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**HEALTH INSURANCE
VALUATION ACTUARY**

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- o Is the valuation actuary concept applicable to health business?
- o Health insurance areas affected
 - Claim reserves
 - Long-term care products
 - Disability income/income replacement products
- o Introduction of new concepts
 - Cash flow analysis
 - Scenario testing
 - Morbidity and disability/economic scenario relationship
- o Integration with new health insurance reserve standards

MR. MARK E. LITOW: What does the concept of the valuation actuary mean to health insurance actuarial work? In simplistic terms it means that the health actuary who does valuation work can no longer focus only on liabilities, but must also review assets and their relationship to liabilities. Accordingly, this topic represents a new road for the health actuary, whereas life actuaries have been examining this issue for at least several years.

To date, life actuaries have primarily been interested in the interest rate risk and, to some extent, the asset default risk. However, they have done little work in areas related to health insurance; that is, the risks of premium inadequacy and of external influences. Also, very little work has been done on the interrelationships of various risks; not only by type of product, but also for the aggregation of products within a company.

Therefore, the actuarial profession needs to address those issues which have received very scant attention, and the health actuary needs to become more involved. Our objective is to put these issues and concepts on the table and to facilitate discussion and more involvement of the health actuary.

Let us examine the purpose of the valuation actuary concept which can be found in the *Valuation Actuary Handbook*. Four points are noted in the handbook as to the purpose of the valuation actuary. These are shown below:

To Determine:

1. Will assets cover liabilities now and in the future?
2. Are plausible deviations covered in #1?
3. Does the company have enough surplus to grow?
4. What risks and means of immunization exist?

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In addressing these concepts we have several basic terms that we need to examine. The three main terms are solvency, solidity and vitality. Solvency is assets exceeding liabilities plus minimum capital requirements. Solidity is assets backing reserves; surplus and potential earning streams are sufficient to provide for plausible deviations. Vitality requires solidity plus enough surplus to grow or change in the future at a desired rate.

The four basic risk terms within the valuation actuary concept are shown below:

- C-1 Asset Default Risk -- the probability assets will default or become worthless.
- C-2 Premium Inadequacy Risk -- the probability of underpricing and its magnitude.
- C-3 Interest Rate Risk -- the probability that interest rate changes will produce serious losses.
- C-4 External Influence Risk -- the probability that influences not under C-1-C-3 will cause losses (i.e., regulations, etc.).

Discussion of these questions and terms will be the main focus of our presentation. First, we will address in some detail the liability side of valuation, mainly from the claim reserve perspective. Next, we will look at the current status of the valuation law for health insurance and how it coordinates with the valuation actuary concept. Finally, we will briefly discuss the risks to be studied in scrutinizing the relationship of assets to liabilities, paying particular attention to those relevant to health insurance.

MR. JOHN M. BRAGG: When I take on an assignment like this I usually try to start by estimating the size of current health insurance claim liabilities. As of the end of 1987, such liabilities were in excess of \$50 billion. This includes the operations of life and health companies, property and casualty companies, Blue Cross and Blue Shield Plans, and HMOs. This figure is about ten times the size of active life health insurance reserves held.

For the health valuation actuary, the claim liability should be the most important topic and is likely to be the most difficult. I say *the most difficult* because claim liabilities do appear difficult to determine, as a result of the unreported elements involved. There are other reasons too, including misunderstandings about the 5-element nature of these liabilities, past practices of using arbitrary (and even unsubstantiated) amounts, aggregation of the elements into one statement line, etc. For these reasons, I can think of no more fruitful area of activity for valuation actuaries than the area of health insurance claim liabilities.

Before going on, I should summarize my understanding of the role of the valuation actuary, as currently proposed. This role includes:

1. A legal requirement for an opinion of the valuation actuary as to whether the reserves are at least equal to the legal minimum standards.
2. The opinion of the valuation actuary as to whether projected cash incomes are sufficient to meet projected cash disbursements with consideration as to the timing of such cash flows.
3. The opinion of the valuation actuary as to additional requirements to provide for plausible deviations.

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4. Reporting arrangements for the valuation actuary at least to the level of the company's Board of Directors with suitable arrangements for notice to interested parties of changes of valuation actuaries.

This role of a valuation actuary appears to be just as applicable to the health claim liabilities as to other liabilities. The valuation actuary is a trained, experienced, and independent person, not constrained by internal pressures, who is expected and relied upon to determine the liabilities correctly.

Before I get into specifics about health claim liabilities, I would like to cover two current activities which have a bearing on health insurance liabilities. The first is the subject of minimum reserve standards for individual and group health insurance contracts, which will hopefully result in new state regulations. This subject has been active for several years and has gone through numerous drafts. The current version is the April 15 standard, which does not contain the benefit ratio reserve concept. This may speed the adoption of a model regulation.

My printed remarks for the 1987 Nashville meeting (RSA Vol. 13, No. 1, Nashville, page 138) contained the following: "Maybe the benefit ratio reserve falls into the proper realm of the valuation actuary, rather than the realm of compulsory fixed regulation." I include this remark once more, because we are now dealing with the valuation actuary topic itself.

The April 15 standard contains material regarding health claim liabilities. Some of it is controversial and may be changed. There seems no need to speculate about the nature of the final regulation. One of the controversial things in the April 15 standard is the overemphasis on aggregate estimation of liabilities. Aggregate estimation, especially if extreme, is a pitfall for a valuation actuary trying to determine claim reserves properly.

The other current activity is the ratification on April 5, 1988 by the Board of the American Academy of Actuaries, of the "Recommendations and Interpretations Concerning Incurred Health Claim Liabilities," which has been adopted by the Interim Actuarial Standards Board. This document, which is now official, should be of great importance to valuation actuaries dealing with health insurance claim liabilities.

I have a specific comment to make about the IASB release and I wish to place it officially on record. The release does contain one inadvertent oversight. In defining the tabular method, on page 1, the following appears: "denotes the application of a reserve factor developed from prior experience to an inventory of claims." The inadvertent oversight is that the phrase to an *inventory of claims* should have been deleted. Tabular factors can be, and frequently are applied to an inventory of claims. However, tabular factors can also be applied to such measures as business in force or to premium income.

I have compared the exposure draft and the final document and it is obvious that the committee made many changes which were intended to recognize the numerous variations of both the tabular and development methods. The above mentioned small flaw was inadvertently left in the final document. I have discussed this question with a member of the Health Operating Committee of the IASB, who participated in the drafting of these standards. I am assured that the committee fully intended to recognize the broad meaning of the tabular

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method, that the document contains references which make this clear, and that there is no problem here.

The broadened tabular method was originally described in *TSA XVI*, pages 26-36; more recent discussions are in *RSA Vol. 11, No. 4B* (New Orleans), pages 2505-2511 and in *RSA Vol. 13, No. 1* (Nashville) pages 132-133. I believe the day of the broadened tabular method may be coming.

Here are twelve considerations which apply to the valuation of health claim liabilities, and, therefore, to the work of valuation actuaries:

1. Five elements are involved. These are: (a) reserves for amounts not yet due on reported claims; (b) reserves for amounts not yet due on unreported claims; (c) reserves for deferred maternity and future contingent benefits; (d) liabilities for amounts in course of settlement; and (e) liabilities for amounts incurred but unreported. The five-element nature is a fundamental truth which cannot be changed by different annual statement treatments, nomenclature decisions, attempts at aggregation, etc. Keeping the five elements in mind is one of the recipes for not missing anything.
2. Another fundamental truth concerns the three lags: the accrual lag, the reporting lag and the payment lag. It is through the operation of these three lags that the five elements arise. Analytical thought in terms of the three lags and the five elements is very helpful in both arriving at and judging the reasonableness of results.
3. There is a tremendous and growing number of health insurance products. Each product is likely to present its own set of claim liability problems.
4. Many methods may be appropriate; however, the development and tabular methods, both in their broadened forms, are specifically recognized.
5. The relationship with active life reserves must be recognized.
6. The incurral date must be properly determined.
7. The period of disability rules must be properly determined. The period of disability is the period for which liability is being established, once a claim has been incurred.
8. Proper discounts for interest may be used.
9. Proper adjustments for inflation should be used, where appropriate to the coverages involved.
10. Run-off testing must be done.
11. Adequate liability for claim expense must be established.
12. When considering underlying assets, it should be realized that claim liabilities are likely to be short-term in nature, unless very long lag patterns exist.

Before concluding, I would like to refer to two other subjects which are on the program for this meeting. One is the matter of long-term care products, a very

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active current topic. I wanted to bring your attention to the nursing home utilization tables developed by the Office of the Actuary of the Department of Health and Human Services. These tables are useful in determining net annual claim costs and tabular method claim factors.

The other topic is a matter of economic scenarios. I have been very interested in this subject for the past four or five years. I wrote a recently-published book called *Protecting Against Inflation and Maximizing Yield* (published by Georgia State University) and it contains a chapter and an appendix on economic scenarios, including a method for generating such scenarios. An economic scenario projects the phases or periods in the business cycle. The scenarios can be as optimistic or pessimistic as one desires. Changes in inflation rates, interest rates, etc. can be projected by using economic scenarios. Work is needed to see how morbidity and mortality results vary by economic period. Such factors could be incorporated into economic scenarios without much difficulty.

MR. WILLIAM J. BUGG, JR.: Last year I had the opportunity to serve on the NAIC Special Advisory Committee which was established to develop language for a new valuation law. This was the committee appointed by John Montgomery and cochaired by Bob Maxon and Carl Ohman. This new law, which would be applicable to all lines of business, would incorporate ideas and principles inherent in the valuation actuary concept. The committee needed representation from all product areas and I was asked to participate because of my health background. I was serving at that time, as I do today, on the American Academy Health Subcommittee chaired by Paul Barnhart, which has been working on a new model law for minimum reserve standards for health insurance. This task, which was started in 1983, has still not been completed. It has gone through many versions and the NAIC will be continuing discussions. Because of significant changes, in particular the removal of the benefit ratio method from the latest proposal, the revised proposal will likely be exposed again. This will be the fourth such exposure.

Back to the NAIC Special Advisory Committee on Valuation Law. Because of the broad and all-encompassing objective, it became apparent after a year of monthly meetings that no conclusions could be reached which would receive broad industry support and it was realized that no new law could be adopted without broad industry support. Therefore, the objective was revised to narrow its focus and a new committee, a much smaller one, was formed. This new and smaller committee is chaired by John Tweedie and a report of their activities and progress can be found in the panel discussions, "Toward the Development of a New Standard Valuation Law" in this volume of the *Record*. However, much work was done by the former committee and I welcome this opportunity to present a summary of the discussion and conclusions which were reached regarding health insurance valuation.

The Special Advisory Committee on Valuation Law was a very large one made up of individuals with various backgrounds and interests. Nine working subgroups were established to discuss and make recommendations regarding specific areas, one of which was health insurance. Other topics for which working subgroups were formed included: traditional life, nontraditional life, annuity and pension products, reinsurance, federal income tax implications, investment and related matters, small company concerns, and legal structure of law.

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I was asked to chair the health working group. Our assignment was to develop specifications for a basic valuation standard for health insurance, both individual and group. The parent committee had already discussed various ideas for a general approach, suggesting such diverse approaches as: 1) a high standard with provisions for downward adjustments, 2) a low standard with provisions for upward adjustments, and 3) a middle-of-the-road standard with provisions for adjustments in either direction. The health working group was asked to recommend an appropriate basic standard for health insurance and to develop criteria whereby a company could make adjustments to the basic standard depending on its own particular circumstances. Such adjustments would have to be explained and their justification included in an actuarial report.

Specifications for the basic valuation standard were to include: the valuation method and applicable formulas and the process for deriving basic valuation assumptions for interest, termination and morbidity.

The health working group consisted of William F. Bluhm, G. Scott Bucher, Paul R. Fleischacker, Roy Goldman, Peter M. Thexton and myself. We had several meetings discussing various issues, ideas and concerns.

During our discussions we identified a number of issues and questions, such as: Should the evaluation process be sensitive to such features as: the ability to rebate; the absence of surrender values; variations in market and distribution systems; occupational classes; and level of first-year expense?

Also, in the application of retrospective methods versus prospective methods in the valuation process, retrospective is based on what has happened in the past, whereas prospective is based on assumptions as to what will happen in the future. At the time of our discussions, the debate about the benefit ratio reserve method was raging.

Third, what level of overall margin is sufficient for the statutory reserve? 10%? 25%? We would all agree that the statutory reserve should be conservative, but can the desired amount of conservatism be quantified? Can there be too much conservatism? I think there can be.

Fourth, what documentation and/or actuarial report is desired to support the reserve basis used? Some type of report would be needed to document any required studies and any adjustments made to the basic reserve. Another issue here is whether insurance departments are staffed to read and understand such reports.

Fifth, how does a regulator ensure that any required periodic testing is being performed? Perhaps an addition to the base reserve might be required if such studies are not carried out.

Sixth, should tabular valuation methods reflect rerates? Handling rerates is awkward for reserve systems using conventional reserve methods.

Seventh, what is the proper treatment of policy replacements in the valuation process? And finally, is there any situation where the asset underlying an A&H block of business should be segmented?

In discussing the investment risk, we concluded that the investment risk for health insurance is different from that for other products, particularly

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investment-oriented products. Rarely would one have to liquidate assets underlying the entire reserve at one time. Thus, the reinvestment risk is the main investment risk for health products.

As I mentioned earlier, work was underway by the Paul Barnhart committee on a new model law for minimum reserve standards for health insurance. The health working group discussed how this new model law, assuming that it is adopted, might be incorporated into the new valuation law. One thought was to let whatever was adopted as minimum health reserve standards from the Barnhart effort serve as a basic standard for health insurance under the new valuation law.

During our working group's first meeting, discussion centered on having a basic standard which could or would be modified based on the results of appropriate testing. If testing reveals the necessity to increase reserves above that of the basic standard, then the reserve must be so increased. Conversely, if testing reveals that a lower level of reserves is sufficient, then the lower level can be held. We noted that if a standard were so high that no increases were ever required, then it would be too conservative. On the other hand, if the standard were one which routinely required additions, it would run into practical problems for the company actuary.

We discussed the various assumptions which should be tested and the situations where modifications would be required. Here are some of the thoughts expressed by our group about criteria one could use for making adjustments to the basic reserve.

INVESTMENT YIELD

A&H products do not contain the interest-sensitive aspects of current life and annuity products. The great majority do not contain any equity (nonforfeiture) values. Thus, interest considerations are different.

One is concerned that the net investment yields being realized by a company exceeds the interest assumption used in the calculation of the reserves. We suggest that this differential be at least 1%. If the accumulative margin is not at least 1%, then a lower interest assumption should be used.

As indicated, liquidity concerns are not as great for A&H business. However, they do exist where cash flows become negative in later policy years. We suggest that those tests which are called for in the testing of other products (life and annuities) be used when and where appropriate. This will be particularly so for A&H products with cash values and deposit-type (universal) products.

MORBIDITY

For material and significant blocks of business, periodic studies of experience should be made. For established and less volatile products, a study every five years should suffice. For more volatile and newer types of products, the study should be made every two years.

It is suggested that if experience is within the range of 90% to 105% of the reserve standard, then no change in basis is called for. If the experience is above this range, then a modified basis with at least a 5% margin is called for. If experience is below this range, then a modified basis with at least a 10% margin would be permitted.

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In the analysis of experience, the effects of selection and other durational effects should be studied. Where appropriate, the morbidity basis should reflect selection and durational effects.

Where no reserve standard exists, the morbidity basis used for pricing, incorporating appropriate margins, should be used for reserve calculations.

PERSISTENCY

New ground is being broken with the current proposal regarding the use of persistency in the calculation of minimum reserves. The benefit ratio method which is no longer in the proposal, recognizes 100% of actual terminations. Tabular reserves (type B) permit use of a total termination assumption with certain limits.

Sensitivity tests will be required. If the test indicates that an increase in the termination assumption results in a higher reserve, then the assumption should be set at 110% of the standard (actual or assumed).

EXPENSE ASSUMPTION

How much first-year expense should be reflected in the reserve and over how long a period of time? In the benefit ratio reserve method, the adjustment for first-year expense is made directly and would require an answer to this question.

The written report which our committee presented to the Special Advisory Committee on Valuation Law contained a cover letter, a brief summary of our purpose, a list of various issues which were discussed, and our recommendations. A copy of this report is included as Appendix. I would like to mention certain aspects of this report.

Many of the questions and issues we raised were not addressed in our recommendations. Time did not permit us to research and develop all the questions and issues we identified.

It was our recommendation that whatever was adopted as a model for minimum health reserves from the project then underway, spearheaded by the Barnhart committee, should serve as a starting point for health insurance reserves under the new valuation law and would serve as the absolute minimum. Concerns with federal income tax treatment of reserves led us to this conclusion. I personally feel that a fixed minimum standard is too rigid and could lead to excessive reserves in some situations. But current tax law leads one to fear that the IRS may require the lowest possible basis permitted even though such basis may be rarely permitted, and only in situations supported by an actuarial report. Thus, for tax planning purposes, it would be desirable to have a reserve basis which is unquestionably recognized as the tax reserve basis. Of course, what would be ideal is to be able to use the statutory reserve with all the prescribed adjustments as the tax reserve.

In the absence of prescribed testing, additional reserves would be required. The contract reserve otherwise calculated would be increased by the larger of 5% of the annual premium or 5% of the contract reserve itself. An additional 5% would be added for each subsequent year where the testing is not performed, subject to a maximum upward adjustment of 25%. This recommendation or conclusion was arrived at to deal with the question of how regulators might require that all prescribed testing was done.

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Lastly, it should be noted that at the time of our report we expected the minimum health proposal from the Barnhart committee to have been adopted by the end of last year. Also, much of our report spoke of the proposed standards as they existed at that time. Their report was submitted in June 1987 and as indicated at the beginning of my remarks, not only has the Barnhart proposal not been adopted but it has been modified considerably.

Even though the assignment for the Special Advisory Committee for Valuation Law has been changed to eliminate health concerns, the work carried out by the health working group last year, particularly the criteria for opinion-based adjustments, should be of interest to health actuaries with valuation responsibilities.

MR. LITOW: In this part of the presentation, I will briefly review the important considerations in assessing the C-risks, building on what Mr. Bragg and Mr. Bugg have spoken about. The C-2 and C-4 risks will be reviewed in more detail in that they are so important in health insurance. I will also relate the aggregate effect of studying the various risks to solvency, solidity and vitality.

To study the various risks, we will look at a case study of an insurance company with the following structure of assets and liabilities and surplus.

Case Study Balance Sheet (in millions)

| | <u>Assets</u> | <u>Liabilities - Surplus</u> | |
|-----------|---------------|------------------------------|-------|
| Bonds | \$ 60 | Major Medical (MM) | \$ 30 |
| Mortgages | 35 | Long-Term Care (LTC) | 30 |
| Cash | 5 | Single Premium | |
| Total | \$100 | Deferred Annuity (SPDA) | 20 |
| | | Surplus, MSVR | 20 |
| | | Total | \$100 |

This company has three types of business -- major medical, long-term care, and single premium deferred annuities -- with \$20 million of surplus and MSVR. The intent is to include some health insurance and some other types of business to see how the risks interact in this case study.

We begin with an income statement which reflects both last year and what is anticipated in the following year.

Income Statement -- Past Year and Anticipated for New Year (in millions)

| | <u>MM</u> | <u>LTC</u> | <u>SPDA</u> |
|--------------------|-----------|------------|-------------|
| Cash Premium | \$60 | \$30 | \$20 |
| Investment Income | 1 | 3 | 2 |
| Cash Claims | 30 | 5 | 2 |
| Change in Reserves | 10 | 10 | 16 |
| Expenses | 15 | 15 | 2 |
| Profit | \$ 6 | \$ 3 | \$ 2 |

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On each line, the profit margin on an accrual basis is assumed to be 10%. I would like to go through this case study and look at the risks involved one at a time.

With regard to the assets, one parameter to examine is the risk of default of the various assets, or the C-1 risk. Analyzing this risk requires a review of the type, the quality and the distribution of assets. For example, higher risk bonds should generate a higher yield, but these assets may at times pose a higher probability of default. The actuary needs to assess this type of risk and determine its impact on company solvency, solidity and vitality by reviewing the distribution of the various assets.

Using our case study as an example, assume rather safe investments except for minor investments in junk bonds and mortgage loans in Texas and Oklahoma. These latter investments increase the risk of default; the junk bonds are more speculative in nature and have a higher rate of return, and the Texas and Oklahoma loans because of the depressed economies in those states. Therefore, a reasonable expectation is that 1% of the assets will default next year. This assumption will be incorporated into the final analysis as a \$1 million loss.

The C-3 risk represents the interest rate risk. The considerations in assessing the C-3 risk are the yield curve possibilities, the asset mix, the call and maturity dates and the cash flows. When reviewing this risk more specifically, two concerns are usually paramount:

1. **Disintermediation Risk** -- Assets are longer than liabilities and interest rates rise. For instance, given that monies from single premium deferred annuities are invested in long-term bonds (and/or mortgage loans), rising interest rates can mean that the credited rate on the single premium deferred annuities of competitors may exceed rates earned on our assets minus costs. In other words, assume our single premium deferred annuity is purchased at an initial rate crediting 10% interest minus expenses and the money is transferred to a long-term bond earning 12%. Also assume that subsequent interest rates reach 15%. In this case, the company faces two options: (1) Credit the single premium deferred annuities with a higher return than is earned on the bond; or (2) incur substantial lapsations or loss of business if credited rates on the single premium deferred annuities are not increased. In our case study, we have assumed a 15% interest rate will cause a 5% or \$5 million disintermediation loss where cash flows are driven by a 15% medical inflation rate.
2. **Reinvestment Risk** -- Liabilities are longer than assets and interest rates decrease. For instance, the single premium deferred annuities are invested in high-yielding treasury notes of short duration. In this case, the assets would mature and have to be reinvested at a lower rate, thus reducing the yield to the company. We have not assumed any losses as a result of this risk in this case study.

An analysis of the C-2 risk in health insurance may also require examining the C-4 risk. Therefore, we will study the two risks combined. To achieve this objective, the following items must be measured:

IMPORTANT CONSIDERATIONS

1. **Random variation (C-2)** -- Statistical aberrations only. For instance, a convolution of two coin tosses produces four equally likely possibilities and

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reflects statistical aberrations only. Of course, if the coin is modified in any way, or outcomes are not equally likely, the independence of events no longer exists.

2. Nonrandom variations (C-2), which include: (1) the initial mean value assumed may be incorrect due to lack of data, inability to properly interpret information, or agency, underwriting, or claim administration problems; (2) independence of events may not be a correct assumption; and (3) catastrophes.
3. External Influences (C-4), which include: (1) trends in utilization, charge levels, public attitudes, and availability of facilities; and (2) regulatory influences including mandated benefits, cost shifting, policy provisions; and (3) anti-selection against rate increases.

As an example, an analysis of the C-2 and C-4 risks on a long-term care policy in our case study (with respect to claims only) could be performed as follows:

- Step 1: Develop a probability distribution representing the cost per individual insured.
- Step 2: Develop a probability distribution representing the costs for the total number of insureds in any period, assuming independence of costs between these individuals. We have used a convolution process here for 10,000 lives.
- Step 3: Add variance to represent nonrandom and external risks based on possible variations of actual to expected experience for these risks.

A sample calculation for the long-term care policy is shown below:

Step 1: Expected Probability Distribution
Per Individual Insured

| <u>Claim Amount</u> | <u>Frequency</u> |
|---------------------|------------------|
| \$ 0 | .9800 |
| 2,500 | .0040 |
| 5,000 | .0035 |
| 10,000 | .0030 |
| 20,000 | .0025 |
| 40,000 | .0022 |
| 70,000 | .0018 |
| 100,000 | .0015 |
| 150,000 | .0010 |
| 250,000 | .0005 |

Step 1 reflects an annual situation where the probability of a claim is 2%. Claim amounts vary from \$2,500 to \$250,000, and this represents what the average insured would expect to incur on an annual basis.

Step 2 is the result of convoluting the individual distribution in Step 1 for 10,000 lives. This distribution reflects random variation only. Cumulative probability is 1% that claims will be less than \$5.5 million, and 99% that claims will not exceed \$9.6 million.

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Step 2: Calculate Aggregate Distribution Reflecting
Random Variation Only on 10,000 Policies

| <u>Claim Amount (Millions)</u> | <u>Cumulative Probability</u> |
|------------------------------------|-----------------------------------|
| \$5,471 | .01 |
| 6,541 | .16 |
| 7,027 | .33 |
| 7,430 | .50 |
| 8,326 | .84 |
| 8,973 | .95 |
| 9,643 | .99 |

Step 3: Addition of Nonrandom Variation on LTC Policy

| <u>Ratio of Actual to Expected Result</u> | <u>Probability</u> |
|---|--------------------|
| .40 | .065 |
| .60 | .110 |
| .75 | .140 |
| .90 | .160 |
| 1.00 | .165 |
| 1.10 | .140 |
| 1.25 | .090 |
| 1.50 | .055 |
| 1.75 | .040 |
| 2.00 | .025 |
| 2.50 | .010 |

The above distribution shows quite a bit of variation because of the uncertainty of pricing long-term care policies due to the lack of insured data as well as some of the other dependencies we talked about. The distribution shows that the probability of claims exceeding 150% of expected is 13%.

If we convolute the above distribution for products with our distribution in Step 2, which has only statistical variation, the following distribution results:

Aggregate Probability Distribution for LTC Policy (10,000 Lives)
Random and Nonrandom Variation (in millions)

| <u>Amount</u> | <u>Cumulative Probability</u> |
|---------------|-----------------------------------|
| \$ 2,609 | .01 |
| 4,714 | .16 |
| 6,054 | .33 |
| 7,089 | .50 |
| 9,728 | .84 |
| 13,256 | .95 |
| 17,209 | .99 |

Given that this distribution is \$7,465,000 one can see the large variation in result possible, especially when compared to the result in Step 3 which excludes nonrandom variation and external influences. The actuary must consider this variation as part of his/her opinion as to the solidity and vitality of the company.

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In carrying the C-2 and C-4 risks forward into our case study, the following is assumed to occur under the plausible scenario of a 15% interest rate with 15% inflation in medical costs: (1) Long-term care experience is 67% worse than anticipated; and (2) Major medical premium volume decreases by 25% but claim levels remain unchanged.

We will now examine a method for analyzing all of the C-risks facing a company and how the actuary can reach an aggregate opinion, particularly in relation to our case study.

Methods of Combining C-Risks

1. Sensitivity Testing -- Testing of various scenarios to reach a conclusion.
2. Use of a Probability Model -- Follow-up to test of C-2 and C-4 risks such that C-1 and C-3 tests are incorporated into the probability model; the model can take the form of an accrual model, cash flow model or combination of the two.

3. Use of a Ruin Formula
$$u_A^2 = \sum_i u_i^2 + \sum_j (u_{j,k}^2 + 2r_{j,k} u_j u_h)$$

where "u" is the surplus needed for risk "i" to prevent ruin or insolvency due to that risk alone, and "r" is the weight given to dependency of risks "j" and "h" combined.

To examine solidity and vitality, the sensitivity test is probably the easiest to use given the current state of knowledge. Therefore, we shall use that test in conjunction with our case study and the plausible results or deviations discussed earlier.

A summary of the plausible assumptions or deviations in our case study is shown below. This scenario or other scenarios producing worse bottom line results correspond to a probability of 5% in the following year.

Summary of Assumptions Corresponding to Case Study Scenario

1. Interest rate = 15%.
2. Inflation rate in medical costs = 15%.
3. Probability that scenario produces bottom line result at or worse than case study = 5%.
4. Assets default = \$1 million loss.
5. Disintermediation risk = \$5 million loss.
6. LTC experience is higher than expected by 67%.
7. MM premium volume decreases by 25% but claim levels remain unchanged.

High Interest, High Inflation Scenario (i.e. 1981, 1982) (in millions)

| | <u>MM</u> | <u>LTC</u> | <u>SPDA</u> | <u>Total</u> |
|-------------------|-----------|------------|-------------|--------------|
| Cash Premiums | \$45 | \$30 | \$20 | \$95 |
| Investment Income | 1 | 3 | 1 | 5 |
| Cash Claims | 40 | 10 | 32 | 82 |
| Change in Reserve | 0 | 15 | (14) | 1 |
| Expenses | <u>15</u> | <u>15</u> | <u>2</u> | <u>32</u> |
| Profit | \$(9) | \$(7) | \$ 1 | \$(15)* |

*Cash flow shortage is \$14 million, or 95 + 5 - 82 - 32.

Default of assets - \$1 million loss.

Disintermediation - \$5 million loss.

PANEL DISCUSSION

Balance Sheet Reconciliation
for Case Study Scenario

| | <u>Assets</u> | | <u>Liabilities-Surplus</u> |
|-----------|--------------------------|---------|----------------------------|
| Bonds | \$60 - 9 - 5 - 1 = \$45* | MM | \$30 |
| Mortgages | 35 | LTC | 45 |
| Cash | <u>0</u> | SPDA | 6 |
| | \$80 | Surplus | <u>(1)</u> |
| | | | \$80 |

Bonds -- \$60 million is previous year's total; negative \$9 million represents liquidation of bonds due to cash flow shortages or \$5 million cash at end of prior year minus \$14 million shortage this year; negative \$5 million represents disintermediation loss; and negative \$1 million represents asset default loss.

Mortgages -- There is no change.

Cash -- \$5 million surplus of previous year is used up in funding \$14 million cash shortage.

MM -- No change from prior year-end reserve level.

LTC -- Reserves increase from \$30 to \$45 million.

SPDA -- Reserves decrease from \$20 to \$6 million.

Surplus -- Decreases from \$20 million to negative \$1 million due to accrual loss of \$15 million, disintermediation loss of \$5 million and asset default loss of \$1 million.

Since the company is insolvent under the scenario chosen at the end of the following year, the solidity of the company as currently defined is at slightly less than a 95% confidence level. Further, the vitality of this company is weak or nonexistent. Clearly, sensitivity testing has more limitations than a probability model or ruin formula, but the result would normally cause management to reassess strategy due to the risks indicated. In other words, look at the investment strategy, look at the type of business and the risks and probably change strategies at this point.

In conclusion, the value of performing proper testing in accordance with the valuation actuary concept is to achieve a balance of proper investment strategies and risk undertakings, as well as produce the appropriate liability level. If a valuation at least as extensive as the case study shown here is performed, the result should be improved performance of management due to better information. However, this concept is in its infancy and significant additional work is needed to clarify approaches and usage. Without substantial advancement of the valuation actuary concept, especially as it relates to health insurance, objectives will not be achieved and compliance within the industry will not be good.

MR. BUGG: The Special Advisory Committee on the Standard Valuation Law was revised and the focus was narrowed. Here is the new charge: "The Committee will develop a draft of a model law and accompanying regulations that would require each company to submit an acceptable opinion by a qualified actuary

HEALTH INSURANCE VALUATION ACTUARY

supported by an appropriate memorandum describing the basis of such opinions as to the adequacy of certain specific reserves and the assets supporting such reserves. This draft will be available for discussion in May, 1989." As a committee of nine or ten people, it is my understanding that they have had several meetings already to work on this new charge.

MR. BENJAMIN GEORGE PETERS: What position does the model take on deficient premium reserves? Does it consider they could exist or require them to be set up?

MR. BUGG: We must set up a policy reserve for the benefits that are included in the policy. If you are talking about whether the valuation premium is in excess of the gross premium, it contains no provision for deficiency reserves as such.

MR. JOHN A. MAURER: I believe that the lead paragraph of the latest standards calls the ultimate test the gross premium valuation so that any deficiency in premium will be reflected in that gross premium valuation.

MR. LITOW: Since you mentioned gross premium valuation, there is concern that small companies are able to do a lot of the types of tests that we have talked about or do gross premium valuations and afford the cost. Are we imposing a type of regulation that will put these companies out of business?

PANEL DISCUSSION

Appendix

Date: May 28, 1987
To: NAIC Special Advisory Committee on Valuation Law
Re: June Written Report -- Reserve Standards for A&H Business Under the Valuation Law

Attached is a written report containing our thoughts and conclusions regarding the treatment of A&H business under the new Valuation Law. Our report contains three sections:

1. a brief summary of our purpose
2. a list of various issues which were discussed
3. our recommendations

The subcommittee was conscious of the NAIC proposal for minimum reserve standards for A&H insurance currently under consideration. It was felt that the results of this effort which has been underway for several years should serve as our basic standard. However, several members of our subcommittee expressed reservations about certain features of the "benefit ratio" method, a new method contained in the current NAIC proposal for calculating contract reserves for certain types of contracts. Since this proposal is still under consideration and is, in fact, currently being exposed for comments (for the third time), the subcommittee concluded that the concerns expressed should be forwarded to the Academy's Committee which has been working on this project.

The subcommittee had concerns regarding the income tax treatment of A&H reserves under the new Valuation Law. Upon hearing the interim report of the tax subcommittee at the full committee meeting on May 4th that a company's tax reserve would likely be the lowest possible reserve a company could hold, the subcommittee was led to recommend that the basic valuation standard be the absolute minimum. Opinion-based adjustments where indicated would always be additions. If the subcommittee could be assured that 100% of the reserves held for statutory purposes would be recognized for tax purposes or if reserves computed on the basic valuation standard would be recognized for tax purposes, then the recommendation might be to permit negative adjustments as well.

Respectfully submitted,

A&H Subcommittee

William F. Bluhm
G. Scott Bucher
Paul R. Fleischacker
Roy Goldman
Peter M. Thexton
William J. Bugg, Jr., Chairman

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PURPOSE

To develop specifications for a basic valuation standard for health insurance and to develop criteria for individual company opinion-based adjustment to the basic valuation standard supported by an actuarial report.

ISSUES

The issues which have been identified include:

- o Should the proposed NAIC Minimum Reserve Standards be incorporated into the new valuation law? If so, to what extent? Does the benefit ratio method need further modification and clarification?
- o How much deviation of experience from the assumptions employed in the basic valuation standard should be allowed before an adjustment is permitted or required? How much margin will be required in the modified basis?
- o What latitude should be provided in the selection of the interest assumption?
- o Is there any need for asset/liability cash flow testing? If so, for what products? What type of testing is needed and to what degree?
- o To what extent will actuarial judgment determine the nature of the periodic testing?
- o How should the basic valuation standard reflect the level of excess front end expenses? What adjustment from the basic valuation standard might be permitted as a result of the level of front end expense?
- o In the determination of opinion-based adjustments, what criteria will apply for modification to the basic valuation standard?
- o Should the basic valuation standard be sensitive to:
 - the contractual right to change gross premiums
 - variations in market and distribution systems
 - underwriting classes
 - pricing parameters and methods
- o Should there be an alternative to required periodic testing, such as specified additional adjustments to the basic valuation standard reserve in the absence of such testing?

RECOMMENDATION

BASIC VALUATION STANDARD

The Minimum Reserve Standards that are ultimately adopted as a result of the work of the American Academy of Actuaries Subcommittee on Liaison with the NAIC Accident and Health (B) Committee at the direction of the NAIC (EX5) Life and Health Actuarial Task Force will serve as the starting point for the new basic valuation standard and will serve as the absolute minimum standard. It is expected that the Minimum Reserve Standards will be adopted by the NAIC in December 1987.

PANEL DISCUSSION

This subcommittee has raised concerns with several aspects of the proposed Minimum Reserve Standards and expects to direct these concerns to the Academy Subcommittee.

General

The basic valuation standard itself calls for a number of tests to be made. Distinction should be made between:

- a. Type A products where premiums are guaranteed and contract reserves are calculated using the tabular method.
- b. Type B products where premiums can be changed and contract reserves are calculated using the tabular method.
- c. Type C products where premiums can be changed and contract reserves are calculated using the benefit ratio method.

Type A and B contract reserves must be tested at least every three years using a prospective valuation to determine the continuing adequacy and reasonableness of the reserves. Type C contract reserves must be tested annually using a prospective valuation to determine the continuing adequacy and reasonableness of the anticipated loss ratios and expense amortization percentages underlying the reserves.

Claim reserves for prior years are to be tested for adequacy and reasonableness.

The sum of unearned premium and contract reserves for all contracts subject to contract reserve requirements must be at least as large as the gross modal unearned premium reserve on all such contracts.

In carrying out the testing required by the basic valuation standard, one would prepare an actuarial report where the results from such studies as the following would be covered:

1. Results of studies showing valuation morbidity assumptions as providing for adequate contract reserves.
2. Results of studies showing valuation persistency assumptions as providing for adequate contract reserves.
3. Results of claim runoff studies showing claim reserves to be at adequate levels.
4. A comparison of interest earned on assets supporting A&H reserves with interest required to fund reserve increases and to credit interest on policyholder funds during the current year.
5. An analysis of the excess front end expense and amortization percentages used under the benefit ratio method.

An opinion-based adjustment is the additional reserve, if any, indicated by the testing. Such opinion-based adjustment should be established.

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Criteria for Individual Company Opinion-Based Adjustment to be Supported by an Actuarial Report

An opinion-based adjustment in the reserves may be made as a result of changes in the following assumptions:

- morbidity
- interest
- terminations
- front end expense, where applicable

In analyzing the various assumptions, one should develop a realistic basis with appropriate margins of conservatism for each assumption separately. They should be evaluated based on commonly accepted actuarial principles at the time. This might include certain specific methods and scenarios predetermined by the regulators as well as additional methods and scenarios based on the actuary's own judgment.

The benefit ratio method used for Type C reserves is an aggregate method involving an anticipated lifetime loss ratio applied to a block of premiums for the business cell being valued. Here the process of carrying out the annual prospective testing and developing the opinion-based adjustment involves determining whether or not the anticipated loss ratio needs to be modified. For this purpose only morbidity, interest and termination assumptions are involved. The front end expense assumption is only involved in the "reserve expense deduction."

The actuarial report documenting the testing performed and giving support for the adjustments being made should be prepared subject to American Academy of Actuaries Guides to Professional Conduct.

Morbidity

Adjustments based on morbidity experience should only be made for credible blocks of business. If experience is within the range of 90-105% of the basic valuation standard, then no change in basis is called for. If experience is above this range, then a modified basis with at least a 5% margin is required. If experience is below this range, then a modified basis with at least a 10% margin would be permitted. Particular attention should be given to any changes in the slope of the morbidity curve.

Interest

The criteria for changes in the interest assumption shall be similar (and perhaps the same) as that used for traditional life products. The main concern is that net investment yields currently being realized by a company exceed the interest assumption used in the calculation of the reserves.

Termination

Sensitivity tests should be made to determine the effect of the termination assumption. If reserves generally decrease with an increase in the termination rate, not more than 90% of the expected termination rate should be used. If reserves generally increase with an increase in the termination rate, then at least 110% of the expected termination rate should be used.

Front End Expense

The benefit ratio reserve calls for a reserve expense deduction. This is an adjustment which makes allowance for high front end expenses on a direct basis as

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opposed to the indirect manner used in the calculation of tabular reserves. There recognition for high front end expense is given thru use of the two year preliminary term method.

The front end expense assumption used should not exceed 95% of the actual front end expense. In determining the expense amortization premium, at least 110% of the expected termination rates should be used.

Adjustments to Basic Valuation Standard Reserves in the Absence of an Actuarial Report

The basic valuation standard calls for certain testing to be made at stipulated intervals. If such testing is not done, additional reserves should be established. Type A and B contract reserves are required to be tested every three years. If such testing is not done, then the contract reserves otherwise calculated must be increased by the larger of 5% of the annual premium or 5% of the contract reserves otherwise calculated for the block of business being valued. An additional 5% must be added for each subsequent year where the testing is not performed. The maximum amount of upward adjustment would be limited to 25%. Type C contract reserves are required to be tested annually. If such testing is not done, then the contract reserves otherwise calculated. (. . . to be completed after some testing has been completed.)

Cash Flow -- Asset/Liability Mismatch Analysis (C-3 Risk)

Economic scenario testing of cash flows and possible mismatch between assets and liabilities should be performed for the health line consistently with the testing prescribed for other product lines. If the assets supporting the health line are segmented, then this testing would be performed on the assets supporting the health reserves. If the assets are not segmented, then this testing would be for all unsegmented product lines in aggregate. An additional "cash flow" reserve should be established if the results of such testing reveals the necessity to establish such additional reserves.