

1987 VALUATION ACTUARY
SYMPOSIUM PROCEEDINGS

SESSION 5B

SOLVENCY STANDARDS IN CANADA

(OPEN FORUM)

INTRODUCTION

MR. DAVID R. JOHNSTON: This session is being presented by the CIA Solvency Standards Committee, as is Session 6B, entitled Modelling Techniques for Use in Testing the Scenarios Being Developed by the CIA Solvency Standards Committee.

We intend to be practical in discussing the implementation of a solvency testing process which has been approved in principle by the CIA Council as a reasonable direction to follow. The teaching session later today is intended as a demonstration of the process we envision. These two sessions are part of the communications which we expect to lead to a solvency testing process that you may be involved in as early as 1988.

As moderator today, I will give an overview of what we're trying to achieve, and why and when we're trying to achieve it. The other two panelists are Robert C. W. Howard and Allan Brender. Mr. Howard will discuss the considerations involved in implementing what we propose from a company perspective. Mr. Brender will take it from there and discuss the ways in which the process might be viewed by several other parties.

We're anxious to get feedback. We sent a questionnaire to each Canadian valuation actuary concerning our work, and the responses so far has been very helpful. We'll refer to those responses in this presentation although we intend to discuss them more formally at the November CIA meeting.

Now to start this session, I am going to talk about the why, what and when of our proposal for solvency testing.

WHY DEVELOP STANDARDS FOR SOLVENCY REPORTING?

We have been asked to develop standards for solvency reporting for the following reasons.

1. Dwindling Margins -- Since the rules for valuation were changed in 1978, it appears valuation margins in the calculation of policy liabilities have become significantly slimmer. The Department of Insurance has felt it necessary to comment on this.

2. GAAP -- In the last three years there has been a strong attempt to reach a consensus on what would constitute GAAP for life insurance in Canada. One of the preconditions of adopting GAAP that the CIA, the Canadian Life and Health Insurance Association (CLHIA) and the regulators have asked for, is the development of adequate solvency standards.

3. Company Failures -- While it is still true that there have been no insolvencies of federally registered life insurance companies in Canada, a number of financial institutions have failed. The concern about potential life insurance problems is evident.

4. Industry Compensation Plan -- As a result of the concern over the financial stability of financial institutions, the CLHIA is currently developing a policyholder protection plan. Financial standards, in the form of a minimum surplus formula, are used by the plan to minimize the potential for problems.

5. Federal Regulations -- The Department of Insurance has indicated that it will implement a minimum surplus formula by regulation. Hopefully, this will be the CLHIA formula. The CIA needs to react to both these developments -- namely, the policyholder protection plan and government.

WHAT PRINCIPLES, STANDARDS AND TECHNIQUES ARE SOLVENCY TESTING INVOLVED IN?

The first major question the committee addressed was whether we should work on a formula for minimum surplus and capital, such as the CLHIA and the Department of Insurance are doing; or whether we should take the view that any given formula would be inadequate and pursue principles and procedures for testing solvency instead.

It did not take us long to decide that any given formula would be inadequate, because there are too many differences among companies for a given formula to have the capability of dealing with them adequately. Those of you who responded to our questionnaire this summer have strongly agreed with this position.

I am well aware that those concerned with the industry compensation plan and the Department of Insurance are anxious to have a specific formula for minimum capital and surplus. This is because an objective test provides a good, clear starting point for their work. Frankly, I suspect that the regulators will be slow to abandon a formula approach once they have started it. However, I expect them to acknowledge that whatever their formula ends up as, it will have deficiencies.

In thinking about the work necessary to develop principles and procedures for proper testing of solvency, the committee quickly recognized that a very big job was in store which would take a long time. Therefore, we wondered whether an intermediate step could be taken to achieve our objective more quickly.

We concluded that the environment in which we would be developing standards would likely consist of three phases:

3 PHASED ENVIRONMENT

<u>REPORTING</u> <u>BASIS</u>	<u>PHASE</u> <u>1</u>	<u>PHASE</u> <u>2</u>	<u>PHASE</u> <u>3</u>
GAAP	No	Yes	Yes
STATUTORY	1978 Method	Modified	Modified
SOLVENCY	CLHIA Formula	(CLHIA Formula) (Statutory Formula)	(CIA Opinion?) (Statutory Formula)

With this background, the committee decided on two directions:

1. A short-term direction would entail that we "piggyback" onto the CLHIA or regulatory formula in order to produce a test that would be more meaningful than simply completing the formula itself. This short-term direction will be our focus today.
2. We also envision a long-term direction leading to standards and techniques enabling the actuary to monitor and put forth an actuarial opinion on solvency. This direction would not depend on a statutory or industry formula, but would have to take such a formula into account.

In formulating these two directions, a Statement of Directions was developed and presented to the CIA Council in March 1987. The Statement was accepted by Council and distributed to the membership.

The key components of the Statement involve the short-term direction which consists of the following.

The Actuary will calculate:

- A. Current year formula surplus requirement, and a comparison to actual surplus on hand;
- B. A projection of (A) for five years assuming the company's business plan, including new business, and expected future experience; and
- C. Projections of (A) for five years assuming certain pessimistic-but-not-impossible deviations from the assumptions in (B).

In making these projections, we intend that liabilities will be recalculated during the projection period on assumptions that reflect the scenarios. While we take no position on the results of any one of these tests, we feel the trend of these tests and their sensitivities to the different scenarios will provide valuable information to the management of regulators. Most of you agreed with this position in your questionnaire responses.

Another component of the Statement of Directions is as follows:

The Committee on Solvency is to develop adverse scenarios for testing. To these would be added scenarios chosen by a company's valuation actuary based on the company's particular circumstances.

The current focus of the committee's work is on developing mandated scenarios and reacting to the results in order to develop other scenarios. Your questionnaire responses showed considerable uncertainty as to whether we are on the right track with the scenarios we've developed so far -- that is, you were concerned about having

too many scenarios and with the fact that most of the scenarios were adverse.

Again, from the Statement of Directions:

The results of these calculations would be incorporated into a private report available only to:

- A. The Company's Board of Directors
- B. The regulatory authority
- C. The management of the consumer protection plan (If appropriate)

There was strong concern expressed in your responses about presenting the results of this work to the consumer protection plan.

The Statement also includes the following.

In the longer term, the committee will develop principles, standards and techniques to enable the actuary to monitor and give an opinion on the solvency position of a company. This work would encompass any statutory solvency requirement that may exist, but not depend on it or be limited to it.

I will not comment much on this other than to say that I believe this direction is the one which we all wish we were equipped to head. It will take somewhat longer, but we want to at least get started now.

THE "WHEN" OF SOLVENCY TESTING

So, this is what we have in mind to ask of you: the projection of business, including new business for 5 years under various scenarios, the revaluation of that projected business consistent with the scenarios and analysis, and the reporting of surplus resulting from the various scenarios using the CLHIA formula.

The "when" is described as follows:

Recognizing that this is a significant addition to the current workload, the calculations would not be required until August of the following year. This would be optional for 1988 (in respect of the 1987 year end statements) but mandatory for 1989 (in respect of the 1988 year end statements).

As you can see, our objective is to ask the membership to "piggyback" onto the CLHIA or regulatory formula in order to produce a test that would be more meaningful than simply completing the formula itself, as envisioned in the short-term direction during 1988, on a voluntary basis, and if appropriate, to recommend that it be mandatory a year later. We do not recommend that the membership have this work completed at the time the financial statements are filed in February of each year. It is enough to have the CLHIA or regulatory surplus test completed at that time. We anticipate that the proposed scenario testing be done during the latter part of the year.

Therefore, in the fall of 1988, you might be working from 1987 year end figures, on a voluntary basis, if this process remains on schedule. To complete your work within this time frame, our committee will have to provide sufficient guidance over the period up until the June 1988 meeting to enable you to proceed realistically. Most likely we will need to schedule special meetings in addition to the regular CIA meetings.

Up to now, we have assumed that either the industry compensation plan or the federal government regulations will be in place requiring a formula calculation for year end 1987 figures. However, the time

frame is so tight that neither may be in place. Nevertheless, whatever does happen may have a bearing on our time frame. From the questionnaire responses, it's clear that many of you feel that our timetable should be independent of the implementation date of the industry compensation plan.

Most of you who felt that way were either uncertain as to the best timetable or disagreed with the committee's view. There was a strong doubt that companies would commit the resources to comply with our proposals as early as 1988. Also many companies seem ill-prepared to do the scenario testing we propose. Yet, there is a real urgency surrounding this problem and we must find the right direction and move ahead. The teaching session that follows is one step toward that direction.

IMPLEMENTING SOLVENCY TESTING -- PHASE I

MR. ROBERT C. W. HOWARD: Mr. Johnston has told you that, in essence, you have to do scenario testing of your company's solvency. Although I hope it will not be the case, I am likely to be construed as saying that you won't be able to do what Mr. Johnston has told you you must do. Fortunately I will be followed by Mr. Brender, who will apply the "peaches and cream" method. By the time he is finished you will be so excited about scenario testing that you will start working at it during your flight home.

My presentation is about the way scenario testing can be implemented in your company. Let's start by getting some key principles in mind.

MAIN PRINCIPLES

However the scenario testing is done, the work must have these three characteristics: consistency, depictiveness and economy.

1. There must be internal consistency among all of the parts involved in the calculations. We are trying to get at the sensitivity of surplus to changes in the environment. Any errors that we make in valuing either assets or liabilities may respond in quite different ways to changes in the environment. Hence, if all the pieces are not entirely consistent with one another, a seemingly small slippage in accuracy could in fact render results meaningless.

2. The calculations must depict what reality will be given the assumptions of the scenarios, at least to be in the right ball park. Anything less will be of academic interest only.

3. The work must be economical. This is particularly so since a number of scenarios are required. Within a couple of years the company will be required to find the human resources and computer resources to do the work regardless of cost, but if there are shortcuts to be found that decrease the cost without jeopardizing the validity of the results, then we should all use them.

Making the work consistent, depictive and economical will involve conflicting demands. No scenario testing will be totally consistent, highly depictive and dirt cheap. An important part of your work will be to find a balance among the three characteristics.

THE IDEAL

The ideal approach would be to take the company as is. Apply decrements to the in force files for both assets and liabilities. Calculate expenses and market values. Determine premiums, dividends, death claims, interest, rent, and so forth. New records would be added to the files to reflect policies to be sold and investments to be acquired according to the company's plans.

But this ideal isn't even remotely economical. It is simply too expensive to do all the calculations on the full live file in most cases. From a programming standpoint, if your company is like mine, the 80/20 rule comes into force with a vengeance. There are a myriad little exceptions that have occurred only once or twice, but have been around for many years. If the programming logic were to take all of these factors into account, I doubt that the programming would ever be completed.

MODELS

I am sure that most of you have already decided that you will do the

scenario testing using a model. The purpose of the model is to represent the company by a manageable number of objects on which calculations can be done automatically.

In order to improve communication, I would like to define a few terms. I will refer to a "model cell" as an object in the model that represents one or more discreet objects of reality with similar characteristics. A model cell can be an asset or a liability. Normally the model will be idealized so as to decrease the number of cells required.

By "algorithm" I mean a series of calculations to achieve a desired effect. The workings of a model are essentially a series of algorithms. They describe the relationships among parts. Normally algorithms will not change from one scenario to another.

By "parameter" I mean a numeric value or a table of values, such as a mortality table, which is used in the algorithms. Most parameters will be the same over all scenarios, but a few important ones will change from one scenario to another.

"Assumption," "formula," and "method" are terms frequently used to describe the way something is calculated or the numbers used in the calculation. I try to avoid these terms because they mean different things to different people.

I will now examine each of the three characteristics in turn -- consistency, depictiveness and economy.

CONSISTENCY

The pieces have to fit together properly. Without internal consistency many of the sensitivities observed will be phantoms created by the model. The phantoms will become increasingly significant as the model looks farther into the future.

There are four areas in which you need to be consistent.

1. Consistency among transactions within a single cell -- There are a number of examples of this and they are all fairly obvious once stated. To determine the death claims you will apply a mortality rate to the number of policies in force. Then any future premiums will be collected only from the survivors. It is possible to do a reasonable projection for a year or two into the future without worrying about this type of internal consistency. Many sections of the business will have enough inertia such that, for example, premiums, death claims, surrenders, expenses can all be projected independently of one another. Nevertheless, our world is changing rapidly enough that rules of thumb soon become sore thumbs. It also becomes increasingly difficult to get the reserve even close to correctness.

2. Consistency among cells of similar type -- To achieve consistency and also efficiency, we will want to use the same algorithms and the same parameters for as many cells as possible. You must be sure that you can justify any differences. For example, in

comparing permanent and term insurance, you will almost certainly use different withdrawal tables. You might at first think of using the same mortality table for both, in the name of consistency. However, if the withdrawal rate for term insurance is markedly higher than that for permanent insurance, you should expect some deterioration in mortality. Thus you would have different mortality tables, in the name of consistency. At times it will be consistent to use the same parameter for two cells, at other times different parameters. Consistency is determined by the environment, never the other way around.

3. Consistency among cells of dissimilar type -- Probably one of the toughest parts of the job will involve having assets and liabilities working in harmony. Let me give you an example. Assume that a mortgage is paid off at the end of its term. It is then inconsistent to assume that an accumulation annuity product rolls over at the end of the term unless you have an algorithm for reinvesting the new cash in an appropriate manner. Another place to watch is the choice of new money rates; they should be consistent among the assumed future pricing and future investment transactions.

4. Consistency among new and existing cells -- You will have to assume both future sales and future investments. We have all heard someone say, "Our profit margins are squeezed pretty badly now, but things should get better soon." Although we all hope the statement is true, it would not be consistent to found the model on it.

DEPICTIVENESS

Unless your results look pretty much like your company, your scenario testing will have no credibility. Your model must respond in the same direction and in about the same magnitude as your company in reality will respond to events.

The easiest way to make your model more depictive is to use lots of cells. It is easy to be fooled about the amount of cells you need. Let me give you an example from my experience.

Recently I was working on a new valuation method for our individual annuity portfolio. I did the valuation using 5% of the valuation cells used by the old system. This left me around 5,000 cells to value. Since the results seemed a little odd, I did the valuation again but with a 10% sample. No cell appeared in both samples. What do you think was the difference between 20 times the 5% sample, and 10 times the 10% sample? Naively I expected it to be within 1%. There was an 8% difference in the reserve.

Making a model depictive is highly empirical, and very difficult. I know of no theory that would tell you the point at which you have enough cells or the acceptable degree of idealization. It can be very discouraging because it appears very unproductive to be continually refining your model. You can go to a lot of effort to come up with a very sophisticated idealization of your in force data, and find, once

you are finished, that 80% of the effort was wasted.

A few years ago I constructed a model that contained around 8,000 cells which represented about three-quarters of a million policies. I used quinquennial ages at issue and quinquennial years of issue for policies more than 12 years old. I used annual years of issue for younger policies. There were about 30 different plans included in the model. The results were not smooth. It seemed that there was too much happening at calendar years divisible by 5. Fortunately in this case I got a big improvement in smoothness simply by going to triennial groupings of year of issue.

There are four areas in which you need be concerned about the model being adequately depictive.

1. Be sure that you have the right starting point. Basically the exercise is to construct in force files for the model which properly mirror the real in force files. This is a crucial step. If you don't start right, you have no chance of ending right.

2. A closely related matter which also requires a lot of care is ensuring that the mix of business for new transactions is sufficiently representative.

Incidentally my experience is that you will generally need far fewer cells to represent new sales than you will need to represent the most

recent year of existing sales. As long as all the transaction on the cells are internally consistent, you are not likely to cause the results to be off by much. For example, you might eliminate any plans that represent less than 5% of your business or you might use decennial years of issue instead of quinquennial years of issue.

Let's be honest. Your management will judge the credibility of your model primarily by how depictive the first year of your model is and how smoothly it progresses to the last year. The mix of new business will hardly influence the first year of the model at all. The mix is not likely to disturb the smoothness either. Only you will be able to judge if the mix is sufficiently depictive.

3. The third area in which it is important to be depictive is in developing the algorithms for dividend policy. The required scenarios include some very significant swings in experience. It is highly unlikely that your dividend scale will not be changed. But by how much should it change? If your company is like ours, setting the dividend scale is a very complex task. Noting the change in the experience factors is very significant, but it is only the start. We also have to look at our aggregate earnings, our competitive position and the place to which we think our competitors will be going. I expect that there will be a lot of soul searching before there is a major cut in the dividend scale. Few companies would want to be a leader in this regard. I am unsure as to how I will model our decision making process. It is very important to achieve a proper balance

between dividends and earnings. I am afraid that there may be no choice but to make the calculations iterative. We will likely need at least two iterations, but I hope we will need no more than four.

4. Finally, and more troublesome yet, will be developing algorithms to properly simulate investment policy. The algorithms must respond to changes in the economic climate. Larger companies will need to be able to recognize scarcities in markets, particularly mortgages and real estate. For the model to be any good, you will have to be able to pin down your investment people on how they would respond to a wide variety of situations. For a company such as ours, which is heavily into savings products, it is absolutely vital to get this right. The more heavily your investment people are into trading, the more difficult it will be to get it right. If your company trades its portfolio many times over every year, then I can only offer you my sympathy on your modeling work.

ECONOMY

One of the major benefits of the scenario will be a sense of the way your company will respond to the wide variety of circumstances it may face in the future. If it is too expensive to run or takes too long to run, the model will be of no value to you.

However, never let it be said that I think modeling can be done cheaply. I wonder if there are any companies that appreciate the

magnitude of the task. Surely none has the resources presently idle to be able to put on the task. It is going to require a lot of people and a lot of computing power.

If you are thinking that the modeling can be done with a spread sheet program on a personal computer (PC), forget it. It may be possible for some to do the modeling on a PC, but it certainly won't be the case for us because of the variety of circumstances that we have in our business. I expect that one scenario will take between 10 and 30 minutes of CPU time on a 14 mip mainframe computer. According to comparisons I have made, this same amount of calculating takes about a week on a PC/XT.

Our main thrust for making the model economical will probably be in the area of development costs rather than the running costs. I think it will likely prove cheaper to have more cells even though it will cost more to run the model each time. The larger number of cells will probably allow for more obvious algorithms and less time spent on developing the smallest number of cells that will give satisfactory results. I have been a fan of APL for many years, but I don't think that we find it satisfactory for the number of cells that we will have to deal with. We will almost certainly use PL/I for much of the work. Unfortunately, that will increase the programming time significantly.

I will be looking for ways that I can simplify the algorithms. For example, one might assume that all transactions occur on July 1 of

each year. This is a patriot assumption, but in our case we lose too much in depictiveness. I may explore having all transactions occur at the middle of a calendar quarter. I think this might work.

There is a lot of leeway for the actuary's creativity, but I should add a word of caution. It is possible to spend so much time finding a cheaper way to do things that you may never recover the cost of not doing things the more expensive way.

TRADE-OFFS

It is not possible to have a model that is fully consistent, depictive and economical. You have to trade off each one of these characteristics against the others. All are important. There is no one item that you can just forget about.

1. Consistency -- If I had to pick one of the three as being most important, I would choose consistency. The main purpose of the exercise is scenario testing. That means comparing the effect on surplus of a variety of scenarios. If you don't have a fairly high degree of internal consistency, you'll be sure that surplus will respond as the model suggests. I am not suggesting that you won't get things to move in the right direction, but without internal consistency, the real sensitivity may be significantly more or less than the model indicates.

The longer the term of the projection, the more important consistency will be. As long as your model is depictive at the start, the consistency will help keep it depictive throughout.

Of course, you will want to remember the 80/20 rule. Eighty percent of the consistency that you need will take 20% of your time. In the interests of economy, you may need to give up on the remaining 20% of consistency.

2. Depictiveness -- It is important that the model be depictive for it to have any credibility with management, but here I might be inclined to cheat a little. It only has to be depictive at the start to gain credibility. If the model is depictive at the start and consistent thereafter, then I will be pretty confident about assessing the sensitivities properly. I would be inclined to include a lot fewer cells in the first project year of sales than I did in any prior year of sales. I probably would still have to have the right distribution by plan, but the distribution by age and amount will likely prove to be much less significant.

There is one thing that you can do to get a high degree of depictiveness very cheaply. That is to fudge the results by manual intervention. But don't do it! You might cut your development time by as much as 25%, you might gain a lot of credibility, but you may be misleading your management. If the results are going to be misleading, you would be better off not even starting the exercise.

3. Economy -- I have already mentioned ways that you can trade-off some consistency or depictiveness to improve economy, but there are even some trade-offs within approaches to making the model economical.

Which resources are scarce? Is the bottleneck modelers, programmers or computers? In our case the modelers and the programmers will be largely the same people and they are in short supply. Computing power is a little tight during the day shift, but overnight we have a tremendous amount of idle computing power. I expect that any trade-offs that we make will be to shorten the programming time. There we will be looking for the simplest, most straightforward approach each step along the way. There may be times when we think we could cut the processing time down by, say 10%, by spending an extra week or two in finding a way to get by with fewer model cells. It won't be worthwhile for us to do this although once we get the model running we may have time to go back and look for some of them.

SURVEY

Mr. Johnston mentioned earlier the survey of valuation actuaries. Some parts of the results were particularly interesting to me from the standpoint of implementation. Nobody seems to be ready to do the scenario testing now. Very few expect to be able to work on their 1988 data in 1989, but even they are not positive that they will be

able to do that. I doubt that most appreciate the size of the task.

I am very concerned about the timetable that we are suggesting. I can see the need for moving ahead on this timetable, but it may be impractical. The valuation actuary may be unable to get the necessary resources from his company unless we use something as heavy handed as threatening to drum him out of the profession if he doesn't do it. I am not sure that any one would be well served by authoritarian moves like that. We need your comments.

CONCLUSIONS

If we are to do scenario testing right, it is going to be a big job. It is going to be an especially big job for the old established companies, but it won't be small for anyone. That is good news if you are an empire builder. It's bad news if you are tired of being overworked. At least the work should prove interesting and challenging.

I think we will find that there is a lot of value to be gleaned from the work. Which brings us to Mr. Brender.

MODELING AND SOLVENCY ASSESSMENT: FOUR PERSPECTIVES

MR. ALLAN BRENDER: Mr. Johnston has described the general plan of attack on the solvency problem for life insurance companies which has been developed by the Committee on Solvency Standards.

Mr. Howard has described the properties of models which will be required to carry out this approach and has given you an indication that this is not a simple task; the models will be complicated, expensive to build, and expensive in computer time to run. We will hear more on the construction of models at the next session.

Right now, I'd like to discuss the uses to which these models will be put. I'll consider modeling and the solvency assessment process as seen by four different groups: Valuation Actuaries; the Office of the Superintendent of Financial Institutions; the Life and Health Insurance Compensation Corporation; and Company Management.

THE PERSPECTIVE OF THE VALUATION ACTUARY

Computer models are clearly the major new tool of the valuation actuary. Not only will models such as we are discussing here be required for solvency assessment but also, somewhat simpler versions will be necessary for the basic valuation of policy liabilities. In particular, the recent CIA Technique Paper #3 on the reinvestment rate implicitly assumes modeling will be used in choosing interest assumptions.

Computer models are intended to be used to simulate the fortunes of an entire company, a particular product, or a group of products which are backed by the same group of assets. We want to show with a high degree of probability that a company will remain solvent in the foreseeable future, or that reserves will almost certainly be adequate. We

need models because the situation in which we find ourselves is too complicated for us to be able to find the basic underlying probability distribution of financial outcomes. We ask for assurance to a high degree of probability since we recognize solvency and reserve adequacy aren't sure things; there are no absolutely certain guarantees. "Probability" suggests our models should be stochastic -- that is, we should let the computer simulate the levels of mortality, lapse, expense, investment earnings, and so forth based on distributions for each of these factors and randomly generated values from these distributions. The Committee hasn't suggested a stochastic approach for two reasons: first, the distributions involved are generally not explicitly known and second, a stochastic approach requires the model be run a great many times. Given the complexity of the models suggested by Mr. Howard, the computer resources required would likely be too great for almost all companies. We have therefore suggested that the model be run to test solvency using a relatively small number of scenarios -- that is, we are adopting a deterministic rather than a stochastic approach.

As outlined in our committee's presentation in Halifax last June, a transcript of which has been sent to all Canadian valuation actuaries, we suggest 9 scenarios which must be tested. The first of these involves "best guess" values for all assumptions; the results of this run serve as a standard against which results of other scenarios can be measured. The valuation actuary's first challenge will be to arrive at "best guess" assumptions, stripped of all conservatism. Since the

simulations cover a period 5 years into the future, the next and greater challenge will be to make reasonable assumptions concerning both new business and investment policy. The remaining required scenarios each involve a specified change in a particular assumption and serve to indicate the company's sensitivity to that assumption or factor. These test steady deteriorations in mortality, morbidity, expenses, and lapses. In addition tests are required of sensitivity to changes in interest rates, to sudden catastrophic mortality experience, and to increased asset defaults. Finally, the results of the required simulations must be studied and areas of particular sensitivity and danger for the company must be determined. But this is not all; the fun is just beginning.

Once the results of simulations based on the required scenarios have been studied, the valuation actuary will have some indication of the danger points for his company. It will then be necessary to choose a number of additional scenarios to further study the company's position. Choosing these additional scenarios will not be a simple matter. It will require extensive knowledge of the company's products and markets, its operating style and its plans. Combinations of adverse variations in several factors at once will have to be tested. Factors to which products are particularly sensitive will have to be explored in depth.

Operations decisions which might impact on solvency will have to be studied. For example, a lapse-supported portion of a portfolio should

be subjected to more extreme variations in lapse rates than are required in the compulsory scenarios. It might be advisable to test the effects of adverse lapse experience in combination with high mortality experience or in the face of rapidly rising expense rates. Or, if the actuary suspects management will be slow to reduce dividends on participating business even if gains from operations worsen, then this should be tested. As you can see, the number of situations to be tested can be almost limitless. The challenge will be to cover a wide range of possible futures in a finite computable variety of scenarios.

The natural questions to ask are first, How much testing is enough? Second, How extreme must the scenarios be? At the moment, we don't have answers. In fact, I'm not sure we intend to provide answers other than to give an indication that what is required is a deep and thorough investigation. This is a learning process for all concerned, including members of the Committee, and it may be that standards as to what is an adequate job of solvency testing will have to evolve over time. That evolution may be stimulated and hastened if some sort of peer review process were to be introduced.

Once the necessary number of scenarios have been tested, the valuation actuary will have to prepare a report and offer a professional opinion.

What will the standards be for rendering an opinion? Must a company remain solvent under all scenarios tested in order to be given a clean bill of health? These are not easy questions to answer. With respect

to the latter question, it seems to me unlikely that all tests must be passed. In fact, it could be argued that if all scenarios lead you down the road of continuing solvency, sufficient testing has not been done. The important point is that the report, indeed the whole process, is intended as an early warning test of possible future difficulty. Company insolvencies which emerge in testing give guidance as to what changes may be necessary in the company's operations now in order to avoid actual future difficulties. The report is primarily intended to be a confidential document for management, to show where possible danger lies. Of course, there may be other parties who also have an interest in the valuation actuary's report, which brings us to our second perspective.

THE PERSPECTIVE OF THE OFFICE OF THE SUPERINTENDENT OF
FINANCIAL INSTITUTIONS (OSFI)

A reading of the Canadian and British Insurance Companies Act will show that insurance regulation in Canada has two main concerns: the equitable treatment of participating policyholders, and the solvency of insurance companies. It follows that the Office of the Superintendent is vitally interested in solvency and in any tests of solvency which may be available. You are aware, I am sure, that bill C-56, as passed by the House of Commons on June 30, 1987, provides that a federally registered life insurance company will be required to maintain an adequate margin of assets over liabilities, that is, to satisfy a minimum continuing capital and surplus requirement. The precise nature of the

requirement is left to be specified by regulations. To date, the necessary regulations have not been drawn up and it is most unlikely they will be in place by the end of this year.

Most people, I am sure, hope the statutory surplus requirement will be the same as the surplus requirement being proposed by the CLHIA in connection with its consumer protection plan. It seems this is also the desire of the OSFI. To this end, the values of the CLHIA formula test are being examined for all companies for business years 1984 through 1986 were to have been submitted by September 28, 1987. It is notable that the CLHIA circular requesting this data contained supporting requests from the Superintendents of Insurance of Canada and of Quebec and Ontario. Data will be required of all companies in order that the suitability of the CLHIA formula as a statutory test may be evaluated.

The calculation of the CLHIA formula surplus requirement needs a great many items which do not appear in the current financial statement. Regulators can only accept a calculation if it is verifiable from data available to them. It follows that we will see a considerable expansion of the data which will have to be incorporated into companies' annual submissions to the OSFI.

As I said, it appears to be the intention of the OSFI to use the same surplus formula as is used for the Compensation Plan if at all possible. To date, the principal reservations which they have articulated

primarily pertain to the statement items which are allowed as offsets to the surplus requirement. However, there is a need to look at the formula itself and consider whether it really captures all the important items of risk to which an insurer is subject. Most discussion of test results to date has centered on the values of required surplus which result from the formula. There has been very little comment by the industry or our profession on the design of the formula; I know thoughtful comments would be most welcome.

Now, the OSFI has in the past informally used a collection of simple ratios as early warning tests in a manner similar to the NAIC's Insurance Regulatory Information System in the United States. The surplus calculation will supplement these tests. However, each of these is a static test. At best, one can track past performance of these indicators, but they say nothing about future possibilities. The procedures being proposed by the Committee on Solvency Standards are, on the other hand, dynamic and very much concerned with future solvency. They are intended to provide early warning of possible threats to solvency. The OSFI is certainly aware of our proposals; in fact, one of its staff actuaries, currently Gerald O. Stibbard, sits as a member of our Committee. If, as we suggest, valuation actuaries will prepare solvency reports in the future, you can be sure the OSFI will want to see them. They would be handled on a confidential basis as the valuation actuary's reports are handled today. I don't believe there is any doubt that the OSFI can require the submission of these reports; its powers in this regard are clear. However, I also do not

expect it to have to exercise these powers; I think it is generally recognized that the information contained in these reports is needed to enable the OSFI carry out its mandate to protect the solvency of insurers doing business in Canada.

THE PERSPECTIVE OF THE COMPENSATION CORPORATION

As many of you are aware, the CLHIA proposes to establish a Life and Health Insurance Compensation Corporation, legally independent of the Association, to operate the consumer protection plan. The Corporation will basically be an insurer and the CLHIA surplus test an underwriting tool. The target date for introducing the Corporation and the Plan is January 1, 1988. While this target may not be met, I would guess that everything will be in place some time during 1988. Therefore, a formula surplus calculation will be required for each year from 1988 onward. Since test calculations are being required for 1986, I expect a calculation will also be required at the end of this year as a final test before the system comes into operation. I should mention that the CLHIA expects that the formula might be modified from time to time as circumstances require. For example, if and when GAAP financial reporting is introduced based on a version of the policy premium method, then the surplus formula will have to be modified accordingly. Notice that modification will become more difficult if it is desired that the Compensation Corporation and the OSFI always use the same formula since each change will require Cabinet approval.

Will the Compensation Corporation receive the valuation actuary's solvency report? Certainly, it would like to see the report if possible. As an insurer, it would like to monitor the health of its insureds and perhaps take measures to control its risk. However, is it likely to get the reports? At a workshop in Halifax during the CIA's annual meeting last June, several members of the Institute voiced reservations about having the report go to the Compensation Corporation. The questionnaire on the work of our Committee which was sent to valuation actuaries in August contains a question on this point. Preliminary replies indicate widespread concerns on this issue among valuation actuaries.

The issue really depends on the Corporation's power to act as a result of its monitoring of member companies. It is proposed that membership in the Consumer Protection Plan be required of all insurers as a condition of registration to do business. However, whether the Corporation might have the power to lift coverage if it deems a company's financial position to be unhealthy is an entirely different matter. Such power is tantamount to the power to lift a company's license to do business. Now, this goes to the heart of the regulator's authority. It seems to me that no regulator can delegate this ultimate power. If this is so, the Corporation would be unable to take any effective action but would be forced to rely on the regulators. From this circumstance it follows that there is no particular value in the Corporation monitoring insurers. There would then be no need for the Corporation to receive the solvency report.

I'm sure there are those who disagree with this point of view. However, I see the division of powers as an extremely important point and know there is concern on the part of our regulators in this regard.

THE PERSPECTIVE OF MANAGEMENT

As we have seen, and will see again in Session 6B of this Symposium, the process of carrying out a solvency assessment will be expensive in terms of time, manpower, computer resources, and money. How will management view the process? Are the benefits worth the cost?

From one point of view, if our profession requires all valuation actuaries to prepare solvency reports, or, if regulators require them, management will have little choice; the expense will be a business necessity. However, this is no way to sell management on the value of the study. Apart from satisfying a formal requirement of the actuarial profession, what are the benefits of constructing large simulation models and carrying out solvency studies? Here are a few possible answers.

First, the report should highlight possible sources of risk and danger for a company and be useful in formulating future strategy.

Second, the study will help the company fix the minimum surplus required to support each line of business. This establishes a basis for the calculation of ROI or ROE and other profitability measures.

Third, the construction of the model will require increased communication and coordination among different parts of the company. This should improve the efficiency and quality of the company's operations.

Fourth, the models can be used not only to test solvency but also for tests of plans for new business, new products, new investment strategies, new dividend scales, and so on. We contemplate that the solvency report would be prepared during the summer after many simulations have been carried out as part of the annual strategic planning process which, in many companies, is carried out in the spring.

Fifth, the models would be particularly useful in checking asset/liability matching.

Sixth, the determination of required surplus also fixes the remaining free surplus which is available for uses other than the support of the current business.

Overall, it would seem then, that the tools required to carry out a solvency assessment are also valuable in strategic planning and day to day operations.

FUTURE PHASES

I'd like to conclude with a remark about our intentions beyond the introductory Phase I.

By its nature, a formula test of surplus is a test of whether the company will be able to run off its current business. It is a static test designed to cover policyholders in the event of a company failure. We are, however, dealing with going concerns -- this is, functioning companies. We are concerned with continuing solvency, a dynamic phenomenon.

The test being proposed by the Solvency Standards Committee is a dynamic test; it requires a company to show that given its current operations, plans, strategies, it should be able (to a high degree of probability) to meet a runoff test at each point within its planning horizon. Situations which threaten the company's solvency should only occur far enough in the future that the company has sufficient time to discover them and take action to avoid them. After some deliberation we concluded that a reasonable reaction period, as well as a reasonable planning horizon, is about 5 years. Note that we are not ignoring possible danger beyond the 5-year projection period. It is required that the valuation used in the models at the end of the 5-year period be carried out using assumptions, with margins, which are consistent with the experience rates in effect at the end of the projection period. In this way, provision is made for future unfavorable experience

beyond the projection period.

The dynamic testing is embodied in the simulation model. The runoff test rests with the surplus formula.

We have labelled as Phase II the environment which will exist when GAAP financial reporting is introduced. At that time, the runoff component, the surplus formula component, will change. The dynamic process will remain unchanged.

Phase III envisions the runoff test being changed from an industrywide formula to a criterion tailored to the circumstances of each company. The basic dynamic modeling will remain as before. Ever since the appearance of my study for the Department of Insurance and of the CLHIA formula, we have heard many remarks to the effect that one can't hope to find a single surplus formula which is appropriate for all companies. I think most people agree with this; certainly, I do. Our third phase envisions a tailor-made runoff criterion for each company. I think it will take many years and much theoretical work before we are able to construct these company-specific criteria, but I hope to see it happen. You might consider, however, that even if we can reach this lofty goal, there may still be a need on the part of the regulators and the Compensation Corporation for an "objective" uniform formula surplus requirement.

Finally, I want to make a few remarks about the Solvency Standards

Committee's plans for the near future. At its last meeting, the Committee formed two subcommittees. The first will concern itself with the preparation of standards and with the education of valuation actuaries with respect to the task we are proposing. The second will work on constructing a flexible simulation model of a Canadian Life company. We realize it will be necessary to demonstrate in great detail how one would carry out the sort of solvency study I've been discussing. We propose to hold a seminar in the Spring 1988 at which the whole process would be laid out in detail, including the choice of scenarios to be tested and the analysis of various runs of the model for an entire company.

As you can see, we are entering a new field of amazing complexity. All of us will be learning as we do the job. We will need a great deal of continuing education, technical education, and I anticipate that we will all be attending valuation symposia such as this one for many years to come.

