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SELECTION OF SCENARIOS AND ASSUMPTIONS FOR VALUATION ACTUARY WORK

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- The Exposure Draft on Life Insurance Company Valuation Principles calls for scenario testing under assumptions. This session will explore the considerations entering into such assumptions, in particular:
  - -- Appropriateness of past trends in analyzing the future
  - -- Techniques for assuring that scenarios tested are self-consistent
  - -- Use of valuation scenarios in company management
  - -- How many scenarios and who should choose them?
  - -- How the external environment should be considered in developing scenarios to be tested
  - -- Effect of changes in the shape of the yield curve
  - -- New York Regulation 126 -- background and coping with requirements

MR. EDWARD P. MOHORIC: The purpose of this session is to discuss the selection of assumptions and explore testing of scenarios including coping with New York Regulation 126, which has been a topic for much discussion this year, and talk about the practical aspects about what being a valuation actuary means.

The first speaker is Reed Miller who is Director of Corporate Planning at Lincoln National. Reed is going to speak from the perspective of the valuation actuary, from the perspective of the corporate actuary, and on the use of scenarios, and correlate those uses with projections and assumptions and the role that the results are going to be applied to. Our second speaker will be Frank Cody who is Senior Vice President and Actuary at Presidential Life. He is going to focus

on New York Regulation 126 and the practical aspects of complying with the regulation, particularly as seen from a small company perspective. And our third speaker is Allan Brender. He is an Associate Professor at the University of Waterloo and he is going to give us the Canadian perspective where at least regulatory-wise, I think they are about 8 or 9 years ahead of the U.S. Allan will also share some of the perils and pitfalls actuaries have encountered up there, and talk about the applications of solvency testing and construction of scenarios for yield curves and interest rates.

MR. REED P. MILLER: My role in this issue is from a corporate rather than product line focus. I am director of Lincoln National's corporate planning department within the holding company. I also am one of several valuation actuaries designated by the Boards of Lincoln National Life and Lincoln National Pension Insurance Companies. With my company level focus, I am the designated coordinator for communication with regulators. Each of our major product areas has its own valuation actuary who is charged with the actual valuation effort. My discussion will be from this corporate actuarial perspective. I will attempt to address what I feel are multiple roles for the valuation actuary and the various assumptions associated with the valuation actuary work.

VALUATION ACTUARY ROLES

While the principal focus on this issue has been in the area of satisfying a statutory or regulatory need, I think the issue is much broader than that. This is really a management issue that deserves proactive attention rather than reactive. The work of the valuation actuary might be broken down into the following categories: (1) product development; (2) surplus needs management/risk quantification; (3) assistance in development of investment strategy; (4) liquidity or cash management; (5) internal communication; and (6) regulatory. The regulatory issue is listed last for a reason. If the valuation actuary focuses adequate attention on the first four, the effort needed to satisfy the regulators should fall out of what has already been done.

There is room in product development to test your pricing assumptions and profitability for their sensitivity to a dynamic and unknown future environment using multiscenario modeling. This is in contrast to what might be the more normal, single scenario pricing approach. Because current profit margins are sufficiently narrow, the valuation actuary "what if" modeling might provide

important insight into the impact on profit of possible adverse interest environments. You can specifically identify the interest environments which cause problems and plan accordingly. If you view this effort as a form of options pricing, you might get a better handle on the estimated cost to the company of the options being granted to policyholders. You can identify the various options being granted to the contractholder and those which the company has. By modeling a single option at a time, such as a book value cashout option under a single premium annuity contract, under multiple scenarios you can try to measure and compare the cost to the company of granting that option versus the price, if any, charged for the option. In too many cases, companies have granted such options without being adequately compensated for them. Modifications in product design aimed at reducing this cost may flow from the effort. At a minimum you will at least have a better picture of potential profit and loss volatility.

C-3 risk surplus quantification is another possible valuation actuary application. Trying to find the best way of doing this is something we are currently struggling with. We find our current measure to be inadequate and are trying to improve it. Our current measure takes into account a very simplistic view of both the assets and liabilities. Both sides of the equation need improvement. Our current thinking would have us use a large number of random multiscenario trials to provide a reasonable statistical base. We will then solve for the level of initial surplus needed so that the accumulated present value of statutory profits and losses, including capital gains and losses, will not go below zero. After ordering the results by the magnitude of required initial surplus, the decision will need to be made as to whether we need to satisfy 90, 95, or 99% of possible future scenario needs. This decision will be based to some extent on the comfort level of management.

The third and fourth categories are interrelated. The valuation actuary should be able to provide valuable input into the determination of the investment strategy which will maximize the risk/return relationship under a variety of interest scenarios. The phrase *risk/return relationship* normally refers to credit risk, but I am also using it to include the C-3 related risk.

The fifth role listed above relates to the need for effective communication of the findings in the first four. This is necessary if senior management is to make well-informed business decisions.

ASSUMPTIONS

All of the valuation actuary modeling efforts are heavily assumption driven and should never be looked to for firm answers, but rather as tools in making better management decisions. The process of setting assumptions may be as beneficial as the output of your modeling effort because it causes you to think through things that you might not otherwise address. Some of the many assumptions that the valuation actuary must make are as follows: (1) future interest scenarios; (2) likelihood of reaching various scenarios; (3) interest crediting strategy; (4) relationship between interest rate changes and lapses, withdrawals, and cessation of premiums; (5) new business or closed block; (6) investment strategy; (7) asset credit risk; and (8) asset calls related to interest rate changes.

The size and organization of each company will impact how and by whom these are addressed. The development of interest scenarios and the probabilities of movement from one to the other may differ depending on the use of them. For example, New York identifies seven scenarios which might be used to satisfy Regulation 126. These, however, are just suggested and not required for use. As it turns out, these are the scenarios which we and many others actually used. The scenarios used in the product development process may not be the same as those used in quantifying of surplus needs. Using the defined terms from earlier valuation actuary discussions, reasonable scenarios may be appropriate for product management while plausible scenarios may be appropriate for development of surplus needs. Where you draw the line is a matter of judgment. At Lincoln National, we have attempted to develop a consensus among our investment operation, product management, and senior corporate management as to the appropriate range and variation of scenarios as well as the probability of movement from one to another. At a minimum, we have asked for upper and lower limits. We have used the interest rate levels and patterns of the last twenty years as a tool to assist in this process but took the limits a few hundred basis points beyond this. In working with this process, it is interesting to see how people's perspectives change with time.

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Given the recent moderation in interest rates, our early tables of scenarios didn't even reflect rates as high as we experienced in the early 1980s. No one seems to feel comfortable with projecting interest scenarios but this is a necessary and important part of the assumption building process. The end result has been a set of thirty yield curves starting at 2-3% at the low end, and peaking at roughly 200 basis points higher than the 1981 experience. The random movement from one curve to another is driven by a probability grid. We also have the ability to specify specific scenarios.

Items 3, 4 and 5 are specific to each product area. Interest crediting strategy needs to be defined. In particular, is it based upon a portfolio earned rate less a spread, is it tied to a market rate, or is it a combination of the two? If tied to the earned rate, how flexible is the spread? Will the spread be allowed to go negative to stem cash outflows? If the crediting strategy is tied to the market rate, what limitations are there on following the market? Past practice is something to study in developing assumptions, but you really need to more specifically address how you think you will react in the future.

Heavily tied to the interest crediting strategy is the development of a lapse or withdrawal formula which tries to model the rate of liability cash-outs with changes in interest rates. Key elements of this are the relationship between the market and credited rate as well as any surrender charges present in the contract. Once the model is built, it is helpful to graphically depict the results. You need to generate a comfort level with the reasonableness of the rates of withdrawal and their variation with crediting strategy. Another thing we need to develop a comfort level with, especially where we are talking about required surplus levels, is that there is a relative level of consistency between product areas. Because we are using this modeling effort to assist us in allocating surplus and because product areas are charged with earning a return on surplus, the individuals involved want to create a level playing field.

Finally, as suggested in item #5, you need to decide whether to model a closed block of business or include new business. The latter is probably the best picture of reality for developing investment strategy and other business decisions related to an ongoing operation. A closed block may be most appropriate for surplus needs quantification and regulators.

The investment strategy should include an indication of the current strategy, anticipated changes in the strategy as the interest environment shifts, strategy as applied to existing assets, reinvestment strategy, etc. Included in these strategies are the type of security, the degree of marketability, the grade or credit risk, and the maturity structure. Unless you are dealing with segmented portfolios, you will also need to identify specific assets which support the products being modeled. While an investment strategy is a major input assumption into a valuation actuary modeling effort, it can also be the result of the effort as a result of the "what if" testing to maximize the risk return relationship. You can try to back into the investment strategy which maximizes profitability for a particular level of required surplus. You need to ask the question, does the profit from one strategy compensate for the extra risk related to another?

The last two assumptions listed, credit and call risk, should be driven by the investment professionals. Credit risk is tied directly to the types and grades of securities purchased as well as the investment underwriting capability of your investment managers. The risk of call as most of us have experienced over the last year or so should not be ignored. While this risk doesn't necessarily cause sudden hits to surplus, it will gradually bleed your profits over time.

One final consideration relates to the sum of the parts being greater or less than the needs of the total company. With the possibility of positive cash flows from one product area being available to offset the cash outflows of another, company level cash flow may be more than adequate. The result could be too much liquidity with a negative impact on profits. Also, excess surplus may be held which could be more effectively used elsewhere.

I haven't attempted to be too specific in stating what assumptions should be for any of the above. The process of going through the assumption setting is one that each valuation actuary needs to attack. One thing which I have discovered is that there is probably at least as much to learn from the assumption setting process as from the actual modeling of results because it forces you to think through situations before they become a problem rather than after.

MR. FRANCIS X. CODY: Before getting into some of the practical problems in complying with New York Regulation 126, we might look at the background leading up to publication of the regulation last year. When the Dynamic

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Valuation Law was passed in 1982, New York adopted a two-tiered valuation interest rate system for valuing annuities. In order to use the higher interest rates produced by the Dynamic system, as adopted in all other states, it was first necessary for the actuary to submit an opinion and memorandum which would be satisfactory to the department. If no actuarial opinion and memorandum (AOM) was submitted, or, if the AOM was unsatisfactory, the maximum allowable interest rate for valuing annuities was significantly less. For example, on 1982 issues of immediate annuities, the maximum interest rate with an AOM was 13 1/4% for all other states, whereas without an AOM it was only 10 1/2%. This two-tiered system was applied to all of the various categories and plan types stated in the Dynamic Valuation method.

The requirements for the AOM in 1982 were primitive as compared with what's found in Regulation 126 today. They did require cash flow, earned income, and statutory surplus projections, as well as an allocation of assets to the annuity product line being tested. While there was a requirement that various interest scenarios be tested, the scenarios were not spelled out nor was the duration of the projection specified.

The initial guidelines published by the Department were primarily geared to guaranteed investment contracts. In those days few deferred annuity companies submitted an AOM because, generally speaking, the only reserve item affected by the two-tiered system was the excess interest liability which might be too small to make it worthwhile. Many companies which only issued a few immediate annuities also concluded it was not worthwhile to submit an AOM.

In our own case, we decided to file an AOM even though the differences in reserve were not crucial. We wanted to keep in touch with developments in the Department and we also thought we might learn a few things.

We were very limited in those early days because the work was being done manually with a very small staff, and we did not have either a sophisticated asset portfolio management system nor the software to perform the specific scenario testing. We did manage to manually test 16 scenarios, however, but for a relatively short projection period.

In 1985, New York passed new legislation for the valuation of annuities. The new law practically mandated submission of an AOM since it established punitive reserves if no if no AOM, or an unsatisfactory AOM, was filed. I do mean punitive. The penalty is either an extra 15% or 20% of accumulated deferred annuity values depending on whether or not you pass the Macaulay duration tests.

An industry committee consisting at one time or another of 30 to 40 people was set up to work with the department in drafting specific language for Regulation 126 in order to implement the change in the law. There was a lot of give and take between the department and the industry in hammering out specific language for the regulation. The final regulation was published in December 1986 and was applicable to 1986 year-end valuation.

Despite the fact that we retained an outside consultant in July 1986 and started working on compliance at that time, it still proved very difficult to put it all together in time for submission with the 1986 year-end valuation. There were problems on both sides of the balance sheet but certainly the problems on the liability side were easier and certainly more understandable to an actuary. Deferred annuities proved to be rather simple. We were able to model a liability portfolio of close to a billion dollars of single and flexible premium annuities with a dozen or so valuation cells.

One minor problem which arose had to do with flexible annuities. Recently contracts have been issued providing for loan values in connection with 401(k) and tax sheltered annuity (TSA) plans. In those contracts the spread between loan interest charged and interest credited on account balances for the loan principal amount is usually fixed and at a lower spread than normal for this business. In our case, we felt the loan volume was too small to warrant an enhancement to the scenario programs.

Excess interest liabilities, as required by New York, were projected manually. We also manually projected the net cash flow ceded to reinsurances under deferred annuity modified coinsurance treaties.

There were more serious problems in valuing immediate annuities particularly since we are in the structured settlement business. In effect, the regulation

requires a separate cash flow projection of immediate annuity benefit payments, separately for each year of issue and for all types of immediate annuities combined. In all cases where expected benefit payments in a given year exceed the prior year by 10% or more, excess benefits must be removed from the regular valuation (which is being done at the higher of the two-tiered valuation rate) and valued separately at a lower interest rate, based on Plan Type B in the valuation law. In general, the benefits being pulled out of the regular valuation are so-called bullet benefits on structured settlement but a lot of trial and error is needed in order to produce a residual cash flow and a regular immediate annuity valuation which meets the 10% requirement. We have a lot more work to do on this problem. It would be nice to give a permanent tag to the valuation assumptions on each immediate annuity contract or portion thereof. Otherwise, it will be necessary to go through the trial and error process each valuation year with respect to all previous issues and that seems like an inordinate amount of work for this purpose.

Another side issue is that no matter what you do for New York on this, the federal tax reserves will be based throughout on the higher interest rates approved by all other states.

Let's turn to the asset side. First of all you have to get the investment department involved in all this early in the game. Sometimes it's difficult to get their attention since they may be primarily addicted to thoughts of making money rather than complying with complex state regulation. If you point out to them that if you don't get the required information from them on assets, you will have to set up penalty reserves that totally wipe out your surplus, then you may get their attention.

What you basically need on the asset side, of course, is a disk containing required data for all your investments. This sounds simple but it isn't. First, there's the usual problem of getting a disk from the investment software system which will be readable for the scenario testing software system. Second, the investment department may be unfamiliar with its own systems. They may well be going through an upgrading process and may have recently purchased new software.

In general, it seems that the investment department purchases software for their own uses on an "as is" basis; they don't usually try to put in enhancements to the system on their own. Therefore, what you get is whatever the investment software system thinks you should get and nothing more.

For example, the calculation of Macaulay duration is required under Regulation 126. It is since being phased out as being impractical to administer. In any case, the Department wanted the calculation done at the Moody's rate (9.23% I believe, last year). However, our investment system did the calculation for each bond at its own yield to maturity. It took quite a while to straighten this out.

There were other problems. For instance, on one of the early runs all bonds bought at a discount had their yields to maturity calculated incorrectly. Somehow yields were calculated using book values at time of purchase instead of as of the valuation date. This generated yield and forced us to throw out one whole set of projection runs and lose about three weeks time.

Another problem was deferred coupon bonds. In general, they are zero bonds for say five years at which time they start paying a rather high coupon until maturity. We were finally forced to enter data on these bonds manually giving a constant yield to maturity over the duration of the bond. This distorted the cash flow projection's inflating income in early years and vice versa, but the results seemed to be acceptable since the volume on these bonds was rather low. We're planning an enhancement to the scenario software this year to correct that situation.

Another major problem was getting call data entered wherever it was appropriate. When we started out only about half of the call data had been entered on the investment disk. As a result, the investment department had to go back, usually to prospectuses, to get exact call data and prices. This is a big job. Sometimes there are several call dates at differing prices which will give different yields to call. For purposes of scenario testing, we assumed that the premium at time of first call would be amortized uniformly over the remaining lifetime of the bond.

We relied on the investment department to establish an investment strategy applicable to net cash flow emerging in future years, and they also determined

the percentage to be held short term as well as the maturity distribution of the rest of the portfolio.

We have a significant volume of Government National Mortgage Association (GNMA) and Federal Home Loan Mortgage Corporation (FHLMC) securities and, of course, prepayment is the principal problem here. Our investment department worked directly with the scenario software outfit in devising a mechanical formula to estimate prepayment activity under various scenarios.

Another basic problem is the C-1 Risk of default. The regulation specifically requests that this risk be tested and suggests that, say 250 basis points be deducted from the yield, at least on so-called high-yield bonds. We tested for this by taking 200 basis points away from all bonds except government and short term and found the results to be satisfactory. As a matter of interest, we also tested a reduction of 115 basis points which was obtained from an article by Richard Sega *TSA* XXXVIII on the C-1 Risk. This seems to be an area where actual practice is getting ahead of theory. It appears that much theoretical work still needs to be done to arrive at a consensus on the proper level of risk premium to be carved out of the gross investment yield to cover the default risk.

This leads to the larger question of who is to evaluate the quality of the investments in a company's portfolio. Personally, I feel it should not be the actuary, and I'm not even sure that a statement on asset quality should be included in the actuary's certification. It's true that Regulation 126 allows him to rely on the investment people, and he can so state that in his certification. I think it would be better to have a separate statement from the investment officers regarding the quality of assets and perhaps stating what yield reduction is appropriate to test the effect of default on the projections. Of course, the actuary should be the one who puts the whole analysis together and monitors the calculation and results, but I think it should be permissible to submit a separate statement from the investment officer.

The New York regulation is in the process of being extended to cover single premium universal life, and it's just a matter of time before it applies to all interest-sensitive products. In addition, many other states, if not the NAIC itself, will probably adopt some form of this regulation in the near future. Thus

many more actuaries and many more companies, particularly small ones, will be involved with this in the future. I might add that the Regulation 126 is now extraterritorial and applies to all licensed N.Y. insurers. If it's headed your way, I recommend you get started early. That way you may have a chance to comply on time, and you'll surely learn a lot about your own business while doing it.

DR. ALLAN BRENDER: We are here to talk about the valuation actuary movement. I think most of you are motivated by what is going on in the United States and I will make particular reference to the final report of the Joint Committee on the Role of the Valuation Actuary that was published a couple of years ago. Actually, that same committee now has put out a new version of that final report with commentaries. I do not know if that has been widely circulated, but I happened to see a copy.

So why talk about Canada? We have had the valuation actuary idea in Canada for a number of years and if you are thinking about introducing it into the United States, it is a good idea to look at how somebody else has done it, even if you do not like what we have done; this old notion of compare and contrast makes a lot of good sense. It lets you see, by comparing what somebody else has done, what features you like and what features you don't like, and will help you in arriving at your own ideas. The second reason is that we have nine years of experience now with this idea and we are finally beginning to think about it and learn some lessons (and they are not all great lessons). There is a lot to be learned from the process and I think that is valuable.

As I have said, we are learning lessons. Four or five years ago if I or someone else had given this talk at this sort of meeting, all you would have heard is how great this whole concept of the valuation actuary is; isn't it nice now that people trust us, we have all this professional responsibility and freedom, we are doing things right, and nothing could be better? By and large I think people still believe a lot of that and remain completely committed to the idea of the valuation actuary. All the discussion and work that is going on now is aimed at improving how the job is done. So if I sing you sort of a sad song, remember it is not that we feel bad about the concepts, it is just that we are trying to work on them.

So what is the situation? Since 1978 the financial statement of every life insurance company in Canada has contained a certificate of the valuation actuary which certifies that reserves have been calculated using assumptions appropriate to both the policies that are being valued and the circumstances of the company. The usual language of "good and sufficient" is also in there but I think that most people concentrate on this notion of the assumptions being appropriate. Assumptions are made not only with respect to usual mortality and interest but in fact our reserving system is one which makes explicit use of lapse rates, expense rates, reinsurance allowances, etc., that take place in the contract. And you have to make assumptions for all of those things. There are absolutely no statutory minimum standards for what these assumptions will be. The choice of the assumptions is totally left up to the valuation actuary. This is rather difficult -- I mean there is no Commissioners Standard Ordinary (CSO) table sitting off in the background or Canadian Institute tables or anything like that which are referred to in any regulation. Of course, in the Federal Department of Insurance, the Superintendent of Insurance always reserves the right to disapprove the actuary's assumptions and put in place some of his own. But I also have to tell you the Superintendent of Insurance and all his top officials are actuaries, and they are inclined to put great trust in this certificate. They believe that if someone is saying that these are appropriate assumptions using their best professional judgment, that in fact as fellow actuaries, they have to really have a lot of misgivings before they are going to disallow or change somebody's assumptions. They are inclined to accept the certificate and the judgment.

One other fact that I have to tell you as background: our insurance law says that there is only one set of reserves in this world, at least as far as the public is concerned -- and whatever reserves are in your statutory statement, those are the only reserves you can publish. This means that if there were a notion of GAAP in Canada (which there is not now, although we are working towards it), GAAP reserves and statutory reserves would be the same reserves. This means that statutory reserves are not nearly the kind of reserves you are thinking about in the United States -- they are not that conservative. There has certainly been a move over the last number of years towards our reserves approaching a GAAP-type level; which means we then have to distinguish between a GAAP outlook and a solvency outlook. What we are essentially saying is "Let the reserves tend towards GAAP and let us provide for solvency some other

way." We have a notion of something called appropriated surplus -- the Joint Committee on the Role of the Valuation Actuary talks about designated surplus, though they talk about it as internally designated. We have actual appropriations of surplus in the statement and the idea now is that you will provide for solvency by some sort of appropriation whose calculation may not bear any relationship to the way the reserves are calculated at all.

When we are talking about assumptions, some confusion is created. Are we talking about conservative, solvency-type assumptions? Or, are we talking about GAAP assumptions? When the valuation actuary concept was introduced, you'll find that most actuaries after awhile developed their own levels of comfort as to what appropriate assumptions were, but there was some confusion because some people's level of comfort relates to solvency and some relates to GAAP. The larger companies which have a lot of surplus, particularly the mutual companies, tend to have assumptions which are more appropriate for solvency while some of the other smaller companies tend to have GAAP level assumptions. This has created, of course, considerable difficulty; we have to get some standard reference point which we haven't had. When the valuation actuary notion was introduced, the CIA financial reporting committee in 1979 (actually the Council of the CIA which is like a Board of Governors) approved Recommendations for Life Insurance Financial Reporting which are binding on all valuation actuaries and are supposed to tell you how to do the job. This is really a misnomer. They are a lot more than recommendations, they are requirements. They set down guidelines for doing this job; they tell you what you are supposed to think about when you choose assumptions, but they are not really very technically specific. They do not have any numbers that I am aware of, or say that there is a reasonable range of assumptions or anything of that kind. And that I think has been one of the really difficult points.

Things went along for a number of years -- from 1978 until 1984. And in 1984, several things happened that caused us to enter into this new, latest era which has a lot of ferment and activity. To explain the first fact, I just want to remind you of one other thing which is different in Canada than in the United States. We have no nonforfeiture law, no minimum cash values, no required cash values. Most of our policies do have cash values and they are the same level as you will find in the U.S.; and reserves or appropriations of surplus, in one way or another, have to cover the cash value. Somewhere you have to have

assets to meet your cash values. As a matter of fact, the real test is more stringent than it is in the United States. These cash values have to be covered on a policy-by-policy basis, not on an aggregate portfolio basis. But you don't have to have those values in the first place.

Now in the early part of this decade there emerged a collection of products called lapse supported products, which as you might guess, are products which have little or no cash values. The leading one, typical of these types of products, was called "Term-to-100." Term-to-100 is basically whole life insurance with little or no cash values -- often those values begin to be paid at age 65 and above, but nothing before that. As you can imagine, they are priced on the assumption that, in fact lots of people will lapse. We expect lapse rates to be significantly different with these types of products than they would be with ordinary life, and if people do lapse then there are lots of nice asset shares recovered by the companies; and that is why, in fact, you can call these lapse supported. In the pricing I think people tend to use fairly optimistic, high lapse rates. At the end of 1984 the Department of Insurance became quite concerned (this concern had been growing over the years) that valuation actuaries in some cases were using these same rather optimistic lapse rates in their reserves, producing rather low reserves. The Department wrote to the CIA in early December 1984 asking to please give their members some guidance on how to do this job and not pick these nice, high lapse rates. A couple of weeks later, on December 24, 1984, as everybody was getting set to do all their year-end work, the Department issued a memorandum to all valuation actuaries containing acceptable maximum lapse rates. I am not sure what the number is, but in any case, they laid down the law at that point. This is the first time that regulators had in fact questioned the way the profession was doing its valuation actuary work. And it was more embarrassing because this stomping down was done by members of the profession, who themselves were the prime movers behind introducing the idea of the valuation actuary.

Now in early 1985, in response to this, the CIA began conducting lots of anonymous surveys of valuation actuaries finding out how they were doing their job, not just with respect to this product but with respect to other products. The results again were not all that satisfying. In particular it was found that 50% of actuaries responding admitted that when choosing an interest assumption, they were not really paying much attention to what the assets were that were backing

the product. This is a direct contravention of the Financial Reporting Recommendations and if the survey had not been anonymous, people who admitted to it could have been subject to discipline.

Now what are the responses? The CIA began to produce a series of what are called valuation technique papers, which complement the Recommendations on Financial Reporting and again, once they are adopted, are binding on valuation actuaries. These papers are much more detailed than the Recommendations. They actually do contain ranges of numbers; they contain methods for determining what appropriate assumptions are; they try to define "appropriate"; and they contain lots of examples of how one should go about using the first part of these papers with the numbers in them to come up with appropriate assumptions for particular types of companies, products and situations.

Two technique papers have appeared and have been approved by the Council of the CIA. The first, as you might guess, is on lapse supported products. The second is on individual renewable term insurance, with a particular emphasis on the reentry-type products and assumptions and what do you do about the mortality problem. There are a number of other papers in the various stages of preparation: one dealing with the treatment of reinsurance; one dealing with interest rates for new money products with adjustable products; the mortality assumption; universal life, and I think there are some others along the way.

At the same time, the Financial Reporting Committee has been preparing guidelines on how to choose margins for adverse deviation when choosing rates. The recommendations essentially say, and this is something that people really are not used to doing, that when you pick an assumption, you really are supposed to start off by saying, "Here is my best guess, this is what I think mortality is really going to be." Then you are supposed to add a provision for adverse deviations in case you are wrong. But no guidance was ever really given as to what a provision is for adverse deviation.

So, we have had a lot of response. There are other things that are happening which I think are particularly important. People are looking at the discipline question and in particular a very hard topic is whether we should institute a system of peer review on valuation actuaries' work so that each year, perhaps,

on some random basis a certain number of valuation actuaries' reports will be reviewed by their peers to check up on the work.

Now, what I would get out of this, in terms of implications for the United States, is first of all a reinforcement of the report of the Joint Committee on the Role of the Valuation Actuary. You should keep on using the standard valuation law while the valuation actuaries in fact learn their job. That report says that professional standards have to be developed. We cannot be turned loose until these standards have been developed and we all know how to do exactly what it is we are supposed to do or what that report envisions us doing. I think what we are really learning from the Canadian experience is that until we actually nail down the standards, we cannot be sure the job is going to be done. On the other hand if you do not begin doing the job before the standards are written, there is an education process that will never take place. You have to begin doing something and going through some kind of learning process, but not give up the minimum valuation standards until you are sure that everything else is well in place.

The second thing that I take away from this is that when it comes to choosing assumptions and doing valuation actuary work, life is going to become a lot more technical than it is now. You will have to have best estimates. You will have to have a good idea of how experience can vary from those best estimates. You will have to know how to make reasonable forecasts -- the best estimates are probably going to be based on history and not on what is going to happen next year. And you are going to have to know something of how to make forecasts of what might happen in the future. And here I would just point out the words I have used -- estimate, variability and forecast; those are all main topics in statistics. I think there are a lot of statistical techniques which we pretend we know. We tell people to take things in Part 2 and now much more in Part 3 and we very rarely use them. The way life is going I think we are going to have to start using this material. As a university professor, I can tell you if you look in the new actuarial mathematics textbook on contingencies, you will see that there is an integration of probabilities and statistics into life contingencies. I think this is a really great step and just a beginning. We are going that way. I think it is going to be a necessity to do that. We are going to have to collect data so that we give people estimates as to how good our tables are; standard

errors are going to have to be included, for example. And actuaries are going to have to know what that means and use them.

Now there is no doubt in the U.S. when you talk about reserves for purposes of the valuation actuary, you are not talking about GAAP. You are talking about a statutory standard. You are really then talking about solvency testing and this is the other main thrust of this valuation actuary notion.

What does solvency testing mean? It means you have enough assets to see you through hard times. And of course, the whole question then is, what are hard times? Here we come to these marvelous and undefined words, reasonable and plausible deviations from experience; and what in the world are these words *reasonable* and *plausible* supposed to mean? I have heard that some of the people who have proposed these words are not sure anymore. I think there is something we can say. I would think that reasonable (if you look at the way the Joint Committee refers to things) is supposed to be something you provide for in the reserves. Reasonable variations from expected are provided for by putting margins into reserve assumptions. So, I would say reasonable, therefore, means something like we mean in Canada in providing margins for adverse deviations. Plausible variations from the experience are supposed to be covered not only by reserve assumptions, but also by designated surplus. From that you get into the whole question of solvency testing involving surplus. The question then is how, in fact, are we going to do that?

We are conditioned to using or thinking that the only reasonable way to do this is by simulation. That is all that most people have suggested and certainly what Reed was suggesting. By and large that is probably right; that is all we know how to do at the moment. There is a subject, I remind you, which you all have been exposed to, called risk theory, which you have all probably tried to repress. It does offer some insights. It was designed, as a matter of fact, to answer this whole question. In fact, there are even, in spite of your education and your study notes you have read, ways to do calculations that are quite practical and that can be quite palatable. It is unfortunate that North American actuaries have not looked to what is going on outside of North America because some of the Europeans, in fact, have done lots of solvency work and have published it and made use of some of these techniques, in addition to simulation. In particular, a lot of work has been done in Finland, and there is work

emerging now in Great Britain, which is very well documented and published; I really think more of us should start reading it. You will find that some of the risk theory calculations are useful. They definitely give you insights. But simulation is the way of looking at things we are used to and that is what I will concentrate on.

Let me tell you what is going on with respect to solvency testing in Canada because it is along the same lines as what is going on here; but perhaps we are a bit more ready to specify things. As I said, the valuation actuary in Canada up until now has just concentrated on reserves and, of course, was not really addressing the solvency question if the reserves did not have to be solvency-type reserves. Now we are trying to modify that as well. So, another part of this whole movement is that the CIA has formed the Committee on Solvency Standards for Financial Institutions. We are not just thinking of life companies or of property and casualty (P&C) companies; we see no reason why this work, which is essentially financial institution work, should not eventually impact on banks and trust companies, which are equivalent to savings and loans, and so on. But for right now, we are beginning to work on just life companies.

We have realized that most valuation actuaries in Canada do not know how to look at this. They are probably as unsure as anybody else as to how to approach this whole solvency testing question. So, being practical, we are essentially saying that our job is to educate and so we are thinking of an evolutionary process. Now, as it happens, just as you have the standard valuation law, we are going to have another crutch to fall back on. For various reasons, it looks like there will be some sort of minimum surplus formula, a continuing minimum surplus and capital requirement, which is about to be imposed on life insurance companies through a joint effort of our trade association, the Canadian Life and Health Association, and the regulators. There have been a number of comments about formulas and how inappropriate they are because you can not properly measure the risk in every company by the same formula and I agree with that, particularly as one of the designers of the formula. I do not defend it on that basis. It is not being used in the way I would have intended it be used. But it is a kind of crutch which is useful in the first few years because it gives us something to fall back on while we learn how to use it.

Now, the legal requirement, is probably going to mean that you satisfy the formula. It is not that different than the way you do standard valuation in the United States right now. What we want to do is get the actuary used to the idea of testing solvency. So this committee is going to say that there should be a standard that the actuary should test; that his company will be able to continue to meet the formula for the next five years under a variety of scenarios of possible future experience. And the hope is if he can do this type of test, eventually we can get rid of the formula and he can replace it with something more appropriate. But in the meantime, we will have gotten used to the idea of scenario testing and projecting financial results of the company. We are talking about a five-year horizon because, first of all, we are assuming that we are looking at a going concern operation and five years seems to be about the limit of most company planning horizons. So it is not clear that it would make sense to go beyond five years. Second of all, it is felt that if you can prove that you can survive in the next five years, that is almost enough time to implement any kind of business decisions that you might require if you see that you may have trouble at the end of five years. It is a reasonable horizon which provides enough reaction time.

We are specifying scenarios to a certain extent. We are specifying three levels of scenarios. The first level is a required scenario which is basically a steady-as-you-go scenario. It is a base against which to measure everything else; you choose your best estimates of what your real experience is now and assume this experience will continue. You need an investment policy and you have to know what that will be. You have to know your business plan as new business is part of this whole situation. There are other simulations where you assume that experience will change according to set scenarios. You have to make assumptions about how you would change your business plan if experience changed according to these scenarios and how you would change your investment plan. It is going to require a lot of negotiating with investment people and with senior management.

The second set of scenarios are ones which the committee is specifying -- you have certain changes in mortality or certain changes in interest rates or lapse rates or changes in new business and so on. These are intended to do two jobs. First these are intended to be base lines, mainly so that regulators will have standard ways that they can compare the sensitivities of different

companies to the same changes; and the regulators are going to have to learn, as much as anybody else, about how all this works. And the second thing is it will expose to the valuation actuary areas in which his company is sensitive.

The third set of scenarios are ones which the valuation actuary really is responsible for choosing on the basis of the sensitivities displayed in the second set and whatever other information that actuary knows about the company, i.e., what that company is sensitive to that may not have been picked up in the second set.

We do not see how we can specify what those scenarios should be. I suspect that most of the scenarios that are going to have to be done are going to be of the third type. But I think, again, this is going to be a learning process for the CIA and the Solvency Standards Committee and so on, to see how this job emerges.

Finally, I want to say a few words about interest rate scenarios and models. This has been the focus of most of the discussion, particularly in the U.S., and we have seen a number of commercial products emerge. First of all, I think that a lot of these models are very good. But I do want to throw out a couple of cautions.

First, we have seen some of these models; certain of the owners or vendors have discussed them and have shown us the results at valuation actuary symposiums for the last two years, and at Society meetings. One of the things that bothers me about the results is that the scenarios in some of these models which turned out to give the worst results were not the kind of scenarios you would have guessed. The kind of scenarios that most of us are used to thinking about are the kind that you see, for example in New York Regulation 126, where we assume interest rates are going to move nearly straight up or straight down or move up and down. The interest rates behave in a nice, regular, straight-line fashion. Then all we really do is pick a couple of these nice patterns and test them. You have seen this in the work of the C-3 Task Force, which I think was great. For purposes of education, they should have picked those kinds of scenarios. But if you really start doing the work, you should look to some of the results of these talks that I have mentioned.

Often, it has turned out that the worst case scenarios, i.e., the ones that have done the most damage, are ones in which you do not have radical changes in interest rates. You just have interest rates changing, wiggling up and down. My problem is that if people had picked the scenarios, they would not pick the damaging ones, they would pick the nice, regular ones. And that causes a problem. I think we have to start getting into really building interest rate models. And I think they have to be stochastic, involving some probability and they have to be consistent with the real world and the world of finance, in particular, which has been doing a lot of work to develop these kinds of models. People in finance are publishing these models in banks and banking institutions and are using them for pricing bonds and bond options and all kinds of fancy lending arrangements. These models are done half academic and half through these institutions and they are consistent with whatever is understood about developing yield curves. There are similar models which are emerging in the actuarial community in Great Britain which have been used there. They are solidly, stochastically based. We cannot tell what are reasonable or plausible variations unless we have some underlying probability structure.

To wind it all up, there is going to be pressure to write standards. Right now we are really in the infancy of this whole movement. Whatever our standards are will probably involve writing into stone fairly ad hoc methods, just as New York Regulation 126 is written using fairly ad hoc scenarios. They may not be as required, as I thought they were, but for all practical purposes, they are the ones most people will tend to use. I suggest that we ought to take one caution in writing these professional standards. They should not be immutable. They really should not be engraved in stone. They should be able to be erased so that as we learn more about finance, learn more about choosing assumptions properly, we can in fact insert into those professional standards the latest and best of what we know. The worst thing, I think, is to have standards which, as soon as they come out, everyone immediately recognizes as being out of date. I just hope that in doing this job, the Joint Committee on the Role of Valuation Actuary and the American Academy will allow for this evolving knowledge and technique.

MR. MOHORIC: Some of the talk has been about New York Regulation 126, which is very important to Bob Callahan. I think that maybe the general consensus is that it is something to grab around and react to and complain about

from the industry standpoint, but it is an important first step to getting companies to do these scenarios. Frank mentioned the difficulty in measuring the default risk and certifying on asset quality and Allan mentioned the weakness of testing what I will call fixed movement scenarios. I would just be interested, Bob, in hearing your opinion, now that I assume most or all of the reports are in for 1986, on whether the Reg is really accomplishing what you intended it to accomplish and what your reaction is to it now.

MR. ROBERT J. CALLAHAN: Even if we have legislation or regulation I would not really say that it is fixed in stone. We have worked with this over a number of years. As new conditions have arisen we have tried to come up with something to meet that problem. If legislation was needed, we put it there. If regulation was needed we put it there. We found that if we made a mistake we would then go back and cut out what we did. For instance, we realized that when we went to write the regulation that we made a mistake when we put in the law any reference to the Macaulay duration of assets and liabilities and three year's differential. So this year we are working on an amendment for single premium life and it was the agreement that it would include a provision to delete the reference in the law to Macaulay duration. Fortunately in writing the regulation, we made it such that if you did have an acceptable actuarial opinion and memorandum it did not matter whether your difference in duration between assets and liabilities exceeded three years or not. Next year we hope to delete that reference from the regulation.

We have found as we have gone along that the statutory form of the reserves are rather arbitrary. Back in the early 1970s we knew we had to come up for guaranteed interest contracts with a dynamic interest rate for valuation purposes that would fit the investments at the time of the guaranteeing interest contract, and we kept revising that as we went along. And then in December 1980, the NAIC adopted the dynamic valuation interest rate. In 1982, New York passed legislation enacting the dynamic valuation interest rate, at the same time, requiring the actuarial opinion and memorandum to be used for the higher set. Before we even had the first year-end valuation in the middle of 1982, there were companies on the group guaranteed interest contract, passports, and advisory groups that said they should not be required to use the valuation interest rate for 1982 issues based upon the 12-month moving average of Moody's index ending June 30, 1982. Rather they should be permitted to use the Moody's index for

the month in which they issued the contract and made the investment. Now, at the time we realized that that was a major step in the law but it was only a transition and that we are still on the road to revising our statutory formula set-up. As a matter of fact, I can give any number of examples where the current statutory formula set-up may produce inadequate reserves for today's business, and yet I hear the speaker referring to the redundancy in this statutory formula system.

But the law does require the actuaries to get into things which the actuaries never got into before. As Frank mentioned, he now has to find out what the investment people do. And the actuary does have to rely on the advice of investment people. But while we are -- and I feel we are still in an experimental, learning stage with this concept or with the practice of the actuarial opinion and memorandum -- we have to make adjustments as we go along. As we see new problems come up, we have to face these new problems. One of the most controversial issues today is what we do about the effect of the quality of assets. The basic position that we took in the regulation is that here is a problem that has to be dealt with. Here is a suggested simple procedure on how to deal with it -- you have to do something, you can't stick your head in the ground. You can use other procedures, but whatever you do, justify it, but just don't ignore it. Techniques will be developed. Changes will be made to that regulation.

There were a lot of actuaries out there that were looking for some guidance on scenario testing. We talked about this for a long time during the task force deliberations. Some did not want to put in any reference to scenario testing. Others wanted some guidance. Some wanted to have the actuary have full freedom as to the choice of his assumption. So we put in a kind of watered down version; we suggest the actuary consider testing these various scenarios. The regulation does not require that those scenarios be tested but they do give some guidance. The regulation does not say you must show positive results under all of these scenarios. But it does give the actuary some guidance and for some products, some of those scenarios would not be apropos.

How far should you test? 5 years. I was kind of shocked at that. I know that there are some short-term liabilities and in the short-term liabilities perhaps 5 years may be a good period. But today you also have a good deal of structured

settlement business being written where the liability may go out 40 years and where the valuation interest rate is based upon the date of issue of the contract. Now project yourself out 20 years -- should you still use the valuation interest rate for 1986 issues when you then make a further test of your remaining obligation? And because of the nature of obligations that increase, and lump sum payments, the present value at the end of 18 years using 91% of the then remaining obligations can be greater than the present value as of 12/31/86. And that is one example why I say that the present statutory form of the reserves needs to be revised. I feel we need to make the statutory formula system somewhat dynamic and come up with some means to where we can have valuation interest factors for both the asset and liability side that are current as of the date of valuation. But if this is something that must be done let's at least go forward and if we make mistakes, let's not have it written in stone, but let's take the necessary action.

DR. BRENDER: One thing about this 5-year projection period, I must point out, we're talking about all business, all life company business, we are talking about extremely long-term stuff. But what we can do is change the valuation assumptions at any point and it has nothing to do with anything that went on in that issue. When we say a 5-year projection period, we are also assuming that as you go along in this projection period, each year's reserve that you are going to be testing will be done using assumptions that are appropriate to the conditions in the scenario at the time. So that at the end of 5 years if things have really deteriorated, you will have had to do your surplus testing against a background in which your reserves have also been severely strengthened. So hopefully there is some provision there if we have reasonable valuation standards as well as solvency standards. All that comes into that model.