

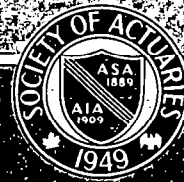


SOCIETY OF ACTUARIES

Article From:

# The Actuary

December 1987 – Volume No. 21, Issue No. 10



The Newsletter of the  
Society of Actuaries

VOL. 21, NO. 10  
DECEMBER 1987

# THE Actuary

## Hazardous Wastes Create Risk for Society, Insurers

by Jack F. Sulger

(Ed. Note: The following article is reprinted with permission from the *Health Section News*, Number 7, June 1986.)

While most of our attention these days centers on a litany of three-letter acronyms — HMO, PPO, DRG, etc. — legislative developments deal with the treatment and effects of hazardous wastes could easily have an enormous impact on the health insurance industry before we become aware of them.

Where is this activity occurring? Why are those of us involved in health insurance generally unaware of it?

The answers to these questions and others are explored in this report, which discusses the possible consequences to health insurers due to the accidental release of hazardous substances into the environment, as well as government efforts to protect the victims of such accidents.

Exposure to hazardous substances, transmitted through the air, water or ground, is a threat to all of us. While to date there has not been in the United States a catastrophic release of such materials on the scale of the accident in Bhopal, there do exist many sites where these materials have been stored and are now seeping into the environment.

The issue of who will pay the cost of cleaning up these sites is being addressed by state and federal governments in legislation designed to fix the liability for existing sites and to assess taxes to cover costs associated with new sites. The stakes are enormous: responsible producers and their

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## Asset/Liability Management

by Joseph J. Buff

This article gives a brief summary of how asset/liability management for life insurance companies has evolved over the last decade. The subject has important origins in the Report of the Committee on Valuation and Related Problems (1979) chaired by Charles Trowbridge, where various risks, including the C-1 risk (asset defaults and equity value fluctuations) and the C-3 risk (interest rate risk) were defined. Change in technologies for measuring and managing investment risk has been especially rapid in the last few years, and important regulatory changes are also underway. Undoubtedly, both the technical practices and the regulations will continue to progress in the years ahead.

### Relating Assets to Liabilities

Ultimately, the success or failure of an insurance enterprise depends on how surplus changes over time. Surplus, of course, is the excess of assets over liabilities (however the two are valued). So, right away we see that business success depends on managing the assets and the liabilities. The breakthrough to asset/liability

management is realizing that the two sides of the balance sheet can't be considered in isolation. The reason is that in the real world of competition, and given the volatility of the stock and bond markets, both assets and liabilities are affected by some of the same external forces. What's more, contract design and policyholder behavior have a direct impact on cash-flow requirements and hence on investment requirements. Likewise, investment opportunities have a direct bearing on pricing, competitiveness, and persistency. But how are actuaries to tackle this problem, since it is difficult to predict the future events which will shape corporate success or failure? A two-part general approach has emerged.

First, since most critical events basically result from asset or liability cash flows, we can focus on projecting those cash flows (such as bond calls, policy lapses, premium dump-ins).

Second, since we cannot be sure what path interest rates, lapses, etc., will follow in the future, we should

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# THE Actuary

## The Newsletter of the Society of Actuaries

VOLUME 21, NO. 10  
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Published monthly (except July and August) by the SOCIETY OF ACTUARIES, 500 Park Boulevard, Itasca, IL 60143.  
Gary Corbett, President;  
Anthony T. Spano, Secretary;  
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Non-member subscriptions:  
students, \$5.50; others, \$6.50.

The Society is not responsible for statements made or opinions expressed herein. All contributions are subject to editing. Submissions must be signed.



### Asset/Liability Cont'd.

work with a range of scenarios and assumptions instead of with a single "best estimate." Computer models are needed to carry out the intricate calculations to predict persistency, cash flows, assets-under-management, profits, and so on. Sometimes future new business is included as a variable in the model. At this time, different insurance companies have developed a number of fine models, while others are available commercially from consultants, vendors and investment bankers.

### Uses of Cash-Flow Scenario Projections

The general methodology of cash-flow scenario testing has many different applications. The variety of these uses may seem surprising at first, but it makes sense that this methodology works on many different problems. Each problem is influenced by the question of investment risk exposure and future profitability.

1. Testing Sufficiency of Reserves: The reserve is a liability which has to be backed by an amount of assets. Cash-flow projections look at characteristics of the insurance product (the liabilities) and of the investments owned (the assets) and test the adequacy of the reserve and accompanying assets. This testing is done by examining the results of projections along different future scenarios.

2. Regulatory Compliance: New York Regulation 126 permits use of a lower minimum reserve standard if cash-flow testing is done. At year-end 1987, this regulation will apply to annuity and GIC business issued in 1986 and 1987. The scope of New York Regulation 126 is gradually expanding (to Single Premium Life at year-end 1989). Similar requirements may be promulgated nationwide by the NAIC in the future.

3. Surplus Requirements: The whole subject of required surplus needs much more research. Generally, it is recognized that some amount of assets, above that which backs the reserves, is needed for an insurance company to be "solid." Solidity means the ability to stay in business as a viable corporate entity. Solidity can be judged by reviewing a set of cash-flow scenario projections.

4. Pricing: Once traditional asset shares (or other methodologies) produce some preliminary pricing decisions for a product, it is very useful to subject that pricing structure to scenario testing. This allows the pricing actuary to ask "what if" questions, and analyze the risk/reward effects of alternative pricing strategies.

5. Credited Rate Reset Strategies: For interest-sensitive products that periodically reset the interest rate credited to policyholders, the carrier faces the continual challenge of making these resets. Cash-flow scenario methodologies can be used to compare the long-range effects on the profit and marketing position of different credited rate reset strategies.

6. Investment Strategies: Cash-flow testing can be used to help answer a number of questions about investment strategies. What strategies do a good job of immunizing profit against future interest rate volatility? What strategies best take advantage of a specific interest rate forecast? How can we quantify the risk/reward tradeoffs when promised yield varies with asset maturity and quality? What are the advantages and disadvantages to different allocations of assets between investment grade and high yield (junk) bonds? What are the pluses and minuses of investing in equities (stock and real estate)?

7. Reinsurance: Increasing attention is being paid to surplus relief reinsurance treaties that pass some investment risks to the assuming company. Investment risk scenario testing is important to properly structure these deals, maintain them over time, and provide information for review by state regulatory authorities.

8. Variable Products: Variable products are not exposed to the same kinds of C-1 and C-3 risks as are fixed account interest-sensitive products. In some variable products, guarantees do create some C-1 and C-3 risk. The cost of such guarantees can be studied through scenario projections.

9. Actuarial Appraisals: In a volatile environment, it is important to understand investment risk exposure before arriving at a fair purchase price for an insurance operation. For this reason, scenario testing is being used more and more during actuarial appraisals for insurance company mergers and acquisitions.

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*Asset/Liability Cont'd.*

10. Internal Performance Appraisal: Some approaches to internal performance appraisal track the economic value of different profit centers over time. Once again, cash-flow scenario testing can be of use. First, determining current economic value can be aided by taking a look at the asset/liability match or mismatch situation. Second, effectively implementing risk control and risk taking strategies (investment, pricing, credited rate reset, etc.) is an important variable in management performance.

As time goes by, it seems likely more uses will be found for the general approach of scenario testing.

**Option Pricing Theory**

Interest-sensitive assets and liabilities can be looked at like financial securities including put and call options. Thus, modern option pricing theory can be applied to study the interest-sensitivity of these assets and liabilities. In fact, by using option pricing theory, it is possible to find market values for the liabilities as well as for the assets. This permits a system of "Market Value Accounting." Market Value Accounting is a kind of leading indicator for statutory accounting. Furthermore, option pricing theory can be used to construct good asset/liability matches or international mismatches. This approach is also useful in pricing and in devising credited rate reset strategies.

It is worth noting that some option pricing models are a special form of cash-flow scenario projection models. Many of the same assumptions are needed, and a lot of the same cash-flow information is produced. The difference is that the option pricing models specially process the cash-flow output, based on arbitrage pricing theory, to arrive at a single-point, theoretically correct price for the whole interest-sensitive product line.

Option pricing theory is a challenging subject, and option pricing models for life insurance companies are technically complex. Much pioneering work has been done on Wall Street (some of it by actuaries!), and some insurance companies now have their own option pricing models.

**Duration**

Duration is a useful tool for asset/liability management, when duration is properly calculated. Since this is a

complicated subject, the *Valuation Actuary Handbook* published by the Society is a good reference for details. For interest-sensitive cash flows, option pricing theory is needed to compute accurate duration, while when cash flows are fixed, Macaulay duration is effective.

**Assumptions and Scenarios**

In understanding the state of the art in asset/liability management, we should all be aware of an important distinction drawn by the Committee on Valuation and Related Areas. This is the distinction between methodologies and assumptions. Methodologies are formulas, calculating procedures, or models. Assumptions are the input to those models, such as lapse rates or future reinvestment strategies. A very important class of assumptions is the set of scenarios. Scenarios specify the external environment in the future, including interest rates and default experience. Naturally, the results of all calculations are critically determined by assumptions and scenarios (as well as by methodology). There is room for more research on how to select assumptions and scenarios that produce useful results, for each of the different purposes to which one can apply an asset/liability management system.

**References**

For further reading on asset/liability management, the Society publishes papers and proceedings periodically that cover the subject. You might refer to the various *Proceedings* of the Society of Actuaries Valuation Actuary Symposia (held annually); the *Records* of the Society of Actuaries, which have the texts of many panel discussions on asset/liability management, going back a number of years; and the *Transactions*, which have several articles on asset/liability management, investment risk, and option pricing theory.

Joseph J. Buff is Product Manager at Morgan Stanley & Company. He was a panelist for a session on Asset/Liability Management at the 1987 Montreal Annual Meeting.

**TSA Paper Accepted**

The most recent paper to be accepted for publication in the *Transactions* is "The Benefit Ratio Reserve Method" by E. Paul Barnhart. This will appear in Volume 40.

## Actuarial Aptitude Test Discontinued

The Society of Actuaries has discontinued its Actuarial Aptitude Test, and advises that it should not be used for any purpose. We request that members make sure that all persons in their companies who might be using or plan to use the test are informed of this action.

The test was developed many years ago to use in situations where an employer wanted to evaluate a prospective actuarial student who had not yet passed any actuarial examinations. The results correlated reasonably well with performance on the Part 1 exam.

Since the Actuarial Aptitude Test was never validated in the U.S. for employment discrimination purposes, it had long since lost its usefulness. It could not legally be used for making any employment decisions, such as hiring, promotion, or changes of position. Notices about the extreme limitations on how the test could legally be used appeared in *The Actuary* from time to time. We believe that very few people were still using the test at the time of its discontinuance.

In addition to the legal problems, the test was badly outdated. A few years ago, the Board of Governors decided that in light of the legal limitations, it would not be worth the cost of developing an up-to-date version of the test. Now the time has come to retire it completely.

## Report of the Task Force on Mutual Life Company Conversion

As mentioned in the June 1987 *Actuary*, the Report of the Task Force on Mutual Life Insurance Company Conversion has been completed and is available by request from the Task Force Chairperson, Harry Garber, at his 1987 Yearbook address.

The report records the Task Force investigation, carrying out its charge "to examine the actuarial issues involved in converting a mutual life insurance company to the stock form of ownership." It consists of 28 pages with 6 appendixes totaling 100 pages.