

RECORD OF SOCIETY OF ACTUARIES 1985 VOL. 11 NO. 1

ROLE OF THE VALUATION ACTUARY IN PRODUCT DEVELOPMENT

Moderator: HAROLD D. SINGH
 Panelists: ALLAN D. AFFLECK
 KENT R. JOHNSON
 ALEXANDER G. SCHEITLIN
 Recorder: RICHARD LAU

- o Financial reporting systems as a source of information for product development.
- o Interaction of pricing actuary, valuation actuary, and investment officer in designing interest-sensitive products.
- o Allocation impact on product development - expense, investment income, tax, and capital.
- o Financial reporting information on changing premium rates for nonguaranteed premium products.
- o Maintaining consistency between pricing and financial projection models.
- o Reserve basis impact on product development.

MR. KENT JOHNSON: I would like to summarize the Final Report of the Joint Committee on the Role of the Valuation Actuary in the United States. The Joint Committee was asked to make recommendations to the Academy and Society boards regarding:

1. What is the appropriate role of the valuation actuary in the United States?
2. What is necessary to effect and support this role?

The Joint Committee's report contains two major recommendations dealing with the role of the Valuation Actuary and addressing general principles underlying the valuation of life insurance companies for solvency and solidity purposes.

The committee recommends that each state enact legislation requiring the directors of life companies to appoint an actuary to serve as valuation actuary of the company. The directors would also need to file notice of any changes in that position. The Academy would provide qualification standards and administer them through the "Guides to Professional

Conduct." This would include provisions for assuring that the valuation actuary remains current with standards of practice. Provision would be made for valuation actuaries who are not Academy members.

The committee recommends that the valuation actuary should be responsible for selecting assumptions and establishing appropriate reserves. The valuation actuary will be guided by principles contained in actuarial literature and standards of practice set by the actuarial profession.

Since such valuation principles and standards are not now available, the committee believes that the current specific requirements contained in the Standard Valuation Law and related statutes and regulations regarding statutory accounting principles should be maintained. These will be the basis of legal solvency requirements.

A statement of actuarial opinion will be required of the valuation actuary in addition to the legal solvency requirements. The basis for the opinion will be contained in a report to the company's management and board of directors but would not be a part of the annual statement. The statement of actuarial opinion addresses reserves and surplus on two levels. This is the exact wording:

1. Reserves established are such that anticipated policy and investment cash flows will make a good and sufficient provision for all future obligations on a basis sufficient to cover future reasonable deviations from expected assumptions, and
2. Such reserves and additional internally designated surplus are such that anticipated policy and investment cash flows will make a good and sufficient provision for all future obligations on a basis sufficient to cover future plausible deviations from expected assumptions.

On a practical level, satisfying the opinion may require reserves which exceed the legal solvency requirement. Any surplus necessary to satisfy part 2 of the opinion must be recognized by management - that is, internally designated. Documentation of the amount of surplus and how it was determined would be contained in the valuation actuary's report which would be available to outside regulators and to people within the company.

Eventually, statutory solvency standards would address only valuation principles and perhaps become minimum standards as confidence in the actuarial opinion is established. The actuarial profession would work with regulators to develop such statutory principles. The valuation actuary would exercise professional judgement in selecting assumptions appropriate to the company and its operating environment and consistent with the statutory valuation principles.

A note dated January 20, 1984 written by Mr. Don Cody for the Joint Society/Academy Committee on the role of the valuation actuary contains an excellent commentary on the current situation and a list of articles

on the subject and related items. If you want further information this is a good source.

Essentially the job of the valuation actuary is to see that the pricing process is related to the required reserving principles and that the asset side is properly related to expected cash flows. The valuation actuary must be in a position to grasp the entire situation.

The design and pricing of an interest-sensitive product such as single-premium universal life or a single-premium deferred annuity will require an integrated approach between the pricing actuary, the investment officer, and the valuation actuary. Initial pricing assumptions must be supportable by both the pricing actuary and the valuation actuary. Failure to attain a close agreement could lead to reserves, in the worst case, that are higher than those anticipated by the pricing actuary, with a misstated return on investment (ROI) or an understated estimate of surplus needs. On the other hand, a more competitive product could be brought to market if the pricing actuary's assumptions are too conservative when compared to the valuation actuary's. This could have an impact on the ongoing vitality of the company.

Again, pricing and valuation need to be undertaken on the same fundamental assumptions, similar to where GAAP reserve assumptions are pricing assumptions with a margin for conservatism.

For interest-sensitive products, the initial pricing work is important, but managing the results are probably more important. For the valuation actuary to document the required opinion, he or she must reprice the product starting with accumulated experience results and then projecting forward, including asset and reinvestment projections in a comprehensive study.

A problem for pricing and valuation actuaries is quantifying different policy design features like market-value-adjustment provisions on cash outs and interest credits related to an outside index, as well as common features like disability premium waiver. Whatever the benefit, combination of benefits, or policyholder rights, the cost should be recognized consistently by the pricing actuary and the valuation actuary.

Since the levels of variations and design features within an interest-sensitive product are interrelated, a single profit study using best estimate values for all assumptions will not be adequate. The valuation actuary's opinion must include reasonable and plausible deviations from expected assumptions. Sensitivity testing will be required using different scenarios and perhaps changing variable relationships under different circumstances.

Equally important for the statement of opinion and more important in terms of relative risk for interest-sensitive products is the asset side. The valuation actuary becomes involved with the investment officer and investment policy. In my company, our investment officer is also an actuary, so there is some built-in appreciation for the

product development process. Not all valuation actuaries will be working in this situation, so actuarial needs and investment fundamentals must be developed.

For interest-sensitive products, a means of segregating assets should be available either by approximate methods or by actually earmarking assets by product type or line. There are practical problems in tracking cash flows by product. The investment officer will use his or her expertise to satisfy the yield and maturity requirements defined by the product and valuation actuaries. Minimizing risk may be something that can be defined by the investment officer and communicated to the actuaries. Managing allocated assets over time, with rebalancing as the experience develops, will be necessary for the valuation actuary to give a clean statement of opinion. Looking at the result of cash flows under different interest environments and different pricing assumptions will be required.

The means of limiting certain types of risk each have an associated price or cost. Company retention, proportional reinsurance, nonproportional reinsurance, and portfolio immunization techniques are available. For most companies, these are corporate level decisions. These should be addressed in the initial development work to produce an acceptable balance between risk and the cost of the risk control. These would be reviewed over time as experience is obtained, and adjusted accordingly.

To support the close financial monitoring of product and business lines, financial reporting systems will likely need enhancement over those currently available. We prepare monthly GAAP financials. The earnings reports are broken down by major business line and where size warrants by product within a business line. The objective is to carry forward a fund accounting for each major line. A cost allocation system is in place to allocate expenses; interest on funds borrowed from surplus is charged to the appropriate product or line; and charges are made to recognize costs associated with maintaining our target A.M. Best rating. Assets, segregated by major business and product line, are the basis of the investment income allocation.

There are practical problems from reporting financial results in twenty to thirty different categories. We are continually refining the reporting process. We have benefited from the insight of these monthly reports, pinpointing lines that are doing well and those that are underachieving.

There are two additional interactions that the valuation actuary must deal with in order to effectively carry out his or her responsibilities. Accounting personnel must be given specifications for financial reporting needs, by line of business as a minimum, but probably to the major product level. The valuation actuary must rely on the results produced, so quality is always a concern. Second, the valuation actuary's work will involve extensive data processing support in making the projections which are not directly related to product development but to the ongoing management process.

MR. ALLAN D. AFFLECK: If the recommendations of the Joint Committee are implemented, the Valuation Actuary will clearly have a much larger role to play in the future. I will assume that this will happen.

Let me summarize the two key changes that will place the valuation actuary more squarely in the middle of product development:

1. The valuation actuary will have to express an opinion that the anticipated cash flows will make an appropriate provision for future obligations of the company.
2. Reserves must be adequate for cash flows to meet this test on a basis sufficient to cover reasonable fluctuations in future experience. A second test must determine that cash flows make provision for plausible (i.e. wider swings than reasonable) fluctuations in future experience. The definition of reasonable and plausible is obviously subjective. The company must internally designate surplus funds, if needed above statutory reserve levels, in order to meet this second test.

Clearly valuation and pricing actuaries will need to work together so newly developed products and investments meet these criteria and enable the valuation actuary to express the required opinion.

Developing interest-sensitive products requires a major change from the methodologies actuaries used to apply in pricing traditional products.

Investment Officer Involvement

We all recognize and accept the need for the actuary to coordinate closely with the company's investment officer. It is not simply a case of determining current yields from the investment department. The actuary and the investment officer must communicate about investment strategy, length of maturities, yield curves and risk factors.

Product Pricing

Product pricing is done continuously. The actuary cannot establish a price when the contract is issued and then sit back and watch experience emerge as with traditional products.

Interest-sensitive products are repriced each year. In fact, the long-term financial success of a block of business may be more dependent on managing the block effectively after it is on the books than setting the price at issue. Interest-sensitive products require active year-to-year management if initial target profit objectives are to be realized.

Interrelated Assumptions

For interest-sensitive products, many of the major assumptions are interrelated. Table 1 shows five interdependent assumptions. One individual within a company must understand the relationships between

these parameters, for purposes of both initial pricing and future pricing. When experience is monitored, understanding the correlation and dependencies between the different assumptions is as important as considering variations in any one assumption.

Initial Pricing

Traditionally actuaries have utilized a best estimate approach for pricing new products. The results of profit studies using these best estimate assumptions, or with modestly added margins, are compared to a company's profit criteria. Some assumptions may be varied and the profit studies rerun, to see the impact of, for example, higher lapses or higher mortality.

With interest-sensitive products, pricing needs to be more sophisticated. For several years, we have been using scenario techniques, particularly for interest and lapse rates. Table 2 shows six illustrative yield curves. At the time this particular product was tested, yield curve 1 represented current interest rates - a typical positive yield curve, with most of the slope between the rates for one and four years maturities.

Our profit study testing would assume a stable interest rate environment and use this yield curve in all durations. Our client would specify its investment strategy (i.e. allocation of cash flow between investments with different maturities).

Our scenario testing might continue yield curve 1 for three years, and then move through yield curves 2,3 and 4 over the next three years. Different clients would want to test different variations in the yield curve; some would want to see the impact of an inverted yield curve at some point in the future (yield curve 6 from table 2). Some clients would be satisfied with yield curve 4 as an upper boundary, while some would want to test as high a scenario as a 20 percent long-term rate.

In each scenario the other assumptions would be modified to follow the interest assumption for a particular year. For example, when interest rates move to yield curve 4, two choices are available:

1. The credited rate is based on the portfolio average for this block and lapse rates are increased significantly, since we assume higher market rates are available from other companies.
2. The credited rates are allowed to follow market rates, with the result that there is probably a negative spread for a period of time.

Scenario testing allows company management to visualize what will happen under each set of future interest rate paths. They can then decide whether they are willing to accept the level of risk implied by the adverse scenarios.

More recently, some Milliman and Robertson (M&R) actuaries have moved to a probabilistic approach in their pricing work. We would expand the number of yield curves to perhaps as many as twenty, both above and below current interest rate levels. Given that we are starting at yield curve 1 today, we would ask our clients to attach probabilities to movements to yield curve 2, curve 3, and so on. Monte Carlo techniques are used to move from one year to the next, and many trials are simulated to achieve statistically reliable results.

Superimposed over the simulation can be a determination of the investment strategy which results in the maximum profits on this block of business for a specific financial criteria. These criteria might take one of the following forms:

- a. Maximum statutory loss in any calendar year of X dollars.
- b. Maximum statutory loss over the lifetime of the block of business X dollars.
- c. Losses in any two consecutive calendar years restricted to X dollars.

We have not completed the evolution of pricing techniques for interest-sensitive products. The movement from best estimates to scenario testing to probabilistic approaches is a response to management's desire to better understand the risk associated with a block of business and to gain insight into the most effective investment strategy for minimizing that risk and achieving an acceptable level of profit.

Valuation

Since the actuary will have to express an opinion that the future cash flows make an appropriate provision for future obligations, coordinating the testing the valuation actuary will do with the initial pricing is essential. If the valuation actuary employs scenarios which are significantly different from those of the pricing actuary, a potential problem exists. A company will want to use the same methodology, scenarios, and related assumptions for its pricing and valuation work.

The pricing actuary must understand the valuation requirements and illustrate to management the reserve and surplus levels needed to support the product under assumptions of reasonable or plausible fluctuations in future interest rates. Consistency is critical. Companies will not be able to properly evaluate new products unless the pricing actuary can illustrate the internal surplus required.

At the New York meeting last year, the three legged stool - investment, actuarial, marketing - was referred to many times. With the valuation actuary requirements about to be implemented, I believe our three legged stool has become a four legged chair which will be in danger of toppling over if the valuation actuary does not have a meaningful role in the development of interest-sensitive products. This clearly is a change in the role of the traditional valuation actuary.

Subsequent Pricing

Interrelated with the work the valuation actuary must complete for statutory statements is the work the product line manager must do in setting the credited rate on a block of business in the future. Emerging experience must be monitored and compared to the initial objectives. If target spreads are not being achieved and/or the current credited rate is uncompetitive, trade-offs must be evaluated. What will happen to the lapse rate if the credited rate is lowered or maintained? Is it better to make small changes to move toward the required spread? Is it better to make the full change immediately?

Does competition affect business in renewal years to a significant degree? How much of a deterrent are the surrender charges?

Close coordination and cooperation between the valuation actuary and the pricing actuary is essential. There is no reason why both actuaries cannot use the same systems and methodology, but that requires advance communication.

For statutory reserves more conservative values increase surplus strain and tend to pull down ROI. The pressure on the product development actuary is now to use the maximum valuation interest rate so that there are no differences between tax and statutory reserves. If this is not done, federal income tax amounts will be determined on earnings which exceed statutory earnings - an unattractive result for most companies. This places more of a burden on the pricing actuary to work closely with the valuation actuary to ensure that reserves using the maximum valuation interest rate will truly be sufficient to cover reasonable fluctuations in future experience. Lower statutory reserves also will increase the amount of internally designated surplus required to ensure that the company can withstand plausible fluctuations in future experience. Management must understand these implications before a new product is brought to market.

For single premium deferred annuities and single premium whole life, many of the major writers have been utilizing surplus relief reinsurance in order to minimize surplus strain. Concern about these surplus relief treaties at the regulatory level has forced some companies to modify their reinsurance arrangements, frequently to a basis which involves a greater risk for reinsurers, and therefore a greater cost.

The alternative is for the company to allocate additional capital funds to these lines of business. Although reinsurance is not specifically on our program, these changes illustrate the need for the valuation and pricing actuaries to communicate.

Increasing attention has been devoted to the amount of surplus required to support a line of business, in addition to the basic statutory reserve. Richard S. Robertson and Richard K. Kischuk submitted a paper which is an excellent outline of an illustrative surplus formula for various lines of business. In addition to the risk surplus required to protect a company against fluctuations in future experience, retaining or improving the company's A.M. Best rating is often an important

consideration that requires a certain level of surplus funds.

Most companies factor risk surplus that is required over statutory reserve levels into their pricing process. ROI would be determined based on profits after allocation of this risk surplus.

Recognizing the risk surplus, the investment income earned on it, and the tax on that investment income has a significant impact on after tax pricing results, particularly with the loss of the 818(c) election.

A typical universal life product with a before tax present value of profits equal to 9.7 percent of the present value of premiums would have an after tax profit of 6.1 percent, assuming no risk surplus is assigned to the line. With a risk surplus of 3 percent of the statutory reserve and 25 percent of the current year insurance cost, the after tax profit drops to 5.1 percent for a stock company and 4.5 percent for a mutual company.

Again, if the risk surplus is identified as the additional internally designated surplus required to protect the company against plausible fluctuations in experience, valuation and pricing actuaries need to work together.

MR. ALEXANDER G. SCHEITLIN: There are two types of guaranteed pension products that command almost all the business today. They are guaranteed investment contracts (GIC) and close-outs (guaranteed annuity products).

GICs are much more complicated than a zero coupon bond. The customer gives an insurance company a certain amount of money and sometime in the future the insurance company will pay them a certain amount back. The generic products have a fairly large number of options for the individual participants.

GICs usually are used to back thrift plans with employers getting bids year by year. Interest is guaranteed on all the money coming into the plan. Different companies have different years of guarantees and it is a guaranteed non-participating rate. This is the ultimate C3 risk product.

The other type of product is a close-out plan. A large number of pension plans are over funded and corporations would like to get some of the money back. There is also a tendency to get away from the defined benefit plans, so there is a rapidly growing market of close-outs, which is the guaranteeing of the defined benefits to the plan participants. These plans again are much more complicated than just an ordinary set of immediate and deferred annuities. They tend to have a strange set of early retirement factors. Each contract is separate and unique so there is no such thing as an off-the-shelf product. Windows of opportunity open and close very quickly. We change rates at least once a week, normally three or four times a week, and there have been times when we changed rates three times in one day.

The final characteristic is that it is relatively easy to get out of this market. You tend to have small field forces, at least in the large group pension cases. It's also easy to enter the market which is a very important characteristic in trying to match assets to disabilities.

Given these characteristics, it is imperative that one knows the asset/liability structure, and that one knows where the opportunities are, increasing profitability and locking it in. While matching sounds very nice, it is virtually impossible to achieve. First, the cash flows change, so you match, then you stop matching. Second, if you were to absolutely match, you probably could not sell anything. It doesn't help to match if you don't have any sales. You need to be a little bit creative. Some form of price matching, that is, immunization or hedging is necessary however, in order to stay in the business.

A key point is that things change fast and you have to be able to rebalance your portfolio. There are two ways of rebalancing. First, you can buy and sell assets. There is a second and sometimes more powerful alternative that sells new contracts or restructures old contracts. Sometimes this is easier than buying or selling assets. It has less effect on statutory income and it makes sales. In order to do this you need precise information on exactly what you need. At Metropolitan, we have weekly meetings between the pricing actuaries, investment officers, and the asset/liability matching group. We discuss what kind of gap we have. The pricing actuaries go out and talk to the customers, and get a good idea of what the market is like and what the customers will buy. The Investment officer will tell us what the financial markets will supply. The hope is that the three groups will come up with a strategy to maintain matching, profitability, and business.

Investment income allocation is very important. I don't think it's possible to run a business without some kind of segmentation. It is quite useful to use various stripping techniques to split desirable assets between lines of business. For example, if you have close-outs and you have a GIC, it makes sense to take a long mortgage and strip the early part of the mortgage for the GIC, keeping the later part for the close-outs. Once you have stripped the assets however, you have created an additional constraint on the asset. You can't sell it without both lines of business needing the sale.

Taxes are becoming more and more critical in our business, especially on the close-out side. Life contingencies and annuities tend to be very tax-efficient. That leads to a question for a valuation-actuary, should one look at varying paths of the tax law in the future?

Another item is capital. We are moving the direction of charging for capital usage, using a rate on the order of 3-5% for the use of statutory surplus.

MR. JOHN TILLOTSON: Do you think that there will no longer be separate pricing actuaries, valuation actuaries, and investment officers, but one person in charge of all three functions?

MR. AFFLECK: One of the recommendations in the Joint Committee Report is a requirement that each company's board create a formal position for a valuation actuary. The individual in that role would have a little more independence reporting directly to the board of directors. We are likely to see more of a separation within the organizational structure than we have in some companies now, which is going to make the coordination and cooperation harder.

MR. TILLOTSON: Perhaps that valuation actuary would be responsible for the investment strategy function, pricing function, and repricing function. If he is responsible for the full result, I would also think that he would have to be in charge of that.

MR. AFFLECK: I think he is going to be doing more of a review and be an independent overseer of what the pricing and investment people are doing. Although he is going to have to be a part of that initial process so that the coordination is there.

MR. PAUL OVERBERG: If we carry Mr. Tillotson's suggestion to its end, you will probably find that the auditors are in charge of the whole company. The valuation actuary is going to have to remain as an independent overseer. It is going to take a lot of close cooperation. Every company will have to move in that direction.

MR. MICHAEL E. MATEJA: The interrelationships that Mr. Affleck showed on Table 1 are critical, but so are the basic valuation reserves which now become a variable and depend upon the relationship of the assets/liability maturities that are established at issue. A perfect cash flow match allows one to be indifferent to the future movement in the interest rates because there are no differential risks as the interest rates change. A reserve equal to the fund value is no longer an adequate reserve. We need principles to guide us in this regard. The kind of answers you come up with are very scary if you start computing your internal rates of return and looking at this stream of cash flows. This is a very important part of the pricing process in my opinion. We used to recognize how the valuation reserve would change if you follow some of these different scenarios.

MR. AFFLECK: We have been doing some testing of internal rates of return. They are impacted to different degrees for different products but overall, significantly impacted by the contingency surplus or internally designated surplus that a company needs. It raises the question whether current price levels can continue, once we all become aware of what the real underlying ROI is in the business we are writing with the contingency reserves that will be required to support it.

MR. CARROLL HUTCHINSON: How soon do you expect the first state to pass laws requiring a company to appoint a valuation actuary, and how soon do you think a majority of states will do the same?

MR. AFFLECK: We have to make sure that the profession understands what has to be done at the same time the changes in these requirements are being introduced. If the regulators decide to move quickly, they

could impose only some of the requirements. The Academy is trying to move forward with the whole package. A draft of a modified statement of actuarial opinion with recommendations and interpretations will be sent out to the Academy membership this summer.

If we do our work well, the time between the first state adopting and a majority adopting the recommendation will not be very long at all. If the profession thinks this is the right thing to do and the regulators believe it is the right thing to do, it is going to happen quickly. 1987 opinions will probably be the first ones affected.

In New York, if you want to use higher valuation rates for annuities you need to do an actuarial demonstration. There is a danger if this thing doesn't move forward at a general company level, we may find segments of products, segments of companies, or individual states taking actions that are going to result in a lot of different opinions without an uniform overall approach.

Inter-Related Assumptions

- 1) Yield Curves
- 2) Investment Strategy
- 3) Credited Rates
- 4) Lapse Rates
- 5) Policy Loan Utilization

Table 2

Illustrative Yield Curves

Years to Maturity

Curve	1	4	7	10	20
1	11.65%	13.00%	13.25%	13.38%	13.50%
2	13.00	14.25	14.60	14.70	15.00
3	14.00	15.50	15.75	16.00	16.50
4	16.50	17.00	17.25	17.50	18.00
5	18.00	18.00	18.00	18.00	18.00
6	19.00	18.00	17.00	16.50	16.00