or science? Valuation actuaries over the years have enjoyed using significant elements of discretion to create schedules of liabilities consistent with their subjective feel for the health and future direction of their companies. I have spoken to, or heard speak, senior actuaries who resist almost any diminution of their discretion. Clearly there is strong smell of art in this traditional approach.

I am not entirely of this school. You will recollect the Ruskin quotation, "The work of science is to substitute facts for appearances and demonstrations for impressions!" I believe that the "facts" for the modern valuation actuary are the prospective formulae for estimation of future benefit costs and premium flows and the demonstrations can now be carried out on a seriatim basis by available high-speed computers. There will always be an acceptable range of results due to the inevitably subjective process of building valuation assumptions. However, actuaries should aim to be able to agree fairly closely on a bottom end for the range, so that a consistent adequate job is being done to protect policyholder interest. Of course the science of valuation must also be flexible enough to react quickly to significant new information.

I believe that this stated position is consistent with the CIA Recommendations on Financial Reporting.

### CANADIAN ENVIRONMENT

At least for the benefit of the Americans present, I will give a brief introduction to the regulatory environment in Canada. The Canadian and British Insurance Companies Act requires life insurers operating in Canada to submit a valuation report annually, signed by a valuation actuary, who must be a member of the CIA. The Act specifies the so-called "1978 Canadian Method." In summary this method is a prospective valuation which requires detailed projection and discounting of all future cash flows including expenses associated with the policy under consideration. At present the valuation premium is a theoretical net premium and allows for amortization of a limited amount of acquisition expense starting in the second year. However the net valuation premium can never exceed the gross premium. It appears likely that moving to GAAP will cause this method to be changed to a pure gross premium valuation (known as the policy premium method (PPM) in Canada). Under this method the valuation premium is always the gross premium, and therefore explicit amortization of acquisition expenses (limited or otherwise) becomes irrelevant. Since the PPM is easier to visualize, even by this accomplished audience, we will not consider its more artificial predecessor, in detail.

Note that negative reserves, generally reflecting deferrable acquisition expenses are possible and acceptable. However, on the balance sheet, surplus must be appropriated to the extent of any negative reserves.

Either variant is vastly different from traditional reserve systems such as the Commissioners Reserve Valuation Method (CRVM) which consider only interest and mortality. CRVM, for example, ignores future discretionary benefits such as excess interest or dividends; it ignores the

## THE STATE OF THE ART FOR THE VALUATION ACTUARY

future cost of administering in-force policies, and most importantly, it generally ignores the possibility that the product was deficiently priced (an all too common situation in recent years).

But the Canadian method goes one stage further. The valuation actuary is required to certify the adequacy of the total reserves. This has been deemed to require specific "provisions for adverse deviation" in valuation assumptions. In the current competitive climate the package of valuation assumptions will generally be poorer than pricing assumptions. Therefore substantial deficiency reserves may be required for new business even though the pricing actuary has done a competent job. With fully guaranteed products, which unfortunately are common in Canada, the deficiency reserves can be and should be alarmingly high. This is an inevitable result of the thesis that significant adverse deviation becomes more likely with the passage of time, and therefore long duration guarantees, for example of term rates, may be imprudent.

The Canadian method as defined in the Act is somewhat vague. For example there could be various interpretations about how to deal with such problems as universal life, adjustable premium products and reinsurance transactions. To correct this deficiency the CIA has been working to produce exhaustive recommendations for Life Insurance Company Valuation Reporting. These recommendations include a variety of technique papers of which more will be said. The recommendations have the tacit approval of the Office of the Superintendent of Financial Institutions (OSFI) which oversees the Act. Also the recommendations are effectively binding on members of the CIA and hence on Canadian valuation actuaries.

### PPM AND SOLVENCY STANDARDS

I mentioned that a move to GAAP was causing redefinition of the Canadian method. Under the proposed PPM, valuation premiums will always be greater than or equal to their net valuation premium predecessors. Therefore without either an increase in the conservatism of assumptions or some change in the definition of future policy costs, statutory reserves will be reduced by the move to GAAP. In effect the present value, according to valuation assumptions, of expected future profits will be removed from total reserves.

The potential weakening of reserves should be of great concern to valuation actuaries and is of great concern to the Office of the Superintendent. In fact OSFI does not intend to approve the PPM until it can be demonstrated that a company's solvency will be reviewed with regard to the potential for surplus evaporating in the foreseeable future. Development of required solvency standards is one of the thorniest financial reporting problems currently being addressed by the CIA. Standards have not been finalized and published, but there will be a requirement to test solvency not only currently but also to project the balance sheet for several years with emphasis on adverse scenario testing. I don't have time to develop these ideas except to suggest that the scenario testing must either involve rough models and low credibility of results, complex models and massive expenditure of effort or (my preferred approach) use of a sophisticated seriatim flexible valuation system. The last approach requires substantial one-time development costs with some ongoing outlays. But once the system is running reasonably well, its usefulness and presumably cost justification can't be overstated. Measuring and managing C-3 risk will have to be part of the solvency testing process. But I'm afraid we don't have any easy answers to this problem here in Canada either.

### PRACTICAL RESERVING TECHNIQUES

Now I wish to run through the various techniques currently defined by the CIA valuation technique papers. Much of what I will mention refers to C-2 risk management. This is an area where I believe the Canadians are ahead of our neighbors.

Canadian product design is not hampered by the stricture of anything resembling the Standard Nonforfeiture Law. As in the United States, lapsation on high early cash value products and even more so on renewable term has caused significant loss of unamortized acquisition costs in recent years. Sales of products with little or no cash values or paid-up values is an obvious development. Since a lapse releases a reserve at no cost to the insurer, a competitive set of pricing assumptions includes high ultimate lapse rates. Pricing actuaries have the right to presume that individuals will not all behave rationally and, therefore will lapse their policies, logic notwithstanding. Valuation actuaries don't have this luxury and will not be allowed this luxury unless credible corroborating experience emerges, which could be many years in the future or never.

## PANEL DISCUSSION

Thus the basic recommendation for lapse-supported products is very simple. An extremely low ultimate valuation lapse assumption must be used. Furthermore, some products suddenly develop substantial values at a long duration or "cliff." In these situations it must be assumed for valuation that there will be no lapse activity for a period prior to the "cliff."

The result of this technique is to directly produce substantial deficiency reserves at policy issue and should indirectly be to require the pricing actuary to resist the competition-driven temptation to offer ridiculously low premiums dependent on future irrational behavior of policyholders. Relying on policyholders selecting against themselves is a novel form of imprudence. Note that prevalence of low cash value or zero cash value products, in Canada, reduces the importance of C-3 risk. This may not be wise and may be short lived.

The next technique, of far more immediate interest to American visitors, concerns the valuation of renewable term insurance. The prospective method above must be applied to renewable term insurance, whether or not renewability is annual or less frequent. The usual concepts apply so that the reserve must allow for projected future mortality costs and expense costs and consider any potential premium deficiency. Of course term rates tend to be deficient at longer durations because ultimate mortality rates are unsalable.

This process need not produce a reserve significantly different from the traditional unearned premium reserve, even with a valuation mortality assumption modestly in excess of pricing mortality. But Canadian valuation actuaries must also explicitly consider antiselection. Formulae have been developed which equate tabular "select plus" and ultimate mortality to a combination of select mortality on reentrants and deteriorated mortality on persisters. The formulae include parameters which can't be established empirically, therefore requiring guestimates, and can be adjusted to allow for products with reentry provisions as well as for products merely with guaranteed step-rate premiums. A typical scenario for a standard five-year renewable product might be to predict mortality at 100% of an experience table for the first five policy years, then 105% for the next five years, then 112% for the next five years, then 120% for the next five years, and so on.

An insurer would likely suffer significant losses if a group with deteriorated mortality eventually exhibits unusually high persistency. Therefore renewable term valuation assumptions ought to consider a basic provision for adverse deviations, a special provision for mortality antiselection and some kind of declining lapse assumption.

The result on any product with reasonably competitive premium rates will be initial reserves which are a multiple of unearned premium reserves (UPRs), which can then increase fairly rapidly. The premium will be highly deficient according to valuation assumptions, and there will be no deferrable acquisition expenses. This adds up to substantial surplus strain causing either upward pressure on premium rates or putting a brake on sales. With the term insurance market having been suicidal in recent years, this is no bad result?

The next issue is the future cash flow investment assumption and development of ultimate valuation interest rate. The CIA Recommendation is a little complex and arbitrary but generally dictates that the valuation interest rate should be no higher than 4.5% after 20 years. Also any current reinvestment rate should be consistent with currently available yields less adjustment for adverse deviations and expenses. Finally the assumed reinvestment rate should progress from current to ultimate no more favorably than linearly. The actual valuation interest assumption requires more complex derivation which could include a variety of matching techniques. But for most annual premium life insurance, the result will be a fairly rapidly declining progression of rates.

This is an obvious conservative approach. The valuation actuary can't and shouldn't rely on the recent past being indicative of the future. As usual, the result is to add weight to possible long-duration premium deficiencies and to tend to increase reserve. A typical valuation interest assumption might be 10% declining linearly to 5%, 10 years after the valuation date.

The next issue is the impact of reinsurance arrangements. It is appropriate and necessary to consider future cash flows to and from the reinsurer rather than presume that coinsurance is a neutral arrangement or that the ceding company can deduct a UPR for YRT reinsurance. There are several contradictory effects. First the reinsurer will tend to expect a profit. This profit is a

## THE STATE OF THE ART FOR THE VALUATION ACTUARY

cost to the ceding company and should generate a reserve. However under valuation assumptions the reinsurance might appear to be profitable to the ceding company and no additional reserve would be required but in no event should a reserve less than zero be held on the ceded business. Another possibility, most easily visualized with a coinsurance situation, is that an inadequate first year coinsurance allowance is offset by excessive renewal allowances. Under pricing assumptions the arrangement is profitable to the reinsurer, but after the first year, the allowances exceed the costs and the ceding company faces inevitable profit.

The CIA Recommendations appear to me to allow the valuation actuary to capitalize the expected renewal coinsurance profits in a reserve offset but so far this is conjecture on my part.

Remaining CIA Recommendations include discussion of credibility weightings for internal company mortality experience. Not surprisingly instant credibility should be given to prolonged adverse experience. But the credibility given to positive experience varies according to the size of the exposure, with the credibility factor increasing only slowly. Rather arbitrary formulae have also been developed to suggest a range for provision for mortality deviation.

Recommendations have been developed for some of the new wave plans such as adjustable premium products and universal life. No doubt more ideas are on the way. Canadian actuaries are just now trying to digest all of this material. There is a potential for theory and practicality being the irresistible force meeting the immovable object. That is, apparently prudent valuation may tend to preclude new sales for all but the richest of companies. However, developing methods to oblige confrontation of unpleasant realities is clearly overdue. Steve mentioned that over-reserving might be the result of considering small blocks separately. There is no doubt in my mind that the Canadian approaches as described may produce a conservative overreaction. This is unfortunate, but might it be preferable to underreaction?

I hope the Americans now feel totally acclimatized.

### SERIATIM VALUATION SYSTEM

A couple of years ago, I was offered a large ongoing consulting assignment by a medium-sized Canadian insurer. The project was loosely defined as cleaning up life valuation. At that time the company used a factor look-up system which suffered three cumulatively prohibitive drawbacks. It was very difficult to either check the accuracy of stored factors or to recalculate and change factors or to calculate and load new factors for new plans. A perfect example would be the inability to react to a new mandatory definition of maximum tax reserves, without recalculation of millions of factors or possibly resorting to inefficient estimation.

Obviously an automated "first principles" system was the answer and as a consultant I had no choice but to forge ahead. Unfortunately the in-house data processing (DP) department reacted with horror to my first cut of specs and formulae. Sounds familiar?

Management unravelled this Gordian knot by hiring another consultant -- this time a programmer-analyst. His feasibility analysis took about five minutes and you can guess his findings. We set about solving the problem by simplifying it to consideration only of 50,000 term records. Within 3-4 months we had a working, if inelegant, term insurance valuation system. Probably cleaning up the database was as time-consuming as the analysis and programming. One of the fringe benefits of the system is that its edit step identifies a multiplicity of data inadequacies. The fact that the data processing (DP) consultant has some basic mathematics and statistics in his education plus life insurance experience, was very important. We could talk turkey and occasionally he would be able to spontaneously provide enhancements.

The next steps were to build on the basic framework. First cash values and surrenders had to be considered, then dividend and endowment payments. We added special logic for riders and unusual child benefit plans. Formulae for tax reserves, for pricing basis "asset-share-type" reserves, for cash value deficiency reserves, for extra premium reserves and for reinsurance reserves were added. We didn't have a typical DP plan with deliverables, schedules, sign-offs and the like. We merely solved problems and moved on.

Today the system values 100,000 records in approximately 14 elapsed hours running overnight. However, the system is written in COBOL on a fairly antiquated PRIME 6350 4 MIPS machine with a PRIMOS operating system. We expect run time to be cut in half when a conversion to an

## PANEL DISCUSSION

IBM 4381 Model 12 is complete. This machine has an MVS/XA with CICS operating system using VSAM data sets. Double Dutch to me! If critical parts of the system were optimized probably in FORTRAN, run time might be 5 hours or less. I seem to remember an initial estimate of 30-50 hours of run time.

The system has "first principles" logic. Commutation functions would be hopelessly difficult to use. If you can imagine APL instructions being laboriously reprogrammed into voluminous COBOL code, then you're getting the picture. The system works alongside and gathers data from a CAPSCO CAPSIL insurance administration package. First extract data are removed from the main policy service file and a consistency and data availability edit takes place. The record is defined using premium and face amount data, issue date, expiry date, premium period, age, sex, smoking status, type of insurance and plan codes. As mentioned, unusual plan codes have special hard-coded logic. Codes indicate whether the premiums are guaranteed or adjustable and whether premiums are level or not.

Based on some subset of this extract data, valuation assumptions varying by type of valuation run are defined. Then the system builds basic assumption tables. First discount tables of "v to the power t" are built with almost complete flexibility in interest rate patterns. Then lapse rates are identified and a table of basic mortality rates is selected. Smoking factors are applied and provision for adverse deviation antiselection if appropriate and AIDS are added. Expense tables are built and can include an inflation factor in renewal expenses. A table of face amounts and cash values and dividends are extracted from CAPSIL tables.

The main reserve crunching now begins. Present values of annuities and insurances are worked out by laborious additive formulae. Adjustment for immediate payment of claim is optional. Present values of surrender costs, dividend costs, maturities and expenses are all considered. Terminal reserves are then computed using standard prospective formulae. Finally interpolation occurs and UPRs are added to produce a final result. Reinsurance data are saved for further analysis. A ream of results are sent to print modules.

The system is far from complete. Accurate provision for future federal taxes is a problem. Reinsurance cash flows are not handled properly; this should be an easy fix. More importantly the system provides only current cash value and account value data for universal life or similar products. This will be harder to deal with because the system will require a cash value projection capability. However my experience suggests that any in-force business of several hundred thousand records or less can be valued by this type of system and with a great deal of flexibility in selection of assumptions.

The last point deserves underlining. Experience occasionally demands that a partial or complete overhaul of valuation assumptions is appropriate. Stochastic testing is very useful, but it requires numerous tests, excellent judgement and/or good luck to estimate the overall effect of a change of basis, especially on a large block of term insurance where reserves are highly volatile. With a scriatim system, the valuation actuary can review accurate effects of several complicated changes in valuation basis, within a couple of weeks. Surely selection of the ideal valuation basis is made easier with this scientific approach.

### MODELING AND FORECASTING

Use of the system for modeling and forecasting has been limited as yet. Certainly the system will accurately calculate reserves at any future valuation date for an input in-force file. We still need to construct persistency factors within the system which would randomly determine which policies would terminate prior to the future valuation date. This seems straightforward. The system would generate both remaining in-force reserve data and benefit payment data. The last piece of the puzzle would be a new business model, which could be PC-backed and a by-product of pricing.

MR. SIBIGTROT: I'd like to talk about a relatively new innovation; it's called bank surplus financing. It relates to implications that will affect the valuation actuary. You may recall some years ago when Monarch was involved in a transaction covering a variable life insurance portfolio to cover a liquidity problem within the general account. That is to say that the other expenses which were required to sell the contract had to come out of the general corpus of the company; they could not be charged to a separate account which had to be funded at full value. More recently, banks have embarked on other transactions that relate to financing of nonadmitted assets, and I would like to address an area that relates to financing of premiums.

## THE STATE OF THE ART FOR THE VALUATION ACTUARY

Now in this situation you have a product line where the company is using the revenue cash flow from gross premiums to support a loan which will be treated as surplus for "blue book" purposes but as a loan for tax purposes. In this situation the company is taking perhaps 20% of premium and using that amount to offset the amortization of principle. Interest would be paid out of the general corporate funds because that is a current accrual and not a significant matter from the standpoint of collateralizing the loan. These contracts are generally issued by either commercial or investment banks. The issue is that the claim is being made in some cases because the valuation of that premium remains unaffected. That is to say the bank is in no way assigning the portion of the premium that relates to what is required to build the reserves and that this should be a nonissue for valuation purposes. The concern with this approach, however, relates to what would come out of 126 valuations where, if you are using a gross premium approach in valuing this particular contract, you then have to find another way to pay for the ongoing acquisition and maintenance expenses that the company has. And the claim is that if the terminal fund doesn't provide adequately to move you into a positive surplus position under your interest scenarios, then this would require adding to your statement liabilities. The other area is that the bank often requires overcollateralization under the structured corporate financing arrangements which is to say it could take a bigger piece of the pie.

*The other area that is of some interest to me is the area of immediate annuity pricing. The current valuation standard for immediate annuities is the 1983 IAM Table (1983 Table a) which relates to experience going back to the mid-1970s. If you look at variable contracts, for example where you do not have significant investment spreads, the issue here is will the valuation standard provide adequacy in mortality pricing going forward? In many cases in order to get a sufficient, attractively priced product, you have to use a valuation standard which perhaps does not have very significant projections of annuitant mortality improvement. So the current level of the payment is such that it is competitive vis a vis nonparticipating contracts. On the other hand, if you expect that mortality improvements will occur in the future, the contract will throw off losses on a pricing basis if you project even on a static basis for some period of time. The 1983 valuation table has about a 10% margin which means that it is adequate under current improvement factors for about a seven-year period of time. That moves the table into 1989. But the issue is, as these contracts are being written today, mortality levels may be deficient by 10% or 15%, and this relates to the valuation issue as to how these mortality losses that are being thrown out in the future are going to be covered.*

The other issue relates to extensions of valuation standards with regard to products such as joint and last survivor contracts. The 1980 CSO Table grades into ultimate mortality at age 100. Under different patterns of joint and last survivor groupings you may have mortality levels that are required 30 or 40 years beyond that. And so a proposal is being worked out to lower the valuation mortality rates under the 1980 CSO Table to go out to some greater period of time so that mortality rates are still available for joint and last survivor contracts.

Tom Kabele will now talk about some of the other innovations with regard to bank surplus financing and term mortality structures.

MR. THOMAS G. KABELE: I am going to discuss whole life and term insurance, perhaps the two most common products sold by life insurance companies, and some technical problems with the reserves for those products. In particular, I am going to examine what I call the "double deferred acquisition cost (DAC) problem" and also the effect of select and ultimate mortality and lapse rates on reserves.

The current statutory reserve practices assume that lapse rates are zero, and that mortality follows an ultimate (or aggregate) table, rather than a select table. These practices are sometimes considered to be conservative and indeed on single premium insurance and extended term insurance do produce conservative reserves. Typically, statutory reserves are also based on level interest rates (this is especially true after the 1984 tax law was passed), although a graded interest rate reserve often used for GAAP accounting may be both more realistic and even more conservative. Typically, we use an ultimate (or aggregate) mortality table like the 1980 CSO Table, rather than select factors.

The current statutory reserve minimums are based on "zillmerized" or preliminary term reserves, in which the provision for deferred acquisition costs is subtracted from the net level reserve. The amount of DAC built into a whole life reserve can be quite sizable and could easily reach 80% of

PANEL DISCUSSION

the first year gross premium. On term insurance the deferred acquisition cost built into the reserve is not quite as obvious. In fact, it can be quite hidden and hard to find. The DAC can be thought of as the excess of the GAAP (net level) benefit reserve computed using select and ultimate mortality over the statutory mean reserve, which is typically "one half cx" computed using an aggregate or ultimate mortality table.

There has developed some controversy concerning the use of unitary reserve techniques. For example, the NAIC has recently put forth an exposure draft, which is currently being referred to as XXX, which deals with the unitary reserve problem for plans with "jumping" premiums. The effect on reserves of using improper ultimate mortality and zero lapse rates may be much greater, however, than the problem of using unitary reserves for "jumping" premium plans. In fact, the "jumping" premium problem might better be cured by using more realistic valuation assumptions than other fixes.

What is the effect of lapse and select mortality on reserves? For single premium policies or extended term policies the use of lapse rates will usually decrease reserves. For whole life policies, however, the use of lapse rates will usually increase reserves. If you think about it, this is a reasonable result, especially if the policy uses minimum cash values. The minimum cash values have a steeper slope than, say CRVM reserves, and a steeper slope in projected benefits means greater reserves. (In fact, if cash values are equal to the reserve computed using zero lapse rates, but otherwise the same assumptions, then lapse rates do not affect reserves.)

The use of a select and ultimate mortality table increases the slope of the projected benefits, which will generate a slight increase in whole life reserves but a large, dramatic increase in certain term insurance reserves.

The following tables illustrate the effect of lapse rates and select mortality rates, using two model plans. Table 2 shows the assumptions for a twenty-year term plan for a male aged 55. I assume the gross premiums follow the 1975-1980 Basic Male Ultimate Table, while I assume the actual mortality follows the select version of the same table. In the "GAAP" calculation I use lapse rates which I consider to be reasonable for term insurance. The assumed rate of interest is 4.5%.

TABLE 2  
20-YEAR TERM ASSUMPTIONS

Plan	20-Year Term, Male Aged 55
Gross Premium	1975-80 Male Ultimate
Mortality	1975-80 Male Select Ultimate (GAAP) 1975-80 Male Ultimate (FPT)
Lapse	20% First Year, 15% Renewal (GAAP)
Expense	100% First Year, 20% Renewal (GAAP) \$3.25 First Year Only (FPT)
Interest	4.5%

Table 3 shows the results. For the ultimate table the terminal reserves are zero, but the reserves computed using the select-ultimate table reach almost \$30 a thousand, even when I built in a DAC based on the full preliminary term expensallowance. Even when I increased the first year expense allowance to 100% of gross premium, there was still a sizable net reserve (i.e., net of DAC). By duration 15 the net reserve was almost \$30 a thousand. In the final column I calculated a GAAP reserve, using what I considered to be a reasonable rate of lapse. The use of lapse rates did reduce the reserve in the early durations but the reserve by duration 15 was virtually the same (even a little bigger) than the reserve computed using a zero lapse rate. Many who have calculated GAAP reserves for increasing premium term plans have undoubtedly noticed similar results.



THE STATE OF THE ART FOR THE VALUATION ACTUARY

TABLE 3

20-YEAR TERM INSURANCE  
Increasing Premium

Duration	Ultimate FPT	SELECT MORTALITY & NO LAPSE				GAAP
		NL	DAC	FPT	MOD	
1	0	3.29	3.29	0.00	(2.74)	(4.30)
2	0	6.44	3.33	3.11	0.35	(2.43)
5	0	15.28	3.40	11.89	9.08	3.60
10	0	29.90	3.21	26.69	24.10	19.06
15	0	32.85	2.34	30.30	28.47	31.68
17	0	23.13	1.66	21.47	20.21	26.17
19	0	9.18	0.66	8.52	8.02	12.20
20	0	0.00	0.00	0.00	0.00	0.00
Net	6.96	5.49		5.60	7.00	6.34
Allow	0	0.00		3.25	100/20	100/20

Table 4 shows assumptions for a whole life plan which is really an endowment at age 100. Mortality is based on the 1975-1980 Select and Ultimate Table with lapse rates (for the GAAP calculation) of 20%, 15%, 10%, and then level 8%, which I consider to be fairly reasonable. The first year expense allowance is about \$23 and the assumed interest rate is 4.5%. (Interest above 4.5% might be paid out as excess interest or dividends, and the reserve for such payments would offset reductions in the benefit reserve calculated using a rate greater than 4.5%.)

TABLE 4

WHOLE LIFE ASSUMPTIONS

Plan	Endowment at 100
Mortality	1975-80 Select-Ultimate
Lapse	20,15,10, Level 8%
Expense	\$23.39 First Year Only
Interest	4.5%
Cash Values	4.5%, Minimum Formula, 1975-80 Select-Ultimate Mortality

Table 5 shows some of the results. Based on the ultimate version of the table, the first year reserve on the full preliminary term (or Commissioners') method is zero and then it builds up at duration 45 to \$1,000. When I use select and ultimate mortality the resulting full preliminary term reserves are substantially higher, in fact almost 10% higher at some durations. Using lapse rates and "minimum" cash values also increase the reserve.

TABLE 5

WHOLE LIFE -- MALE AGED 55

Duration	Ultimate FPT	SELECT MORTALITY			GAAP
		NL	DAC	FPT	
1	0.00	22.86	22.86	0.00	(0.55)
2	21.69	45.96	22.32	23.64	24.58
3	43.76	69.34	21.77	47.57	49.38
5	88.88	116.84	20.66	96.18	99.18
10	205.50	240.88	17.76	223.12	228.47
20	440.30	472.38	12.34	460.04	456.54
30	644.19	654.58	7.85	656.73	655.95
45	1,000.00	1,000.00	0.00	1,000.00	1,000.00
Net	28.26	24.17		25.74	25.32
Allow	21.30			23.39	23.39

## PANEL DISCUSSION

When I took the actuarial exams I believed that statutory reserves were supposed to be conservative, at least more conservative than GAAP. Such is not always the case, however.

### LEVEL COMMISSIONS

As shown above, a substantial provision for DAC or deferred acquisition costs are built into our statutory reserves, either explicitly as in whole life insurance, or implicitly (by using ultimate mortality) in term insurance. But commissions can be made level, and then reserves may be grossly inadequate.

Commissions can be made level in a number of different ways. One way is to just pay the agents a level commission. Certain agents may prefer level commissions especially if they are near retirement. Also a change in tax laws may induce companies to make commissions level, especially if the inside buildup is taxed. Casualty companies typically pay level commissions.

Commissions may also be made level using a bank finance technique or what I call the master agency approach. Under this approach, the agents may receive a \$100 first year commission from the master agency while the life company pays the master agency something like a level \$20 commission. The master agency may use GAAP accounting so that it sets up a deferred acquisition cost for the \$100. On a GAAP basis it is solvent, and if it needs cash to pay the agents, it may use a bank loan collateralized by the future \$20 renewal payments. The master agency could be an affiliated corporation or it could be a nonaffiliated corporation.

In effect, the life company now has level commissions but still holds full preliminary term (or CRVM) reserves on whole life policies, or a large implicit DAC on term policies. This practice is perhaps a cause for concern; it seems like there is a double bite in the apple, or a double DAC.

I believe we are going to have to separate the DAC from the reserve, just like it is done in GAAP accounting. We have real problems talking to many Washington lawyers, including the lawyers who deal in tax accounting. Many don't seem to understand that there is a DAC built into the statutory reserves, and some of the government people want us to defer the same costs twice.

Moreover, the amortization of DAC through the reserve mechanism is very long (up to 100 years for someone aged 0) and very slow (i.e., a deaccelerated method). A much fairer tax result would be to separate the DAC from the reserve and write it off over a reasonable period of time (maybe seven to ten years) with straight line amortization and with full write-off for policies which lapse. This suggestion is not unreasonable. Every other corporation depreciates acquisition costs, usually with an accelerated method and in a reasonable period of time, with full write-off for disposed-of property.

In order to make the new method consistent with the present full preliminary term method one might cap the actual DAC at say 80% of the first gross premium. For a company selling universal life in New York, paying an 86% first year commission and say a 6% average renewal, the 80% would be the maximum that should be deferred in any event. (New York commissions on regular whole life plans are typically capped at 96%, where 41% of the 96% is paid to the general agent as a so-called expense reimbursement allowance.) We should also require select-and-ultimate mortality and even lapse rates, except for policies with little underwriting, such as credit life or extended term, where ultimate mortality would be used. Using more understandable reserve methods may prevent an unfair and unwarranted tax penalty being imposed on life insurers.

After the seminar in Vancouver, the Supreme Court ruled that so-called ceding commissions on indemnity reinsurance of old established in-force blocks would have to be capitalized (like the regulations provide for certain assumption business). The Supreme Court stated in the case that it believed that, for direct business, new business acquisition costs of life companies are immediately deductible. While many life companies under the 1959 tax law did use net level reserves, or elected to use net level for tax purposes under the old 818(c)(2) election, companies amortized costs through the reserve mechanism, and the old 818(c)(2) regulations contained a "penalty" provision which tended to lock companies into a preliminary term method (i.e., the opening adjustment would be taxable when the reserve ran off, but never deductible when set up). Under the 1984 Act virtually all life companies amortize new business costs through the reserve mechanism.

Under the 1984 Act almost all life insurers amortize most, or all (or more than all) of their DAC through the reserve mechanism. A few voices, however, in discussing the alternative minimum

## THE STATE OF THE ART FOR THE VALUATION ACTUARY

tax, have suggested that DAC should be amortized at the direct writer's level, ignoring the reserve amortization.

The additional taxes, combined with inherently inadequate reserves, especially on term plans, could lead to insolvencies. It is, therefore, urgent that the life insurance industry adopt understandable, realistic, and conservative reserve methods.

**MR. LARRY WAYNE GULLEEN:** I have a question for Mr. Kabele. He mentioned the possibility of making level the commissions that an insurance carrier would pay by basically moving the strain onto the master agency. If it pushes the actual risk of lapsation off onto the master agency, why would it want to take on that risk or why would it be willing to when other companies don't force it to do that? Second, if an insurance carrier does not really push risk off, won't you be in jeopardy of coming under fire from industry watchdogs basically for surplus relief where you're not actually passing off risk?

**MR. KABELLE:** The deal I outlined I suppose actually did pass off risk. There was a very sizeable deal of that type that was done. I'm not exactly sure what the industry watchdogs will or will not say. The real problem is not with the master agency itself but with statutory reserves, and in effect the statutory reserve is a built-in DAC that in certain cases can be eliminated. What I think we need to do is change statutory reserve systems rather than go after master agencies.

**MR. VINCENT Y. Y. TSANG:** I have a question for Donna Claire. We worked on the New York 126 and bought a software system. When I finished running the system, I presented the result to our investment officer, and he disagreed with the numbers. He thought that the prepayment call and so forth is not what he believed it to be and that put me in a very difficult situation. I can't overrule him and he can overrule me. Is there any way we can convince him that the method in New York 126 is at least adequate?

**MS. CLAIRE:** I would love a research actuary to do more research on that. As I said, in our company I have the advantage of in effect being the investment side of the balance sheet. The thing is it was actually based on studies done by me and several other people in preparation for the Valuation Actuary Symposium of two years ago. Some later data have been published, I believe Morgan Stanley and Goldman Sachs have published material on prepayments of bonds and prepayments of mortgages which sort of actually go along with the examples shown. If they actually have better data, you can use their assumptions and see what the tests prove, but then you have to prove that the data are better and that they are based on facts as opposed to the investment officer's feeling.

**MR. SIBIGTROT:** I'd like to throw out a question to Steve and Lorne. Part of the development of these financial modeling systems require passing of detailed asset and liability information into the environment. As you define the issues toward developing a bridge system or some technique to move this information into the valuation system, what considerations do you come across?

**MR. RADCLIFFE:** We have developed a download program that feeds the model. Well, first of all there is a program on the mainframe that sorts all of our assets into the various sales for quality duration coupon rate. That program then feeds another program that downloads all of that information to our PCs, and our PCs are where we do all of our stochastic testing. We have had some problems making that download work. As a matter of fact, it was the first download that we did at our company. We finally got it to work and then our software company changed the software so we had to rewrite the download program. The whole process took about six months, but it now works and it will work all the way from completely seriatim, downloading every single asset we've got into the PC, to grouping all assets into one asset, loading that down to the PC, both bonds and mortgages. We don't have any of the other assets modeled, but we are thinking of extending that model so it will recover other assets as well. The real question that we're dealing with now is how to model those assets in an appropriate way. If you download the whole thing seriatim, it's so cumbersome you can't run a trial and if you group it into ten asset classes, you can run all the tests you want, but you don't have any accuracy because it doesn't predict anything on the asset side that's worth looking at.

**MR. CAMPBELL:** I'm quite familiar with asset and liability matching with respect to annuities. Unfortunately, I have not dealt with any asset liability matching with respect to portfolio insurance products, which is quite different. As far as discussion with computer techniques is

## PANEL DISCUSSION

concerned, I would observe two things. First of all, if it is at all possible to use a mainframe it's worthwhile because you get much greater speed than even on the most advanced PCs. Again, that may change, but that seems to be the situation right now. And second of all, if at all possible it is worthwhile to include someone on your technical team who is an expert on front-ends. My computer skills stopped improving some years ago before decent front-end software was available and I waste an incredible amount of time because I don't have a good front-end. I see what other systems have where you push a few buttons or you use a mouse or whatever. That's fantastically efficient and worthwhile if somebody can be found with those skills for any of that sort of work -- stochastic or seriatim.

**MR. ANDREW DAVID SMITH:** Ms. Claire, I was wondering if there is any chance for proposal where the NAIC or New York or whoever would require that, if you had an annuity payment which was 115% or more, larger than the previous annuity payment, or if the payments were more than 12 months apart, do you have to consider them, for tax purposes, as two separate annuities? My second question is for Mr. Campbell. I was curious if there was a structured settlement market to speak of in Canada.

**MR. CAMPBELL:** There is a small structured settlement market in Canada. It has possibly occurred because some of the main brokerage companies in the United States have decided to move across the border, but the tax situation is different here and litigation is far less common and it's not a big deal. But, there are annuities written for structured settlements. I have not heard of lump sums playing a significant part in benefit structures.

**MS. CLAIRE:** In the U.S. the volume of business written last year was probably a little bit over \$2 billion so it's a much bigger issue. In effect, with the NAIC people sort of separating the payments into what they consider an SPIA and the excess a lump sum, they are going along with the tax structure where it's sort of like two different contracts. I would say the tax treatment is going to remain, in effect, in the two different contracts.

**MR. BURTON D. JAY:** I have a question for Steve, who talked about financing the results of rapidly rising interest rates and the attendant high surrenders that occur during those periods by writing more new business. I'd like to clarify that a little bit. Obviously, if you can support the out cash flow of the surrenders by the additional cash flow from the large amounts of new business that you're writing, you don't have to sell your bonds at a loss. But, at the same time you deny yourself the opportunity to invest your new cash flow at the high interest rates that you have to pay your new customers, so you build in losses at least for a period of time there. The only thing I can think of is that you're writing enough new business at such a fast rate that the additional cash flow over and above the amount needed to avoid cashing in your bonds is so large that the replacement is not significant.

**MR. RADCLIFFE:** No, not quite. You do have losses. I think it was in 1983 AUL had a zero net cash flow even though we sold \$100 million of new business. Now, essentially we're borrowing from our old policyholders to pay the current interest rate, and you do have an interest rate loss based upon that borrowing. In other words, you've got these old 8% bonds that are now supporting a 14% interest rate that you've declared. The opportunity is when U.S. interest rates return to normal, and remember, I have to assume that there is some normal cycle, and that I will be able to manage the credited rate in such a way that I can get the spread in the long run. Now these are very important assumptions. The implication is that you make more than your spread in the good times and less than your spread during the bad times. As a matter of fact, I think that's kind of the cost of this option. And the problem is that we don't charge for the option. We don't make more for the spread during the good times to offset the problems we have during the bad times. That's the pricing problem.

**MR. WILLIAM A. KLING:** Mr. Radcliffe, first of all, have you considered a selective liquidation strategy in terms of your assets in case you're forced into a liquidation of assets? Do you just prorate the liquidation across all assets or do you select certain ones? And second of all, have you considered other trading strategies other than buy and hold?

**MR. RADCLIFFE:** Yes, we have done some refinancing of our portfolio at various times, none as large as Donna mentioned in the \$2 million range, but we have taken certain occasions to refinance our portfolio or restructure our portfolio for various reasons. One is to build up our call protection whenever we can. In terms of liquidating the portfolio, we have not yet had to do

## THE STATE OF THE ART FOR THE VALUATION ACTUARY

that. This would be up to the investment people to select the most opportune assets to liquidate and possibly at liquidation to take care of some of these other problems along the way in terms of restructuring. For instance, if we are too long, we can sell off enough to get us back in balance a little bit. But we have not yet had to do that. We have not liquidated any of our portfolio in any of the situations we've been in so far.

