

**1990 VALUATION ACTUARY
SYMPOSIUM PROCEEDINGS**

Session 5

Open Forum: Long-Term Health Insurance Risks

**Individual Major Medical (Under Age 65) Rated by Attained Age
Bernard Rabinowitz**

**Long-Term Care
Helen Hofmann**

**Long-Term Health Insurance Risks
Arthur L. Wilmes**

INDIVIDUAL MAJOR MEDICAL (UNDER AGE 65) RATED BY ATTAINED AGE

MR. BERNARD RABINOWITZ: First, I will discuss the long-range risks affecting individual major medical insurance.

Second, I will discuss the use of financial projections for illustrating these risks. Please note that a gross premium valuation merely discounts the net cash flow of the financial projections into a single number. It is more informative to deal with the components and dynamics of a financial projection than with the single number produced by a gross premium valuation.

I'm going to discuss these from the viewpoint of a valuation actuary who has to explain to top management the nature of these risks, how these risks may be managed, and potential financial surprises.

To do this, he or she has to have good statistics, do a thorough analysis and present the results by using multiple scenarios. In this way, the valuation actuary is integrating cash-flow testing with assisting top management in managing this line of business.

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The long-range risks that have to be considered are:

- Agency Antiselection (e.g., against underwriting rules, moving business on rate increases)
- Policyholder Antiselection (e.g., by benefit/deductible selection)
- Inability to get timely rate increase approvals
- Regulation (e.g., mandated benefits)
- Extra Lapses on Rate Increases
- Antiselection on Withdrawal
- Rate Increase/Antiselection Spiral (discussed later)
- Action of Competitors (HMOs, PPOs, Ins. Cos.)
- Catastrophes (Epidemics, AIDS)
- Changing Public Attitudes
- General Economy (Employment Cycles)
- Claim Trends (see below)

Claim trends can be broken down into the following factors:

- Medical Component of CPI
- Cost Shifting (because of Medicare, HMOs, PPOs)
- Cost Containment Activities (e.g., utilization review)
- Changes in Medical Practice (e.g., more testing, more procedures, unbundling)

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- Advances in Medical Technology (e.g., CAT-scans, magnetic resonance imaging)
- Shifting of Services (Inpatient vs. Outpatient)

Note that these are the same risk factors that a pricing actuary considers in developing a marketable product. The pricing actuary is concerned with the potential of a profit. The valuation actuary, however, considers these risk factors with the full range of financial outcomes in mind.

For those of you unfamiliar with the business, I recommend that you review the health insurance topics in the *Record* of the Society of Actuaries over the past five years.

Again, the most effective way of interacting with top management is through the use of detailed financial projections using a variety of scenarios.

The valuation actuary needs to understand all the elements of this line of business -- both external and internal and build a model accordingly. This calls for studying and understanding the following:

EXTERNAL ENVIRONMENT

- General Economy
- Health Care Delivery System and Its Economics

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- Regulatory Framework
- Claim Trend Factors
- Public Attitudes

INTERNAL ENVIRONMENT

- Functioning of
 - Marketing and Sales Departments
 - Distribution System
 - Underwriting Department
 - Claim Department
- Statistics Relating to
 - Lapses by Plan, Age, Sex, Area, Agency
 - Extra Lapses and Antiselection on Rate Increase
 - Claim Costs by Plan, Age, Sex, Area, Agency
 - Deterioration of Claim Costs with Time

COMPETITIVE ENVIRONMENT

- Identification of Competitors
- Distribution Systems of Competitors
- Competitors' Products

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- Rate Competition

The valuation actuary is now in a position to build a model to project financial results on a variety of scenarios.

Just discussing with top management the reasons for the assumptions underlying each scenario and the resulting financial outcomes, has in our case led to proactive strategies.

The model that I favor is updated quarterly. It projects monthly results for the next 24 months on both a cash and accrual basis. This enables actual monthly results to be compared with projected. The mere researching of these differences has greatly improved our understanding of the dynamics of the business.

Typically a model cell is set up by plan, state grouping, issue month/year, and premium mode.

The cells may be less refined for smaller, older blocks.

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MODEL CELL

- Plan
- State Grouping
- Issue Month
- Issue Year
- Premium Mode

INPUT DATA

- Number of In-Force Policies
- In-Force Premium
- Base Claim Cost Per Policy
- Lapse Rates
- Trend Factors *
- Deductible Leveraging *
- Projected Rate Increases *
- Extra Lapses on Rate Increase *
- Antiselection on Extra Lapse *

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- Wearing Off of Initial Selection
- Antiselection on Regular Lapse
- * These are interrelated. Trend factors lead to deductible leveraging and rate increases. Rate increases may cause antiselective extra lapses, which in turn may cause poorer than expected experience and thus cause further rate increases.

The following is a typical projection formula for cash premiums and incurred claims. Unearned premiums are determined from mode and average due day. Cash claims are derived from the completion factors used for determining claim liabilities. Other items such as investment income, expenses, commissions and taxes are projected using standard techniques.

TYPICAL FORMULA

$$P (M+1) = P (M) * A * W * R * K$$

$$C (M+1) = C (M) * T * A * S * W * K / (1 - Z * k)$$

where the following relate to month M

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P (M) = Cash Premiums

C (M) = Incurred Claims

A = Rate increase factor due to age change only

W = Regular lapse factor = $(1-w)$

R = Projected rate increase factor

K = Extra lapse factor (usually a function of R) = $(1-k)$

T = Trend factor (including deductible leveraging)

S = Initial selection wear-off factor including antiselection from regular lapses

Z = Antiselection factor between 0 and 1

(0 = no antiselection)

(1 = 100% antiselection)

k = Extra lapse rate due to rate increase

w = Lapse rate for the month

My experience has been that the more we know, the more refined we want to make our models. Given the small profit margins and the profit volatility, it is critical to study the experience monthly.

LONG-TERM CARE

MS. HELEN HOFMANN: I will discuss what I see as the long-term risks of long-term-care products and how they could potentially affect the adequacy of reserves and/or surplus.

First, I will briefly outline the points I plan to cover. After giving some background on the growth of long-term-care coverage, I will discuss the long-term risks. The underlying problem is the lack of data on the insured population. We will cover why those data are not there. Next we will review the effects on reserve adequacy of future claims, persistency and interest rates. Then we will comment on the impact of recent developments -- home health benefits, extended maximum benefit periods and competitiveness in the marketplace. Finally, we will examine solutions for dealing with these risks -- managing the risk and testing for adequacy.

Long-term-care coverage is rapidly growing. Along with the fast pace in growth of coverage is the growth of reserves. According to the Health Insurance Association of America (HIAA), Long Term Care Insurance Survey:

1. "The long term care market virtually began in 1985-86." This says this market is basically less than five years old.

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2. As of December 1989, the number of policies purchased had increased 36% over 1988.

The demographics are such that given the private sector remains in this market, future continued growth is anticipated. Between 1985 and 2000, the group of people over 85 years old is expected to grow by 90%. By comparison, the group of those 65 and older is expected to grow 22% and those under 65 by 10%. The higher growth rate of those over age 85 implies those using long-term care will increase rapidly.

Our company has been in the long-term-care market since late 1985, about five years, so even though this coverage is quite new for us, relatively speaking, we are veterans in the field. A summary of the growth of long-term-care reserves over this period of time, and the projected future growth (assuming a very modest sales growth of 5% per year), demonstrates the high level and escalating growth pattern of these reserves for a company that is in the long-term-care market.

Because of the rapid growth of this coverage and its reserves, I think the valuation actuary in a company that is in the long-term-care market needs to consider the long-term risks inherent in his company's business and the adequacy of the reserves.

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What are the long-term risks of your coverage? Our purpose is not to provide the answers, but to get us to begin thinking about the questions and to provoke some interactive discussion. Have you talked with your pricing actuary specifically about this subject as it relates to reserve adequacy? Much of what I will have to say on this topic arose from a discussion with our pricing actuary. As he says, the long-term risks of this coverage are similar to life insurance -- without the data to be as accurate.

Some data do exist. I will mention three sources. The first source, the 1985 National Nursing Home Survey, is available on nursing home utilization. Many companies have used these data as a starting point in their pricing. However, these are general population data and not data on the insured population.

Companies like ours that have been in the market a few years have data based on our own experience. This is the second source of data. We had been selling limited benefit nursing home policies since 1973. These products covered skilled, intermediate and custodial care. We had an exposure base to date on these products of over \$75 million of premium at the time we introduced our first long-term-care product. Now we also have some experience on our long-term-care products. But this experience is still immature. We have no data on the frequency of admissions to nursing homes at later durations. We also have little

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experience on continuance, given an individual has entered the nursing home, particularly for longer stays.

The Society of Actuaries is gathering company data, beginning with experience in 1984. This is potentially a third source of data, but I have not seen any results from that work yet.

Next, I will cover potential areas that could affect reserve adequacy.

1. What are the effects on reserve adequacy of future claims? What if the frequency and continuation are different from that assumed?

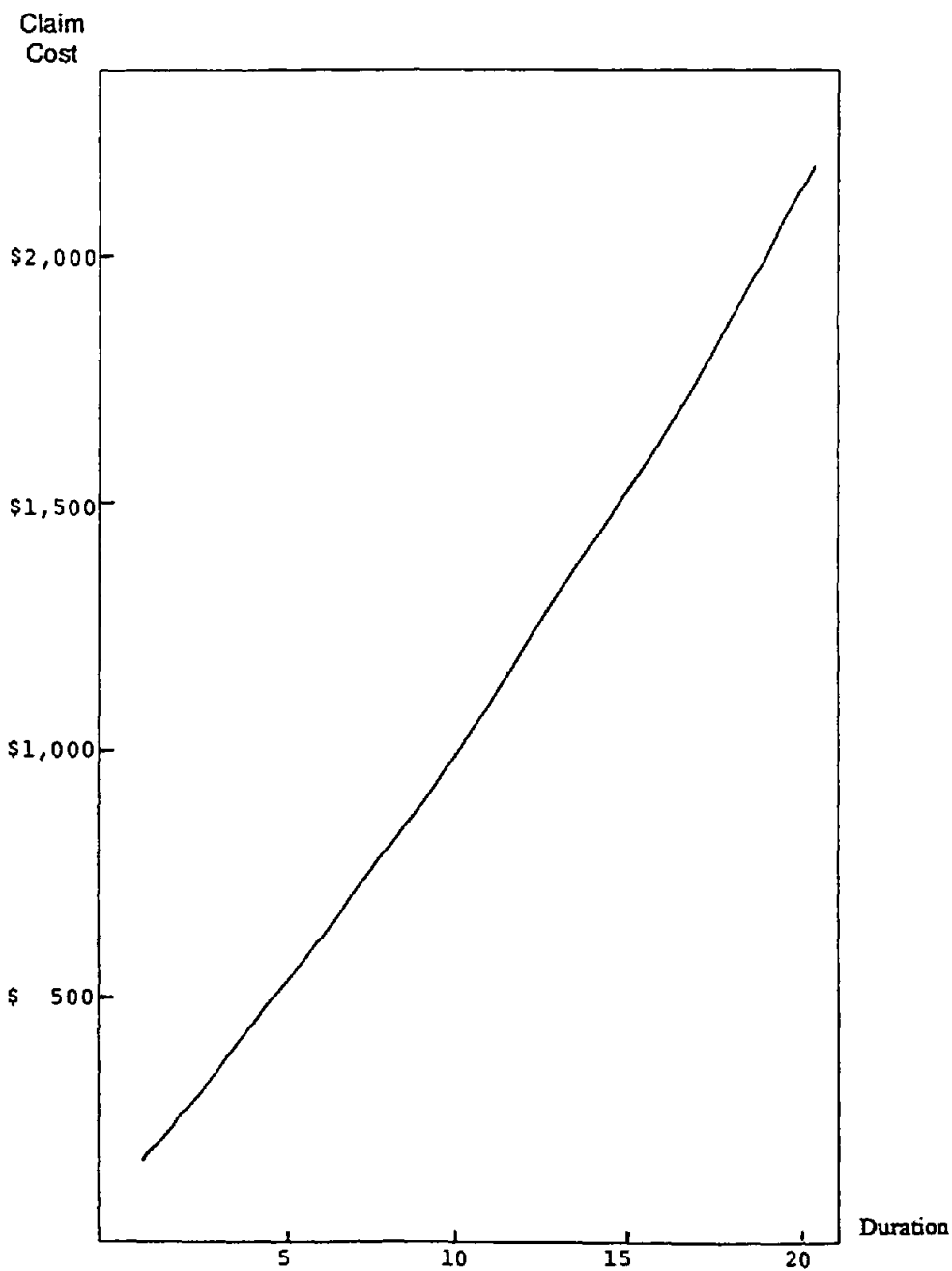
The slope is steep on claim costs by policy duration for long-term-care insurance, much steeper than those health actuaries are generally accustomed to (steeper even than the claim costs for disability income), as shown in Exhibit 1. For this reason reserves are high, and reserve adequacy is a greater issue.

The NAIC Model Act calls for guaranteed renewable products so termination of the business is not an option if the claim costs are higher than expected.

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EXHIBIT 1

LONG TERM CARE -- CLAIM COSTS PER POLICY



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Rates can be increased. Health actuaries are accustomed to the option of raising rates when claim experience is adverse. But this product is particularly price sensitive. This is not surprising since the premium can be as high as \$4,000 per year for a fairly comprehensive plan at age 79. There is a very strong risk of anti-selection when rates are increased, particularly on this product where the claim cost is very high for those who do utilize the coverage relative to the premium. We don't know what the regulatory climate will be in the future, and rate increases may be difficult to obtain.

The health care delivery system of the future and its impact on claim costs is also an unknown. Ultimately, on a closed block of business, many insureds will be in a long-term-care institution or receiving home health care benefits and will be on waiver of premium. How are waiver benefits being reserved?

What are the claim cost assumptions in the reserves? What kind of margins are in there?

2. Reserve adequacy on long-term care is very sensitive to the persistency assumption. Better persistency than assumed at the later durations with the steep claim cost curve

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could cause reserves to be inadequate. This is particularly a risk in combination with the potential for antiselection on rate increase.

3. The interest rate assumption also needs to be considered. Once again, except for disability income, this is an area to which health actuaries have typically given less attention, since reserves on other products are relatively low.

The interest rate assumption is very important on long-term-care products that have quite high reserves. For example, on a closed block of business we projected the contribution of investment income to the income statement. Within ten years, the ratio of investment income to premium is over 50%. This demonstrates the importance of investment income to this type of coverage.

Here many of the issues are similar to life insurance. What assets back your long-term-care liabilities? In some companies dominated by life insurance products, there may be a tendency to allocate the lower yielding assets that are not already allocated to the life and annuity interest sensitive products.

What impact do recent developments have on the long-term risks?

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Companies are now venturing into the field of home health benefits. The 1985 National Nursing Home Survey covers only care in institutions. Also, since this product is relatively new, very little company data are available.

Induced demand is another risk for home health care coverage. Statistics show that for every individual in a long-term-care institution, there are two people similarly disabled and receiving similar care at home. Demand for the services of long-term-care institutions is limited by the fact people don't want to go into an institution. There is also a limitation as a result of the number of existing long-term-care institutions. But, these limitations do not impact the potential for utilization of long-term health care benefits in the home. Also, much of the home health care is provided by relatives -- son, daughter or spouse. How will this change as insurance products provide coverage?

Second, there is some trend toward extended maximum benefit periods (such as lifetime benefits). The continuance on these benefits may well be higher than that on shorter maximum benefit periods. And it seems the probability for variance in the claim cost is higher.

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Third, competition in this market is intensifying, and it is becoming very market driven. This might be forcing more risk-taking in the area of pricing. It is important to understand how those pricing assumptions are impacting reserve assumptions.

What are the solutions for handling these long-term risks?

Many of these risks can be managed. For example, underwriting and claim administration can have a great impact on the level and variability of claim costs. Benefit provisions can also have some impact. Some think the use of activities for daily living as a requirement for receiving benefits can control costs better than current requirements.

How familiar are you with your underwriting standards? Have you discussed these issues with your underwriters and claim department personnel? This is particularly important when the product is new and administrative personnel may not be as familiar with the product.

What testing are you doing for reserve adequacy? For life and annuity reserves, states generally specify the mortality/morbidity tables and interest rates required for minimum reserves. Many states currently don't have such specific standards for health insurance. So the health actuary has an even greater obligation for ensuring that reserves are adequate.

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Reserve adequacy can be tested by performing a gross premium valuation. A simple proxy for a gross premium valuation could be the use of net GAAP reserves (reserves net of deferred acquisition costs). This could be used as a basis for determining the adequacy of statutory reserves.

A second type of testing that can be done is scenario testing or the projection of various alternative future cash flows based on some of the risks described earlier. Mr. Art Wilmes will discuss in much more depth some testing he has done using Monte Carlo techniques and multiple scenario testing. His testing was done on long-term disability which has many characteristics similar to long-term-care.

Our goal is not to paint a pessimistic picture of the future. New types of coverage are always experimental and involve some risk. The goal is to motivate us to think about the long-term risks and, more important, alternatives and solutions.

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MR. ARTHUR L. WILMES: Bernie and Helen discussed the types of risks involved with major medical and long-term care. I'm going to provide a little respite. Rather than talk about risks, I'm going to discuss ways to analyze risks.

Originally, I was going to start my presentation with the question, "What do the life actuaries know that we don't?" The life actuaries in my office tend to tell me everything that they know. About four years ago, I noticed they started doing these dynamic techniques for valuation. That really got me interested; in fact, it got me a little jealous.

There are some things that the life insurance actuaries know that maybe we don't. I'm going to present a case study of a deterministic method and borrow some interest-sensitive life actuarial techniques. There may be applications to individual health insurance, especially things that have long-term risks like LTD and long-term care. We are going to talk about non-cancellable disability from a valuation perspective. These techniques can also be applied to pricing. Assume that we have a level premium product that we can't change and we can't cancel. With long-term care, even if the product is GR, we are talking about a comparable rigidity in benefits, because there are political risks with long-term care that we have never seen before.

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With respect to valuation, we have three questions. The first question is, what will give us some confidence that we have a good and sufficient reserve established? The second question is, what is the risk or degree of certainty? The third question is, what kind of additional assets or surplus should we be allocating in addition to our tabular reserves? This is true especially in long-term care.

To deal with these questions, I would like to discuss two types of valuation techniques. The first, gross premium valuation, has been documented in actuarial literature for some time and, I think, has been read and used by health actuaries more frequently than the second type, dynamic valuation techniques.

Briefly, the gross premium valuation is a deterministic model -- you get one answer. The key difference between a gross premium valuation and a dynamic valuation technique, is that, with a dynamic technique, you introduce a stochastic process. You introduce some variability or randomness. You don't get one answer; you get a lot of answers. You can get as many answers as you want. It depends on how much persistence you have. That distinction is going to be a key difference between these techniques as we go through and do a comparison of how they are applied to an existing block of disability income insurance.

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Let's walk through a case study of an LTD block of insurance. Assume that we started issuing an LTD plan, non-cancellable, in 1985, and we have had some reasonable growth in the block of business. We had an original issue of \$67.5 million. The growth patterns have been 10-15% a year.

On December 31, 1989, we went through a tabular valuation process. We set up 1985 Commissioners Individual Disability Table A (CIDA) reserves at 5.5% for active lives and claim reserves on our open claims on the same tabular basis and interest rate. The total reserves are \$34.2 million. In addition to reserves, we are allocating 5% of our reserve as a margin in surplus. In terms of total assets for this line of business, we are holding \$35.9 million.

We can take the existing block of business and run a gross premium valuation on it. You calculate the present value of future benefits and expenses, and from that you subtract the present value of your future gross premiums. Reserves are ignored because the present values are calculated using the net investment earnings rate. With a gross premium valuation, we use best estimate valuation assumptions, something akin to natural reserves. If you do analysis of blocks of business, you probably do gross premium valuations. You end up with a present value of the future ins and outs. It is hoped your result is a positive value.

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One drawback to a gross premium valuation is you get one answer. If you want to get some feedback on the risk and variability associated with a line of business, the gross premium valuation is lacking. With our existing block of business, the majority of our acquisition costs have already been realized. We would hope that our future gross premiums would exceed our future cash-flow requirements for benefit obligations and expenses. How does that compare with the reserve that we have set up at December 31, 1989? It compares favorably. We have roughly \$36 million in assets, a negative gross premium reserve. That's good and sufficient, right? I don't know. All this tells me is, if we realize the assumptions used in the gross premium valuation, it is a good reserve number. But it doesn't tell us what could happen to the reserve adequacy if some random variations occur that aren't reflected in the gross premium valuation.

Again, I back up to some questions. Are my reserves good and sufficient? What is my risk? What's my confidence level on my reserves? I don't know these answers. The gross premium valuation doesn't give me enough information to tell me anything about these things. I can sit and discuss risk all I want, but I can't quantify it. Let's get back to what the life actuaries know that we don't know. They are trying to quantify risk. They are trying to develop confidence levels for the products they're selling, particularly their single premium annuities, universal life, or interest-sensitive-type products.

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I have tried to apply some of their technology to a long-term disability block of insurance. The risk in life insurance is the interest rate risk. In health insurance, our big risk, the majority of our cost, is the morbidity risk. The dynamic valuation technique will try to develop some randomness in the morbidity assumptions.

Our technique ran 40 random claim cost trials. A key element of a dynamic valuation technique is the development of random trials -- a lot of scenarios. The scenarios are done differently than a gross premium valuation technique. Number one, you develop a universe of claim costs. The life insurance actuaries develop a universe of interest rates. They have a bunch of yield curves; we have a bunch of claim costs curves.

The second difference with these scenarios is the use of a Markov process. This is a stochastic process, not a deterministic model. A matrix of claim cost transition probabilities is developed. It defines the likelihood of moving from where you are now to where you're going next. In college, they called them "random walks" Markov chains. You have a probability of a random walk, going from your current state to a different state. You could stay in the same state, or you could move to a state below, above, two above, or two down.

Each trial or scenario is a random walk through time. Our example has been simplified. Everybody was issued at age 35, and everybody had a 90-day elimination period, Class 4A,

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age 65 benefit period. Our technique is running a random walk through a series of claim cost curves, over a 30-year period, for each individual year of issue.

I have never added random variation to the claim costs as I go through time. Each time I run a trial, which is assumed to be independent, I'm going to go a different direction. I randomly generate a new movement. Every time you run a trial, you're going to get a different outcome. If you do enough of these, you can develop a probability distribution.

Prior to discussing the results of the technique, we need to emphasize the two key concepts. The first concept to emphasize is the claim cost universe. This is very important. It defines your potential movement. I simplified this a little bit, but what I've done is isolate an estimated high and low extreme. Our morbidity studies provide our current curve position. The actual to expected studies indicate 130% of the CIDA frequencies and termination rates grading from 50-90% in the first year of termination and 90% ultimate CIDA termination rates after that time. I'm defining my universe of potential volatility or variability as running from 85% of that base assumption of where I am now (good experience) to some poor selection patterns, 150%.

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To give you an idea of what 150% would be, it would be termination rates at roughly 60% of CIDA. That is not unreasonable to me, because I have a client that is currently running at 50%. Eighty-five percent is roughly 110% of CIDA frequency with 90% ultimate terminations.

We have established our current position and the extremes. How do you establish the entire universe? How do you know what it should be? There are some rules to follow. First, isolate your endpoints. That was the approach I took. Curve #1 is my bottom end; I think it is a reasonable bottom end. Curve #16, I think, is a reasonable top end.¹ I don't expect my experience to get worse than that.

When you set a claim cost universe, a considerable amount of judgment is required. You may introduce your own biases into the process. It's your technique to use. You can introduce your own biases.

Keep in the back of your mind that you want to develop a universe that is going to give you some reasonable volatility. As your guide, you can look at what's been happening in the

1. The charts that were used during this presentation were not available for inclusion in these proceedings.

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past. Look at the volatile cycle that you have experienced. This will give you some ideas or some judgment as to the reasonable ups and downs.

The second concept to emphasize is the Markov process, or set of transition probabilities. I refer to it as matrix, because if you lay it out in a computer program, it would develop into a matrix of probabilities. Pictorially, you have a diagonal matrix, with probabilities running from top to bottom. And what you have are columns that tell you your current state, and rows that assign probabilities of moving to another state. The probability of moving from your current state to your current state in the next random walk is 50%. You have an equal chance of staying in the current state or moving.

The case study is biased for antiselection. I have a 55% probability of improvement or staying where I am, and a 45% probability of getting worse. And in some respects, I think that may be reasonable. I think there is an inherent antiselection in most individual health insurance blocks of business.

As a test of reasonableness, run through a series of trials to see whether the mean and standard deviation resembles past experience. This will give you a feel for the validity of the transition probability matrix. Is it consistent with the volatility in the past? I think that's a good test of reasonableness.

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In this technique, you roll a 100 side die. For each trial, or scenario, you roll it for as many times as you have to do your random walk. Movement depends upon which side of the die results. If a "1" shows up, you would move down two curves. If "2" through "5" shows up, you would move down one curve. If "5" through "55" shows up, you would stay where you are. That is the process. We have a big die back at our office; it's called a PC. In APL, there is a nice, simple routine that can be used to generate random numbers. With 40 trials we ended up with 1,200 casts of the die in order to get all our Markov processes or movement patterns.

I want to remind you that we varied morbidity only. All other assumptions stayed the same. The X axis, gives the trial number and the Y axis gives the fortieth-year surplus, the difference between the reserve, and the gross premium reserve that results, under each scenario. We have a mean of \$19 million, meaning that my reserves are more than adequate to cover my future needs. But I also have two trials that came out negative. This means I had some antiselection problems and everything went south, and my reserves weren't enough to cover my future costs.

What do you do with these trials once you've run them? One thing you could do is to run a number of them and do your own probability distribution and develop some answers from

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that. Rather than do that, I assumed that the trials are normally distributed. I don't know if that is correct or not, but for the simplicity of presentation, I have assumed it.

Using the mean and standard deviation of all my trials, I went into a standard, normal table and determined the probability of having a deficient reserve as 8.7%. Suddenly I have some information that I can use. I have some kind of a measure of risk. I now have some decisions to make. Is 8.7% a risk I want to assume or not?

You can now introduce some confidence intervals. What if I need to be 95% confident that my reserves are adequate? What about 97.5%? 99%? At these different confidence levels, the additional reserve needed to get up to 5% or 2.5% or 1% amounts to \$4, \$8.4 or \$13.6 million dollars, respectively. Given these confidence levels, if I were making an opinion on these reserves, I'd likely add an additional \$2.3 or \$6.7 or \$11.9, respectively. If I believed my transition probabilities, and if I believed my claim cost universe, I would believe these numbers.

We now add more variability to this exercise. What if the lapses are morbidity sensitive? As morbidity worsens, will we get some selection patterns? It's likely that there are people in the group who are selecting against us. They will likely lapse their policies a lot less as the selection builds. We have introduced some variability into the lapse assumption, but

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it is tied to the morbidity assumption. This is comparable to the life actuaries and their interest rate scenarios. Their lapses are conditioned on the interest rates.

How does that affect the cash flows that were generated earlier? We reran the scenarios, except that lapses were also a floating variable tied to morbidity. What happened? Our probability of deficiency has increased to 17.3%. Before, the standard deviation was \$14 million; now it's \$16 million. More risk, more volatility! Now we have a different set of surplus additions. The \$1.7 million has now jumped to \$9.6 million.

This analysis has some applications to pricing. If our product was GR, you could possibly raise premiums rather than having additional surplus added. Going back to the previous example, the present value of premiums over the life of the product was \$300 million. We needed an extra \$1.7 million. That's a very small percentage rate increase in order to increase the present value of future premiums and to reduce the surplus required.

