

RECORD OF SOCIETY OF ACTUARIES 1988 VOL. 14 NO. 4B

PRACTICAL APPLICATIONS OF FUTURISM

Moderator: DALE C. GRIFFIN
Panelists: BARRY S. HALPERN
 PETER W. PLUMLEY
Recorder: DALE C. GRIFFIN

- o Examples of futurism applied to actuarial work:
 - Preview of a study note "Futurism for Actuaries," with techniques and examples
 - Valuation actuary use of alternative economic scenarios
 - AIDS modeling by actuaries, a forecasting tool
- o Guided discussion in round-table format by interest area (e.g., financial reporting, product development, AIDS, health) of possible applications of futurism techniques:
 - What are areas which seem to be changing rapidly?
 - What trends and cycles are affecting the changes?
 - Which approaches would clarify the nature of future changes?

MR. DALE C. GRIFFIN: The purpose of this open forum is to get you thinking about ways futurism can be used in your own work. We will gradually move from the general to the specific, ending up with, we hope, some concrete ideas to take back to your own situation. I am a Futurism Council member, and I'll start with some ideas on the general kinds of situations in which futurism can be useful to actuaries. The ideas are based on the efforts of Barry Halpern, also on the panel, and me, to develop a study note called "Futurism for Actuaries." I will talk briefly about how futurism can generalize actuarial techniques in ways that make them more useful. So that you can be thinking about how you can use futurism, I will review, very briefly, the types of techniques in the futurism "bag of tricks."

Next we will hear about specific applications, first from Barry Halpern, of Aetna Life and Casualty. Barry is a recent chair of the Futurism Section and an Actuary who has been exploring the use of futurism for several years. He will cover use of futurism by actuaries, with some emphasis on the valuation actuary.

After Barry Halpern, we will hear from Peter Plumley, Consulting Actuary, who has applied one kind of futurism in actuarial work, predicting the course of the AIDS epidemic. His presentation may give you ideas on the general topic of modeling and how it can be used to study the future, by organizing information and investigating the implications of unknown factors.

Finally, we will discuss, by interest area, uses of futurism in your own work.

I'd like to start by telling you what it has been like to be a futurism section council member in the last four years. At virtually every meeting we would discuss the question, "How does futurism relate to actuaries?" After every

OPEN FORUM

meeting I would come away juggling a list of seemingly unrelated ideas and techniques, trying to sort them out into a logical relationship. At times we have discussed such diverse topics as identifying trends for section members, whether the section should be called the "planning section" (we decided it should not), the use of electronic mail, the latest in underwriting techniques, left brain and right brain thinking, and just who on the Council has ever written a scenario. Partly as a way of coming to some closure on this question of how futurism relates to actuaries, and partly just as a challenge, I suggested a study note on futurism. I figured it was time to put up or shut up about futurism -- that we should get precise about what it is and how actuaries can use it. Barry Halpern and I have developed a first draft, which is still in its early stages.

A review of what has been written by futurists reveals an implicit definition of futurism as the generation of and study of ideas about the future. It covers an incredibly wide variety of approaches, ranging from the most sophisticated mathematical modeling to the most starry-eyed utopian speculation. (Actuaries fall somewhere in that range, for the most part, and I think you can tell at which end of the spectrum we fall, as a group.)

The common theme running through writing on futurism is the significance of change. With very stable conditions futurism is not needed. The future will be the same as the present, so what's the big deal? As Bertrand de Jouvenel, a pioneer in futurism in the 1950s explains, when society is not changing, custom and tradition are the best guides to decision making. But when things are changing, it becomes more important to develop foresight. The problem with futurism, however, especially from an actuary's point of view, is that there isn't one right answer to the question "What will happen in the future?" Because of unknowable facts or random possibilities, the future is not determined in advance, and therefore is not knowable in advance. To borrow de Jouvenel's phrase, the future consists of a "fanlike array of possibilities." The future, for practical purposes, consists of a range of possibilities.

As actuaries, we are familiar with the concept of probability and probability distributions. We are comfortable with the idea that the outcome of a random trial is unspecified before it occurs and can be represented by a probability distribution of outcomes. In the real world we have to contend not only with randomness, but also with unknowable facts and with the will and intentions of people in a position to influence events. Futurism refers to the art of identifying the possible outcomes which are most useful to consider and of synthesizing information which can shed light on the relative probabilities of those outcomes. Its aim is to use available information to anticipate some of the possibilities as aids to decision making. This is not the kind of "structured problem" actuaries are trained to handle in the exams, even though the techniques of forecasting, extrapolation, and life contingencies can be used with judgement, to help indicate what some small part of the future will be.

The relevance of futurism to actuaries depends to some degree on the extent of change in their particular situation. All of the techniques we commonly use can be considered futurism techniques, but as we move on the scale of change toward more pervasive change we need to act more and more like futurists.

As for the actual techniques of futurism, I'll quickly run down a list of the 11 techniques mentioned in the study note. I hope they will encourage your thoughts about your own use of futurism.

PRACTICAL APPLICATIONS OF FUTURISM

CONDITION	APPROPRIATE METHODS OF ANALYSIS
(LEAST CHANGE)	
-- Completely closed system with stable underlying forces	-- Statistical models -- Static actuarial models
-- Gradually changing conditions	-- Models with gradual change built in, e.g., mortality projection
-- Cyclical changes in "outside" conditions	-- Models incorporating economic variables or other "outside" structure (Note that this is not yet a common approach by actuaries)
-- Rapid societal change affecting actuarial work	-- Actuarial analyses incorporating a range of possible situations (Postretirement medical, valuation actuary)
(MOST CHANGE)	-- Insight-based methods of identifying key possibilities from the "fanlike array of possibilities"

ENVIRONMENTAL SCANNING

Environmental scanning is the review and monitoring of trends as reported in various media. Most commonly this method is used by organizations which believe their operations will be influenced by changes in the external environment. The Trend Analysis Program of the American Council of Life Insurance (ACLI) is one example. It relied on volunteer reporters from throughout the insurance industry to report on changes or beginnings of trends, which they monitored in a wide variety of publications.

EXTRAPOLATION

Extrapolation is essentially standard actuarial technique. Current trends are projected to continue indefinitely into the future. More generally, the same can be done with less quantitative trends. The method does not analyze underlying causes so it can provide faulty projections when such causes are undergoing change. For example, the "Limits of Growth" paper, published by the Club of Rome in 1972, projected the outcomes of extrapolations of trends in place at that time, resulting in doom and gloom forecasts. The purpose of that study was not to forecast that the world would run out of resources, but rather to show where then-current trends were leading, and that some change in behavior was needed.

ECONOMIC MODELS

Economic models can create short-term forecasts which are different from a simple extrapolation of recent results. The leading economic indicators produced by the Commerce Department are an attempt to incorporate lead and lag information into short-term forecasts of the future. Actuaries have attempted to incorporate such models and indices into short-term projections such as health care prices or utilization.

DEMOGRAPHIC FORECASTS

Forecasts of characteristics such as age of future populations are based on extrapolations of past rates of mortality, births and immigration, etc. However, because they incorporate events which have occurred over many years in the past, such as the "baby boom," they can produce forecasts which are quite different from a crude extrapolation of population growth.

OPEN FORUM

The Social Security Administration (SSA), in its financial forecasts, uses demographic forecasts. Recently, long-term care has been discussed frequently based on demographic forecasts.

TECHNOLOGICAL FORECASTING

After World War II the U.S. exerted a significant amount of effort trying to anticipate future developments in military technology. This gave rise to the RAND Corporation and to a large extent to futurism techniques. The basic premise of technological forecasting, at least in the military context, is that any technology which can be made practical will be implemented eventually. This has been called the "technical imperative."

Parallels exist in business and society in general. Because of the lead time required to develop and implement a new technology, such as in genetic engineering, computer technology, or superconductivity, knowing about a new technology gives notice far in advance of what everyday life may be like in the future.

TREND ANALYSIS

This is a term often used in conjunction with environmental scanning, and in that case it means the detection of trends from isolated clues in the environment. Futurists such as John Naisbitt often perform trend analysis for corporations. For actuaries, trend analysis is probably an intuitive process, and each incremental bit of information shapes our current thinking about trends within the particular speciality in which we work. Actually writing such an assessment can turn vague thinking into a futurism technique.

DELPHI STUDIES

Delphi studies are an attempt to use the knowledge of experts in the most efficient way. They consist of an iterative question and feedback process in which questions about the future are answered by experts. The technique in simplified form is represented in the Society of Actuaries (SOA) panel discussions which call upon several experts to provide their forecasts of the future of a particular industry or product. An advanced form of this technique was used in the 1984 report "A 20-Year Strategic Outlook for the U.S. Life and Health Insurance Industry" by the Center for Futures Research at the University of Southern California.

ISSUES MANAGEMENT

Issues management is perhaps not a futurism technique by strict definition, but it is an application of futurism ideas by organizations. Most typically it involves scanning the environment in which the organization operates to identify the emerging issues and to categorize them by priority. Action is initiated either to avoid potential problems or to present the best light possible on problems which cannot be avoided, or in some cases to exploit opportunities which are identified early. Such a process is carried out formally by many corporations such as AT&T and Sears, and by the American Academy of Actuaries.

SIMULATION AND MODELING

Simulation incorporates characteristics of a particular system and introduces randomness into various components. The technique is used to explore the range of and nature of outcomes likely from such a system. Mathematical model building can also be useful to a study of the future even without the incorporation of random processes. The process of modeling is often instructive itself. A properly constructed model can synthesize known quantities and relationships

PRACTICAL APPLICATIONS OF FUTURISM

and can help identify the significance of factors which are not fully understood by answering "what if?" questions. Peter Plumley will discuss his modeling of the AIDS epidemic later.

SCENARIO WRITING

A scenario is a coherent description of a future situation. It can either describe a fixed point in time, or start from the present and explain how events unfolded to arrive at that point, to show that a particular situation could exist in the future. Scenario writing is the most common and often the easiest method of generating ideas about alternative future possibilities. It can be done by an individual or it can be a process of synthesis, using the results of the previously described techniques to create a "believable" picture of several alternative futures.

Scenarios often extrapolate current trends but they also can incorporate surprise events or various possibilities for a major influence or factor. The SSA has just published a strategic plan based on one scenario for the SSA in the year 2000. Gulf Oil Company uses a multiple scenario approach in its strategic planning.

CROSS-IMPACT ANALYSIS

This is the organized quantitative identification of underlying forces operating on an organization and the various outcomes likely with each of those forces, as well as the impact of each force on the other forces. All of the various combinations are systematically reviewed to see which are likely and which would have important impacts on the organization. Barry Halpern will say more about the technique.

MR. BARRY S. HALPERN: My stated task is to stimulate your thinking about how the various futures research techniques might be helpful to you in your actuarial-related activities. I'd like to start with a brief anecdote regarding my discussions of futurism with a co-worker and friend who is also an actuary -- we'll call him Mr. Skeptic.

Mr. Skeptic has always been just that -- very skeptical -- about the utility of futurism, and also wonders why an otherwise, seemingly intelligent person such as myself would get involved in something that was of absolutely no practical value. I always tried to point out how I thought it was helpful to think about how things might be in the future, about how what we do today might turn out a few years from now. I'd add that if we thought more about how we wanted the future to turn out, then we'd be better able to take the strategic steps that would get us there.

Since Mr. Skeptic is an individual life pricing actuary, I'd suggest that he think about what would happen if his basic pricing assumptions didn't turn out as he'd hoped or expected. He would respond that he could do that, but he didn't have to waste time with all these futurism techniques and activities that really didn't seem to produce much useful information or that didn't have any sound mathematical basis.

He'd argue further that, despite all our alleged scientific application of futures techniques, we still didn't really seem to be able to predict the future any better.

Well, I'm not here to teach you how to predict the future any better. I'm not here to convince you that futurism is the true religion for actuaries. I am here

OPEN FORUM

to illustrate how futures techniques, if applied knowingly and in a deliberate fashion, can be extremely valuable in our work.

I'm not going to do this by presenting techniques, teaching you their applications, and then exhorting you to go out and use them. Rather, I'm going to show you how these techniques have been used in the past -- by actuaries in actuarial jobs, by actuaries presenting sessions such as this one in our regular meetings and later published in the *Record*, and by actuaries in papers accepted for publication in our *Transactions*.

Yes, I'm going to show you how we've practically applied futures techniques in the past by giving you real examples. In some instances, I'm going to suggest that a greater awareness of the techniques available and their applications might have added or enhanced the presentations made.

Hopefully then you will have had an opportunity in your round table discussions to think a bit more about these techniques and how you'd use them in your day-to-day work. Before I'm finished, I'll come back to Mr. Skeptic to bring you up-to-date on his views of this.

"The work of science is to substitute facts for appearances and demonstrations for impressions." This quote by Ruskin is the motto of the SOA.

What I suggest to you is that those appearances and impressions may be a whole lot more important than we've thought. Particularly in an era of such rapid change, uncertain or unpredictable trends, and unforeseen future, facts are hard to come by. Demonstrations may be impossible. Therefore, as actuaries who have to think more and more about the future and the changes to come, and be more aware than ever that there are a multitude of alternative future possibilities, we need to realize that we won't always have the hard data we need to apply to our financial results. We may actually have to live with appearances and impressions.

It was in the latest Star Trek movie, towards the end, when Mr. Spock was fretting over his shortage of facts needed to make a calculation on which the lives of everyone on Earth depended. He was told to make a "guess." While this went against his purely logical mind, he made the best use of the facts available, and it was said that his guess was better than most people's facts. I suggest to you that even though you may not have all the facts, or may not be able to make a totally satisfactory demonstration, your training, background, and aptitude make your guesses better than most people's facts.

TECHNIQUES

Let's list once again the array of futures research techniques available, ranging from the very simple to apply to the most complex:

Environmental scanning/literature search

Extrapolation/trend monitoring and analysis

Economic models

Demographic forecasts

Technological forecasting

PRACTICAL APPLICATIONS OF FUTURISM

Issues analysis and management

Simulation and modeling

Delphi studies

Scenario writing

Cross-impact analysis

I'd like to just briefly discuss three of these: Delphi studies, cross-impact analysis, and scenario writing. I believe that it is these three techniques that many of us use without recognizing that we use them -- probably because we don't know what they are. In doing this, therefore, we don't get the full benefit out of what are very powerful methods for describing alternative futures.

What is Delphi? The textbook definition is that it's a "systematic, iterative method of forecasting based on independent input from a group of experts on the subject in question." In conducting a Delphi study, we try to obtain a consensus of opinion regarding future events. The keys to a true Delphi are that the panel of experts is unaware of the responses of the other panelists -- that is, they don't know who said what -- but they do know what the other answers were, and are given an opportunity to change their answers through iterative questioning.

Because of this iterative questioning and review, and the knowledge base of the panel, the forecasts and judgements made are very, very believable and accurate. When used as the foundation for writing a scenario, you can construct a very believable alternative future.

The cross-impact technique evaluates the relationship between events. It "orders" relationships by providing a chain of events. For example, in cross-impact analysis, we might make up a list of events that concern us -- the list could be brief (20 or so) or lengthy (up to 100 or more). One event might be "Congress passes legislation taxing the inside buildup of life insurance cash values." Again, we'd use a panel of experts to assign probabilities to the events' occurrence. We'd also assign an impact -- if this event occurs will the impact be positive, negative, neutral, and how much so?

Again, as in Delphi, we can use the results from this analysis as the basis for constructing a scenario of a very believable future. In fact, there are several very complex computer software programs that will help you go through a cross-impact analysis, and then play out the probabilities, essentially constructing a scenario for you automatically.

Finally, scenario writing -- this, I believe, is the technique we use most often without knowing it. It combines the results of many of the other techniques by making the scenario more believable. In using this technique, your scenario -- your vision of the future -- is enhanced if you've previously thought about, and listed, the key elements that make up that future world. By this I mean that you need to have constructed not only the economic environment, but the social environment as well. Also, when you think about scenarios, don't start today and work your way into the future. Start in the future, and work your way back to the past. This subtle change in perspective will make your future more

OPEN FORUM

believable, and it will enable you to understand better the events that must happen to carry you there.

EXAMPLES

Valuation Actuary

In my review of the *Record* of past Society meetings, there are a wealth of examples of applications of these techniques. Most recently, there have been a number of sessions on the "Selection of Scenarios and Assumptions for Valuation Actuary Work." While I am not a valuation actuary -- actually I was at one time, for a whole six months -- I believe I am qualified enough to comment on the techniques that are available.

Obviously, the use of the term "scenarios" strongly implies that this is a futures-related technique. However, as it's normally discussed in connection with that subject, it's more in the nature of selecting a number of financial alternatives and running various projections. That's not really a complete scenario. A true scenario would look at the various futures that would exist in the world created by the various interest rates, lapses, mortality assumptions, etc., that are inherent in the valuation actuary projections.

The valuation actuary, in certifying that assets and liabilities are appropriately matched, needs to run through a series of tests of varying interest rate situations, all the while using relevant asset turnover, default rates, call rates and so forth. On the liabilities side, sensible lapse rates, cash flow rates, and interest-crediting strategies need to be reviewed. This is an extremely complex and time-consuming process, and the reasonableness of the world implied by the scenarios constructed can easily get lost.

I would suggest that before the "scenarios" are run, the valuation actuary should look at probably two or three key scenarios -- a middle of the road, plus two extremes. Now obviously New York requires that certain criteria be met, and I'm not suggesting skirting those. I'm only suggesting that as a proper management tool, the scenarios selected be placed in their proper context -- and while we may normally look at the economic environment associated with the interest rate scenarios selected, we should also look at the social and demographic situation that's associated with the various possibilities. Once that's done, then the other assumptions can easily be set, or generated by computer modeling, and would be internally consistent.

The selection of the right scenarios lends itself to use of some of the other futures techniques. For example, the literature search or environmental scan can suggest likely futures, as well as identifying which discontinuous possibilities might exist -- that is, which events or trends, if played out, would cause you to move from one paradigm, or worldview, to another. It is these discontinuities in events, just as discontinuities in mathematical projections, that cause the greatest disruption and are the most difficult to project.

The cross-impact technique, while one of the more complex futures research techniques, would be valuable here. That is, we'd look at the interrelationships of how the occurrence of one event would impact the other, or increase or decrease the other's likelihood of occurrence. What I'm suggesting here is that while we may informally use impact analysis techniques when we think about the effects of some of the scenarios we consider, we would benefit by making a more formal use of this technique.

PRACTICAL APPLICATIONS OF FUTURISM

Future of the Actuary

Another recent application of futures techniques has been the discussion of the future of the actuary, or the actuary of the future. In fact, there's a session on this subject at this meeting. Here again, the scenario technique has been used. And in this case, I believe it has been used to greater benefit than with the valuation actuary concept. Place yourself in the future. Use your imagination, based on the facts and demonstrations that you have at your disposal, to create a future in which you exist. Now imagine what has happened to get you there. This is very, very different than taking today's world, and creating a step-by-step diagram or plan to take you from here to there.

I'd like to interject here that this subject was covered in a paper, in 1974, by Jack Bragg, called "The Future of the Actuarial Profession as Viewed in AD 1974." That's a good example of a scenario where we are placed in the future, and then told how we got there.

I think that greater use of the Delphi technique with this subject would be very helpful. Very simply, what is done here is to select a panel of experts in the subject area being studied. Presumably we are all experts in selecting the future of our profession. Survey them in the areas under study. Compile the results. Then go back to your panel and do it again, but give them the answers that you got from everyone else. In other words, you have a chance to change your mind.

The point here is that Delphi can be used in two ways. It can be used to predict the future from the present, and it's been a fairly successful technique for doing that. It can also be used to design the desirable future, based on expert input.

Other Subjects

Another subject that has utilized futures research techniques has been AIDS. Peter Plumley will be giving you a description of his modeling technique used to predict the future impact and consequences of the disease.

I know that we have had several sessions over the years that have offered specific instruction in some of the futures research techniques. For example, we've had a few sessions on scenario writing. We've had a session on the cross-impact analysis technique. This is really an excellent technique to enable you to think through the various impacts of the occurrence of alternate possibilities. Not only is the technique very helpful in strategic planning and long-range planning, it's helpful in product design for the individual life actuary, ranging from development of pricing assumptions all the way to development of marketing material.

We've had sessions on "The Future of . . ." whatever -- term insurance, permanent insurance, regulation, etc. The technique normally used is trend extrapolation -- what are the step-by-step increments that are going to happen in the future. Occasionally scenarios are used to allow us to take some discontinuous leaps, but not frequently. I suggest that this technique be used more in these types of sessions -- maybe then we would not always be surprised by some of the rapid changes we see.

In 1980, there was an entire meeting in Hartford devoted to three different scenarios for the future. What good did it do? It got the attendees and readers of the *Record* to think about the future, and to better prepare for change.

OPEN FORUM

Consider the "Future of . . ." type of session. Why do we have these sessions? They're always very well attended. Therefore, we must want to understand better where we are, how we got here, and where we are going. Wouldn't it be to our advantage if we had a better constructed framework to deal with the latter (where we're going)?

The actual sessions involved tend to stay within the mainstream and deal only with the past and the present -- even though the session's title deals with what's going to happen. We don't look often enough at the potential for discontinuous change -- such as a market crash, or explosively volatile interest rates, or significant tax law changes, for example.

How do we do what I suggest? It's up to the moderator to put the session together. The panelists are prime candidates for a limited Delphi, conducted by the moderator. Get the panelists to speculate on what might be, or what we want to be. The audience can use this information in product design, valuation, marketing, or whatever activity they're engaged in.

One other point before I leave this topic. One observation I'd make from looking over the past SOA publications relating to "The Future of . . ." "The Future of" usually means one year. It shouldn't.

Future of regulatory environment -- understand the past, look at where we are now, project trends into the future, and consider discontinuities -- that was the stated objective. The result was only to look at what actually happened. We also don't look at improbable events, even though their effects may be major.

Trends in nontraditionally marketed health products -- we tend to look at trends to date and stop -- let's speculate on the future. Use Delphi, scenario or cross-impact.

Impact of socioeconomic changes on employee benefits -- use demographics, trend extrapolation and predict behavioral and attitude changes.

Future of health-care financing -- this was a debate on what might happen in the future, a form of Delphi.

Future of retirement income plans -- in describing the future, we go step by step, instead of figuring out where we want to be and then working backwards.

Future of deferred annuities, non-cancellable disability income, individual life insurance, and private pension plans.

CONCLUSION

Let me now go back to my friend, Mr. Skeptic. I'll first say that I haven't really changed his attitude towards futurism. He's still a skeptic. On the other hand, I've seen some recent work products of his, one in particular related to AIDS and its future implications. I saw that he was actually applying the results of his own personal literature search, trend analysis to project results, informal Delphi through repetitive questioning of experts on the subject, and finally scenario writing by describing at least three possible futures, qualitatively and quantitatively, using the scenario technique.

When I pointed this out to him, he of course was taken aback that he might be a futurist without knowing it. While I didn't get a whole-hearted endorsement, I

PRACTICAL APPLICATIONS OF FUTURISM

got a grudging acknowledgment that "Hey, maybe this stuff isn't as useless as I thought." I considered that a tremendous personal victory.

I know that I may have sounded a bit like a preacher. But I believe that in order for "practical applications" to really have any practicality, one has to be convinced of the utility of the science. I hope that the examples I've given will cause you to look at futures research a bit differently than before. It's kind of like getting my kids to try a new food -- if I don't tell them they're eating it beforehand, then I have a better chance of getting them to like it. So what I'm telling all of you is that you are already futurists. I encourage you to become *more aware of some of these techniques and apply them more scientifically to what you do.*

I'd like to close with a quotation from a passage that I've considered quite extraordinary and powerful since I first read it:

"There are many things to suggest that we are now in a phase of rapid and unprecedented development. The conditions under which men live are changing with an ever-increasing rapidity, and, so far as our knowledge goes no sort of creatures have ever lived under changing conditions without undergoing the profoundest changes themselves. In the past century there was more change in the conditions of human life than there had been in the previous thousand years . . ."

While this may just sound like another futurist spouting off, in a sense it is. The only difference is that when this passage was first delivered in the hopes of encouraging futures thinking, the writer's voice was but one of one. The writer was H.G. Wells, and the date was January 24, 1902.

So the idea of change is certainly not new, and for us to think we are somehow unique or different than our past counterparts is naive. Where we have the opportunity to differentiate us from our history is to apply new and different techniques to the changes that lie ahead.

MR. PETER W. PLUMLEY: Today, I would like to do two things. First, I would like to present a model which projects the AIDS epidemic based on assumptions as to sexual and intravenous (IV) drug behavior. I believe this is a sensible approach to AIDS modeling because, let's face it, the AIDS epidemic is changing sexual practices, and no model is going to be valid unless it reflects such changes.

Second, I want to discuss some of the secondary effects of the epidemic. To the best of my knowledge, these have not been addressed to any degree up to now. Yet I believe that, for most heterosexuals, they are far more important than the epidemic itself.

A number of models of the epidemic have been developed. Many are quite sophisticated, while some are relatively simple. Unfortunately, there appears to be a dilemma with most of these models. If the model attempts to allow for all of the parameters that really are necessary to project the epidemic precisely, it turns out that most of the parameters cannot be measured with any degree of accuracy, and so the model has relatively little practical value.

On the other hand, some projections have been so simplistic that they have already turned out to be grossly inaccurate. For example, a couple of years

OPEN FORUM

ago, the Chicago Health Department projected the AIDS epidemic simply by doubling the number of cases every ten months, based on the experience to date. Then when the numbers turned out to be significantly lower than projected, a spokesman gave credit to the educational program begun only a few months earlier! Obviously, he didn't know much about incubation periods.

The model I have developed projects the epidemic based on the sexual and IV drug activity which is the basis for about 95% of the AIDS cases. By doing so, it makes it possible to do sensitivity analysis on the effect of behavioral changes on the epidemic. By using the projections developed by this model together with additional assumptions as to underwriting rules, average amounts, claim costs, etc., it should be possible to get a reliable estimate of future AIDS-related insurance claims for reserving, rate-making, and other purposes. It also should be easy to modify these estimates as more data become available regarding behavioral changes.

The basic concept of the model is that, because AIDS is transmitted primarily by certain definite activities, it is possible to develop a predictive model in terms of those activities. The model operates in three major phases. These phases develop:

1. The number of human immunodeficiency virus positive (HIV+) persons;
2. The number of persons developing AIDS; and
3. The number of deaths from AIDS.

In order to develop the number of HIV+ persons, the population is divided by sex, race, and risk group (i.e., homosexual, bisexual, IV drug user, and other heterosexual). The number of new infections is calculated based on the behavior characteristics for each risk group, combined with the probability of infection for each type of behavior.

The number of persons infected in each calendar year form a cohort in the infected group. The number of persons developing AIDS is then calculated by applying the appropriate probability of developing AIDS based on time since infection. The total number of new AIDS cases in a year is the sum of the new cases from each cohort.

A similar technique is used to calculate the number of AIDS deaths. The AIDS cases are maintained by cohort. Mortality rates are applied based on time since the onset of AIDS. The total number of deaths is the sum of the deaths from each cohort.

The model uses a trial and error process to validate its assumptions. It starts with an assumed number of HIV+ persons in each race, sex, and risk category in 1981. By assuming various average numbers of sexual and IV drug acts during the intervening years, the number of AIDS cases for each year through 1987 can be calculated using specific formulae. These figures then are compared with the actual cases, as reported by the Centers for Disease Control. The number of 1981 HIV+ persons and the frequencies of sexual and IV drug activity then are readjusted, until the calculated cases are close to the actual cases. Once this validation process is completed, it then is possible to project the number of AIDS cases and deaths and HIV infections based on any desired assumptions of future changes in sexual and IV drug behavior. By varying these assumptions, it is possible to show the effect of these changes on the progression of the disease.

PRACTICAL APPLICATIONS OF FUTURISM

The projections I have done so far have been on a national basis, without distinguishing by geographic region. However, to the extent that data are available on a more localized basis, such as by state or a group of states, the model could be used to project the epidemic for any such region.

To keep the model within practical limits, there is no segregation by social class or other strata such as degree of promiscuity. My studies indicate that, because of the nature of the validation process, this lack of segregation doesn't materially affect the results.

A number of other simplifying assumptions are also made. I have tried to develop a model which takes into account the parameters needed to give reasonably accurate results, without getting bogged down in those less important parameters for which no good data exist anyhow.

I would like to mention the "discrimination" and "knowledge" factors used in the model, because they make it possible for the model to measure the effect of certain educational and testing efforts.

First, the "discrimination factors." For years prior to 1987, the model assumes that heterosexuals engage in sexual activity with both IV drug users and non-drug users of the opposite sex, without regard to their drug habits. However, for years beginning with 1987, a "discrimination factor" is included in the formula, so that the model can measure the effect of various degrees of avoidance of heterosexual activity with IV drug users. In addition, also for years beginning in 1987, a second "discrimination factor" is included in the formula for heterosexual women to permit the model to measure the effect of various degrees of avoidance of sexual activity with bisexual men.

As I mentioned, the model also includes a "knowledge factor." For years prior to 1987, it is assumed that persons generally did not have knowledge of their HIV status, and therefore that, in choosing a sexual or IV drug partner, one would not be able to exclude anyone because he or she was infected. However, for years beginning in 1987, a "knowledge factor" is included in the formulae for all categories, to permit the model to reflect the availability of information on HIV status. In this way, the model can reflect the effects of expanded testing.

Now I would like to discuss a couple of the projections of the epidemic which I have done using the model. There are two projections, both done through the year 2000. The first assumes a continuation of my best estimate of 1987 levels of sexual and drug activity -- what I call my "worst case" scenario. In this scenario, the number of new AIDS cases per year in the U.S. will gradually increase from the 1987 level of around 21,000 to about 167,000 by the year 2000. By then, about 1.5 million persons will have contracted AIDS, and about 1.2 million of them will have died. However, it is encouraging to note that the projection shows that the annual number of new HIV infections will peak at about 236,000 in 1990, and will have decreased to about 143,000 by 2000. This indicates that the epidemic will be diminishing within a couple of years, based on the number of new infections, even under this "worst case" scenario. Unfortunately, one of the reasons for this is that the high-risk groups will have become so saturated with infections that there will be fewer of them left to infect.

There is also a projection based on what I call my "most probable" scenario. This scenario assumes the following:

OPEN FORUM

1. An additional 75% reduction in homosexual and bisexual activity from present levels by 1990.
2. A two-thirds reduction in IV drug activity using contaminated needles during the same period.
3. A reduction by heterosexuals in their sexual contact with bisexuals by 25% and with IV drug users by 75% over the same period, but otherwise no reduction in heterosexual activity.
4. Additional behavior modification arising from knowledge of the HIV status of persons with an HIV infection.

This "most probable" projection indicates that the annual number of new HIV infections peaked in 1986 at about 170,000. The number already is decreasing significantly, because of safer sexual practices by homosexuals and bisexuals. Further educational efforts, combined with identification of HIV+ persons, will cause the epidemic to decrease further in terms of new HIV infections, to 62,000 in 1993 and 44,000 by the year 2000, of whom 29,000 will be IV drug users.

The number of new AIDS cases, however, will continue to increase sharply for several more years, because of the time lag between HIV infection and the development of AIDS. The peak year will be 1995, in which about 93,000 persons will develop the disease.

The number of annual AIDS deaths will similarly continue to increase, peaking in 1997 before beginning to decrease. At the peak, AIDS deaths will account for about 4% of the total deaths in the U.S. This is far less than the proportion of deaths from cancer or heart disease; however, it should be remembered that most AIDS deaths occur at the younger ages, and that the average medical cost for a patient with AIDS is quite high.

Note that the educational and identification efforts presumed in the "most probable" projection will have a significant effect on the future of the epidemic. Assuming no further change in sexual or IV drug behavior, the projection shows that the cumulative number of AIDS cases would reach about 1.5 million by the year 2000. By contrast, the "most probable" projection shows that the cumulative number of AIDS cases will reach just over 1 million by 2000, for a total reduction of nearly 500,000 cases.

Obviously, the educational and identification efforts presumed in the "most probable" projection will be worthwhile, even though it will take a few years for this to become apparent from the data on new AIDS cases.

At the time I prepared this material, my model only projected the epidemic to the year 2000. However, I have since extended it to the year 2030. (Unfortunately, the full display of this projection takes 54 pages to print.)

At this point, some of you may be asking yourselves what practical value such long-range projections have for an epidemic that still has many unanswered questions. My answer is as follows:

- o First, we as actuaries have to make some kind of assumptions as to the future of the AIDS epidemic, now that it clearly is a factor to be considered by the insurance industry. Even a decision to do nothing is a

PRACTICAL APPLICATIONS OF FUTURISM

decision. Given that some decisions must be made, doesn't it make sense to make them based on projections that are based on a credible mathematical process, rather than merely guessing or doing some kind of "straight-lining?"

- o Second, there actually is quite a bit known about the epidemic, and the model makes use of this information.
- o Third, calculations based on assumptions many years into the future are nothing new to actuaries. We do it all the time for mortality and interest rates, even though we don't really know what the future will bring. Can you really say that my best estimate of the number of AIDS cases in the year 2018 is further off than an estimate made in 1945 of interest rates in 1975?
- o Fourth, there really is not such a wide range of possibilities as you might think. Here's where some of the futurism techniques mentioned earlier can be used. For example, my "worst case" scenario shows no reduction in IV drug use, even though nearly 90% of the IV drug users will be infected by 1997. I can't believe that this is realistic. Similarly, this scenario assumes very little effect from the "knowledge" and "discrimination" factors. Again, this would not seem to be realistic, given the trend toward education and testing.
- o I think that this approach to modeling the epidemic gives the actuary and the futurist an opportunity to show his skills in developing a credible set of assumptions. He can see how the epidemic is progressing based on a given set of assumptions, and then ask himself three questions:
 1. What if I vary my assumptions? How will it affect the results, both for the next year and the next several decades?
 2. Is this combination of assumptions reasonable, given current knowledge of societal behavior? If not, how should they be adjusted?
 3. What is the probability that something will happen to change the course of the epidemic? For example, mandatory testing of certain groups, the development of an expensive drug to slow the progression from HIV+ to AIDS, or even a cure for AIDS? Should I consider such possibilities in measuring my company's exposure to the AIDS risk?

I believe that many of the techniques of the futurist can be used in combination with the model, to provide a better understanding of where we are going with respect to this epidemic, and what it means to your companies.

Now I would like to turn to some of the secondary effects of the AIDS epidemic. For a couple of years, the media has been flooded with stories about the epidemic. Because the media thrives on drama, and particularly sexual drama, many of these stories have been more dramatic than informative. The result has been that people have become fearful of the disease. Frequently, this fear has far exceeded the actual risk. While the risks to homosexuals and IV drug users are very great, for the heterosexual not involved with those in "high-risk" groups, and that includes most of us, the risks are trivial -- far smaller than the general risks of death from other causes that we have every day of our lives.

OPEN FORUM

Yet the fear is there for many, irrational though it may be. Surveys have shown that, not only do many fear the risk of AIDS from sexual activity far more than they should, but disturbingly large percentages of people are concerned about getting AIDS from activities which pose no risk at all -- activities such as sharing dishes with AIDS victims, or donating blood, just to name a couple. These fears are posing grave threats to our civil liberties.

But we are not here as "card-carrying members of the ACLU" -- we are here as actuaries. How do these fears translate into problems which you as insurance company or employee benefit actuaries, and as futurists, should take into account? Well, the answer is that we don't really know at the present time, but here are a few possible questions which you might want to consider:

1. What will increased stress levels from the fear of AIDS do to future mortality rates? You may think that this is a trivial question, but consider the following comparison. The AIDS risk means that if a 30-year-old man has a one-night stand with someone not in one of the high-risk groups once every week for the rest of his life, he will decrease his life expectancy by a single day, based on present risk levels. On the other hand, if the increased stress he incurs from the fear of AIDS and its related effects causes an increase in his mortality rate from heart disease by just 1%, it will decrease his life expectancy by 18 days!
2. Will decreased sexual activity mean higher mortality rates? We don't really know the relationship between sexual activity and good health, but there does seem to be one. This seems to me to be a subject worthy of more research.
3. Many young men and women have all but given up dating because of their fear of AIDS. What will this fear do to marriage rates and family formation over the next decade or two? And how will this in turn affect mortality and morbidity rates? How will it affect the need for insurance products that depend on family formation?
4. We are teaching our children that sexual intimacy is something to be feared rather than enjoyed in a responsible way. How much sexual dysfunction will this cause in the years ahead? What will be the medical costs?
5. I should also mention the many other questions which already have been raised with regard to employment practices, discrimination, and civil rights. I'm sure many of you are familiar with these, and so I won't go into them here.

We also should consider some of the effects of medical advances as a result of the AIDS crisis. First, let's assume that some drug -- perhaps a variation of azidothymidine (AZT) -- is found to significantly delay the progression from HIV+ to AIDS. What will be the impact? We can only speculate, but here are a few possible effects:

1. There would be a vast increase in testing, because people would be able to see a real benefit from knowing if they were infected. Today, of course, knowing that you are infected does you little good -- which of course is one reason many people don't want to be tested.

PRACTICAL APPLICATIONS OF FUTURISM

2. There also could be a substantial increase in medical costs, depending on the cost of the drug, because all of those testing positive would want to have the drug.
3. If the drug were expensive and only marginally effective, the fear of AIDS might be just as great as before. However, if the drug were totally effective, or nearly so, and if it were not prohibitively expensive, it might greatly reduce the concerns that people have about becoming infected, because they would realize that they could be successfully treated, and that the disease was not life threatening, given proper treatment. This could, in turn, further increase medical costs.

Finally, let me close this presentation by suggesting some of the long-range implications of the AIDS epidemic. Today, there is a great amount of research being done to find a cure and a vaccine to combat AIDS. In the course of this research, fundamental discoveries are being made in various medical fields. We should ask ourselves, what will be the long-range implications of these discoveries? In 10 or 15 years, will we be well on our way to curing cancer? Will the medical research lead to ways to slow down the aging process? If so, what will be the cost if everyone wants "anti-aging" pills? How will it affect Social Security and other pension costs?

We don't know the answers to these questions, of course, but remember that, even if such discoveries are some years away, they can have a significant effect on mortality costs for life insurance contracts being issued today. It would be interesting to feed in the extra mortality costs from AIDS, together with assumptions as to the later mortality savings from medical research related to AIDS, and see which actually has a greater impact on rates and reserves. The answer is not immediately clear, and obviously depends on the assumptions used.

I hope that this discussion has given you all some food for thought.

QUESTIONS FOR DISCUSSION

- 1) What aspects of your specialty have changed rapidly in the past?
- 2) What aspects do you perceive to be changing now?
- 3) What trends and cycles are affecting the changes?
- 4) Which futurism approaches would clarify the nature of future change, if someone with unlimited resources were to use them?
- 5) What approaches might an individual company or organization use to investigate the changes?
- 6) What specific approaches could you consider in your own situation?

REPORTS BY INTEREST AREA

Health

We were discussing a lot of issues. The main issue we were talking about was the growth in health care cost as it relates to overall gross national product. How much further can health care costs eat up the gross national product? Where do we have to draw the line when making projections?

OPEN FORUM

We discussed a number of factors that would influence this type of projection -- the doctor population, the population of nurses and other medical professionals, the demographics, the uninsured people problem.

We also discussed a number of possible scenarios that would develop and one of them would be national health insurance or the expansion of Dukakis-style universal health care by employers or the maintenance of the status quo or a further polarization whereby the rich get richer and better medical care and the poor get poorer.

We also batted around a couple of issues on HMOs, mental health, substance abuse cost, the growth of outpatient costs, and possible results of the earlier detection of diseases, for example, through genetic tests which are now being developed. And, we discussed the possible applications of futures techniques such as the Delphi method, scenario writing, extrapolation, simulation and model building and economic evaluation. A number of them would be useful for our health care industry.

Miscellaneous

We decided a quote from the well-know futurist Woody Allen could sum up our far range of discussion. "More than any time in the past, mankind faces a crossroads, one path leads to despair and utter hopelessness, the other path leads to total extinction. Let us pray that we have the wisdom to choose correctly."

Financial Reporting

The late 1960s and 1970s had fairly stable reporting results. Now things have jumped all over, and now actuaries are talking about telling results that might range from here to there, and we report to non-quantitative people. One of the people in our group was talking about the price of a variable life policy back in the 1970s, running 10,000 scenarios to see what the variations in results might be because of the stock market performance. He came up with a set of rates over various ages and his own boss, who's an FSA, asked, "Could you get me those same rates," and he said, "I'd have to run 100,000 scenarios." So we're really getting to an extreme point and that, I think, was a terrific illustration of that problem. Even our own people still live in the deterministic cycle and we're getting towards scenarios and futurism methods, but it's a long way to go in communicating.

Financial Reporting

We're also from Financial Reporting. We are an interesting table, in that we have four countries represented. We have one South African, an Australian, a Canadian and the rest United States. We had a wide-ranging discussion. There were two particular things we talked about in Financial Reporting. We were looking at world-wide trends. One that seems very clear is that there is a world-wide trend for assets of insurance companies to be reported on a market value basis. This has happened already in the United Kingdom and South Africa and it's moving that way in Australia. I think that has to be ultimately the direction it takes, particularly when investment directions appear to be very dynamic in moving in and out and selling fixed interest investments very rapidly which means that book values are becoming obsolete.

The second point, and this was a fascinating one, concerns valuation reporting methods. In the United States you already have the Statutory basis and GAAP Accounting. I think your biggest problems here are letting your accountants

PRACTICAL APPLICATIONS OF FUTURISM

decide what the valuation bases are. This, I think, is one of the major problems. Canada's going a different route. The proliferation of valuation bases is going to give us many major problems down the track and I think certainly the actuaries and accountants are going to have to talk to each other. I think there is going to have to be some rationalization because we can't end up with several valuation bases, particularly valuation basis for tax and valuation basis for GAAP Accounting, like the United States and the United Kingdom. Certain accountants and actuaries are talking about value-added accounting as being the only basis to use.

Product Development

We didn't talk about Product Development a whole lot, although we did acknowledge one trend that has affected Product Development very much. It is that of a much shorter product life span and a need to be able to plan on that.

We spent a lot of time talking about scenarios and three of the companies represented. One company does all its planning on one scenario which is all in the mind of the CEO. Another company (a corporate area) comes down with a scenario and a lot of wild cards for which business units are supposed to plan around the eventualities. A third company specified that each business unit was supposed to develop its own wild card and make contingency plans around those eventualities.

AIDS

We basically talked about different models of the spread of the AIDS infection and it revolved primarily around the spread of two non-IV-using heterosexuals with one view being basically that that spread is pretty slow and there isn't a lot of danger there. The question is whether that is really true, whether it would be more like the spread among homosexuals, and these views lead in two different directions; one is a lot scarier than the other, but there was really no conclusion as to what the actual course would be.

Pension

Demographic patterns and trends are something that we have to look forward to in trying to forecast the future. We seem to be driven heavily by regulation. Any kind of economic forecast scenario creating and testing is something that you could use as well. It would be good to get a handle on the societal trends such as attitudes of employees and employers and the changes in those attitudes and how that would affect different products, trends and plan designs in the future.

