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DISINTERMEDIATION, INVESTMENT STRATEGY AND PRODUCT DESIGN

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1. What is the proper role of the actuary in matching assets and liabilities?
2. What criteria should be used in determining the appropriate amount of retained surplus during a period of large scale disintermediation? How should the evaluation be expressed in the annual statement actuarial opinion?
3. Is there a future for products with market value cash out adjustments? What are the problems in designing and administering such products?
4. Is indexation a useful tool in the construction of long term debt instruments? What actuarial problems are caused by an indexed asset?

MR. DANIEL J. McCARTHY: A topic like today's would have been, perhaps not unheard of, but certainly rarely found on the programs for the Society meetings of years ago. When a new area of interest arises, several stages seem to take place in its evolution. The first is simply identifying that a particular question or topic has become or should be important to actuaries. In the case of this topic, that identification took place primarily with the work of the Trowbridge Committee, the Society's Committee on Valuation and Related Problems, which analyzes the kinds of risks that insurance risk enterprises have to deal with and manage. Included as one of those risks is the risk resulting from a lack of perfect marriage between the timing of asset and liability cash flows, what has been called the C-3 risk. The second thing that seems to happen, once a new area is identified, is that we go through a process of research, education and consciousness raising. That process, which has been going on for two or three years at least with regard to this question, has been particularly the function of the Society of Actuaries' Task Force on the C-3 risk. This Task Force has been chaired by Mr. Ohman, one of our panelists today.

Once that process has begun, and often in tandem with it, the next step begins in which people begin to question how this applies in the context of a particular company. You begin looking at a particular risk enterprise, not necessarily an insurance company, though typically it is, and you begin to look at the question of this risk: how you can get your hands on it, how you can analyze what it is, and in the long run how you can begin to manage it.

Mr. Mateja, one of our panelists today, has been engaged in that exercise at the Aetna, and in the course of his discussion will be talking about the process of trying to get one's hands on this particular risk. Part of managing a risk of this sort, once it is identified, is to begin to see

what can then be done, either with the asset or the liability side of balance sheet, in order to bring the two into harmony so as to minimize, manage and to learn to live with this particular risk. I will be talking about that from the point of view of product design.

MR. CARL R. OHMAN: In the unstable and rapidly rising interest rate environment of the late 1970's, and especially 1980 and 1981, disintermediation from increased policy loans and surrenders, decreased net contributions under guaranteed interest contracts and fewer unscheduled principal repayments from fixed dollar investments became a reality for insurance companies. Now, with the rapid fall in interest rates in 1982 and 1983, intermediation from increased net contributions under guaranteed interest contracts, decreased loans and surrenders and faster repayment of investment principal could also become a matter of concern to insurance companies. With the likelihood that unstable interest rates, both rising and falling, will continue in the future, insurers' concerns over disintermediation, or intermediation or both may be expected to continue.

The risk of loss to an insurance company from changes in the interest rate environment, and the resulting disintermediation or intermediation, was given the name, C-3 risk, by the Society of Actuaries' Committee on Valuation in a report on valuation, surplus and related problems presented at the Society's 1979 spring meeting in New Orleans (RSA 5:1, pp 241-284). Two other classes of risk were identified in this report: the risk of loss from asset depreciation (C-1 risk) and the risk of loss from pricing deficiencies (C-2 risk). The Committee noted, however, that C-3 may be of greatest concern to insurance companies in the then current environment of rising interest rates, and called for research to quantify C-3 risk under various assumptions as to future interest rates.

Early in 1981, the Society responded to this concern of the Committee on Valuation, and similar concerns of other groups, forming a Task Force to Study the Risk of Loss from Changes in the Interest Rate Environment, also known as the C-3 Risk Task Force. The task force was charged to perform research on C-3 risk, make the results available to actuaries and other interested persons, stimulate discussion, and generally start people thinking in terms of C-3 risk and its implications.

My remarks this morning can be considered as a report from the C-3 Risk Task Force. I would like first to summarize briefly the work of the C-3 Risk Task Force. Next, I will attempt to define what C-3 risk is and how it arises, and then how the task force set about measuring C-3 risk. I will then conclude with a summary of ways to control, or at least moderate, an insurer's C-3 risk, which of course leads to the second and third items in the title for this panel discussion -- investment strategy and product design.

Earlier reports from the C-3 Risk Task Force have taken the form of panel discussions at the Society's 1981 fall meeting in Atlanta (RSA 7:4, pp 1349-1391), the 1982 spring meeting in Houston (RSA 8:1, pp 23-78), and the 1982 fall meeting in Washington (RSA 8:4, pp 1501-1561). Included in the Record for the Atlanta meeting is a paper by Don Cody describing much of the underlying mathematics of C-3 risk. Further development in this line may be found in Mr. Cody's 1982 discussion note presented in Orlando (RSA 8:2, pp 697-713).

Also in the Record from the Atlanta, Houston and Washington C-3 risk discussions are a number of papers presenting detailed results of four research projects of the C-3 Risk Task Force to quantify the effects of changing interest rates for specific types of insurance company products backed by specific configurations of assets and with specific strategies for the investment of future cash flow. Jim Tilley's paper, presented in Atlanta, describes a specific approach to measuring C-3 risk and specific results of calculations performed at Equitable in the area of guaranteed interest contracts. A paper by Jim Geyer and Mike Mateja, presented in Houston, describes results of research at Aetna in the area of non-par whole life. Results of further calculations on non-par whole life appear in a follow-up paper by Jim Geyer and Diane Arndt presented in Washington. Also presented in Washington were papers by Jim Feldman and Paul Kolkman describing research at IDS Life on deferred annuities, and by Terry Owens describing research at New England Life on par whole life.

There has been at least one practical outgrowth of these task force projects to date. The New York Insurance Department has adopted a set of illustrative guidelines for use by actuaries in complying with the new special New York requirement for an actuarial certification and tests of adequacy of reserves for annuities and guaranteed interest contracts. The process described in the guidelines, which are set forth in the Department's Circular Letter No. 33 (1982) dated December 31, 1982, follow generally the approach suggested in the Tilley paper for measuring the C-3 risk adequacy of statutory minimum reserves for guaranteed interest contracts.

The task force has recognized that there is a very great need for education on C-3 risk among actuaries (starting with the need for such education among the task force members themselves), and is attempting to respond to the need. The initial efforts might be characterized as consciousness raising -- throwing C-3 risk words and ideas around until people begin to feel comfortable with them. The Atlanta, Houston and Washington panel discussions were all part of this effort, as is this discussion here today. Task Force members have also contributed to similar discussions at other Society meetings and local club meetings. Plans are now underway for a Society sponsored seminar on C-3 risk in September 1983, with more seminars next year if the demand is there. Lastly, the task force is in the throes of writing a final report on its efforts which may find its way into the Transactions and may be of use as source material for the Society's examination syllabus.

The C-3 Risk Task Force does plan to go out of business when it completes its current task. However, its parent Committee on Valuation has been recently re-formed under the leadership of Don Cody and has extensive plans for further research on C-3 risk and related topics. That Committee has a big job to do and will need all the support and assistance any of us can give it.

Briefly, then, what is C-3 risk and how does it arise? Essentially, C-3 risk is concerned with cash flows from an insurance company's insurance and investment operations and how the relative value of expected cash flow may change when interest rates change.

The insurance and investment operations of an insurance company can each be viewed in terms of borrowing or lending transactions. On the

insurance side, the insurer accepts money (i.e. borrows money) from insurance clients on one set of financial terms, which generally include recognition of specified future contingent events. On the investment side, the insurer lends money (the same money it has borrowed from insurance clients) to investment clients on another set of financial terms. The obligations of all parties (insurer, insurance clients, investment client) are settled in cash at specified times. Both assets (investments) and liabilities (insurance obligations) of the insurer can therefore be thought of as cash flow streams.

Traditional concepts for the statutory valuation of insurance company assets and liabilities, in effect, presume defined levels of future cash flow from both insurance and investment operations. To the extent that a large net inflow or outflow of cash with respect to either the insurance or investment operations can result in a shift away from the presumed levels of cash flow, a potential for C-3 risk is present.

If with respect to a particular generation of business, net cash flow (from premiums, less benefits, withdrawals, dividends, expenses and taxes on the insurance side, and from investment income, repayments of principal and realized capital gains, less take-downs of previous commitments, realized capital losses, expenses and taxes on the investment side) is positive in some future year, the insurer must invest that cash. The C-3 risk here is that the interest rates available on such new investments are below those anticipated when the insurer set the contractual terms of the insurance product.

If net cash flow is negative in some future year, the insurer must raise cash to cover the negative. The C-3 risk here is that the interest rates on borrowed money are higher in that future year than anticipated when the insurance contracts were issued so that either existing investments must be sold at a loss, or new borrowing must be effected at a higher cost than can be supported by the return on the investments remaining on the books.

C-3 risk is clearly minimized if the insurance cash flow and investment cash flow streams can be precisely defined at the time the terms of the insurance contracts are set, and if these cash flow streams are matched to minimize future net cash flows. Such precise definition is not possible if the company's insurance clients and investment clients are given any discretion over the timing or amounts of cash payments by the terms of their contracts. Such discretion is currently common with respect to both insurance and investment transactions. If clients have such discretion, the respective cash flow streams may be quite dependent on prevailing market interest rates.

In simplest terms, both insurance clients (lenders) and investment clients (borrowers) must be expected to act in their best financial interests. In an increasing interest rate environment, insurance clients who have loaned money to the insurer can be expected to call their loans and re-lend the proceeds at the higher interest rates then available in the market place. At the same time, investment clients who have borrowed money from the insurer will be motivated to maintain their favorable borrowing terms as long as possible in accordance with the terms of their borrowing arrangements.

The opposite situation occurs in a decreasing interest rate environment with the greatest risk associated with the right of investment clients to call their high cost debt instruments, placing the insurer in a position of having to re-lend large amounts of cash at then lower prevailing interest rates.

Thus, the potential for C-3 risk is present even where a company's insurance and investment cash flow streams are perfectly matched, if the terms of the insurance or investment contracts permit client discretion in the timing or amounts of contractual payments. Such discretion can give rise to disintermediation in an increasing rate environment, or to intermediation under falling interest rates, converting the company's matched cash flow streams to a mismatch with a potential for real loss to the insurer.

The first important task of the C-3 Risk Task Force was to pin down a methodology for measuring C-3 risk in specific situations. After considering many possibilities, the task force decided to focus on measuring the book value of assets needed on a valuation date to fund the obligations of a specific type of insurance contract, given a specific configuration of investments on the valuation date, specific strategies for the reinvestment of net cash flow, and assuming various future interest rate environments. The investment cash flow from such assets would need to be sufficient not only to fund the insurance contract obligations over the entire period of the insurance guarantees, but also to assure statutory solvency for the block of business on all intervening valuation dates.

It was agreed to study one type of insurance contract at a time, leaving for later research the exercise of measuring C-3 risk for combinations of product types with different C-3 risk characteristics. As stated earlier, four distinct types of insurance contracts with very different C-3 risk characteristics were selected as subjects for the four separate task force projects. These were: (a) guaranteed interest contracts with specified maturities and only limited rights of withdrawal before maturity; (b) deferred annuities and accumulation products permitting withdrawal with little or no restriction throughout the accumulation period; (c) non-par individual whole life insurance; and (d) par individual whole life.

The methodology used by the task force throughout these four projects includes the following steps:

1. Construction of a historical block of insurance contracts of the product type being tested in force on the valuation date, with identification of the contractual terms likely to affect future insurance cash flows.
2. Identification of a block of assets supporting such block of insurance contracts on the valuation date by amount and type of investment, expected yields, terms of repayment, and any other contractual terms likely to affect future investment cash flows.
3. Specification of the particular set of future interest rate paths to be tested, together with assumptions as to how future

changes in interest rates will affect the various elements contributing to insurance and investment cash flows.

4. Projection of insurance cash flow with respect to the block of insurance contracts over the duration of the insurance guarantees, including future premiums from the business in force on the valuation date, but generally no new business or renewal of maturing guarantees after the valuation date.
5. Projection of investment cash flow from the assets supporting the block of insurance contracts on the valuation date and from investments to be acquired after the valuation date from the reinvestment of any net cash flow (positive or negative). This requires specific strategies for the reinvestment of net positive cash flow by type of investment and duration, which may vary with changes in interest rates; also specific strategies for borrowing to cover net negative cash flow, by duration of borrowing, which may also vary with changes in interest rates.
6. Combination of the projected insurance and investment cash flow streams for each assumed path of future interest rates, discounted (or accumulated) to a common date. Particular care is required in the process of discounting or accumulating cash flow streams to assure consistency with the underlying assumed reinvestment and borrowing strategies.

The results of the task force calculations on these four product types and initial observations drawn from the calculations may be found in the five papers already in the Record described earlier in this report. An over-all summary of what the tests show, what they do not show, and conclusions to be drawn therefrom should appear in the final report of the task force, now being written. It is important to stress, however, that the emphasis of the C-3 Risk Task Force throughout these projects has been on the process for measuring C-3 risk, and not on specific results.

It is worth noting that the assumption in these tests of no new insurance contracts after the valuation date is critical to the results, and while perhaps appropriate in testing the economic solidity or solvency of the insurer, it may give a distorted view of the real economic strength of the company. The ability of an insurer to generate profit from new business is material in any critical determination of real economic strength.

In applying the task force methodology to the circumstances of a real company with multiple product lines having different C-3 risk characteristics, identification of the assets supporting each of the different blocks of insurance contracts on the valuation date is critical to the outcome. Segmentation of the insurer's general account can make such identification much easier, but this is only one of several approaches and not necessarily the best for a particular company.

Finally, what are the steps an insurance company can take to better control, or moderate the effects of, C-3 risk? Those that come

immediately to mind are the following:

1. Improved understanding, by the company's actuaries, investment professionals and senior management, of the company's expected insurance and investment cash flows and the sensitivity of cash flows to changes in the economic environment.
2. Coordination of the company's insurance and investment operations to achieve a better matching of all borrowing and lending terms.
3. Improved design of the terms of both insurance and investment contracts to limit financial effects of disintermediation or intermediation under conditions of changing interest rates by limiting options for insurance and investment clients to alter the terms of their contracts. This may require changes in insurance laws and regulations -- e.g. a change in standard non-forfeiture laws to permit the limiting of cash surrender values for individual life insurance.
4. Improved design of investment strategies to comport with the differing investment needs of different types of insurance products. This may require a change in the allocation of investment results among product types along the lines of segmentation or in other ways.
5. Conservative pricing of insurance contracts to assure adequate protection against reinvestment risk in a falling interest rate environment.
6. Conservative reserving of insurance contracts to assure protection against market risk in a rising interest rate environment.
7. Restructuring of existing investments and existing insurance contracts, where feasible, to improve the over-all match of expected cash flows from insurance and investment operations.

The entire process of managing an insurance company's assets and liabilities in relationship to each other, to control C-3 risk and reduce the potential for loss from disintermediation or intermediation, clearly requires a very close working relationship between the company's actuaries and investment professionals, a relatively new experience for actuaries in this country and a challenge for the profession in the coming years.

I should add, before closing, that the current concern over C-3 risk, and the methodology for addressing C-3 risk developed by the task force, also apply to non-insured pension plans and other benefit programs in much the same way as they apply to insurance companies.

MR. McCARTHY: Mr. Ohman mentioned the new requirement of the New York Insurance Department for actuarial certification and reserve testing on annuities and guaranteed interest contracts. I would like to suggest that you take a look at New York Circular Letter 33 which sets forth the requirements for testing the matching of asset and liability maturities,

in order to take advantage of the higher valuation interest rates allowed under the law. Last year-end I prepared the actuarial certification and reserve testing in what I thought ahead of time would be a very simple situation, in contrast to a number of other situations which I know exist. It took a great deal more time than I expected to be able to make a statement which was sufficiently documented, which reflected the kind of study that it demanded and which allowed me to express a reasonable professional opinion. This is not an easy exercise, and it is not an exercise that we are used to doing. I would recommend that you take a look at the circular letter and just imagine yourself in the position of having to write such an opinion for any particular company. Ask yourself how you would do it, and try to do that in enough detail so that you begin thinking of the problems. It is a very useful exercise.

As Mr. Ohman also mentioned, the approach to the analysis of the risk by the C-3 Risk Task Force has, in effect, been a product line by product line approach. That is to say, models were constructed, asset portfolios and liability portfolios were described for particular categories of products, and results were obtained. This approach has two advantages and one disadvantage. The first advantage is simplicity, which has made it possible for us to do the work in some reasonable period of time. The second advantage is conservatism. Since different products will have different, and in general somewhat cancelling C-3 risk characteristics, it is presumably true that the total such risk for the company is less than or equal to the sum of the risks analyzed product line by product line. On the other hand, it has one disadvantage. The disadvantage in the product line by product line approach is that you do not confront all the kinds of problems which appear in practice when you set out to deal with this for a particular company. All kinds of assets appear on the balance sheet that do not turn up in simple models, and you have to deal with them. All kinds of problems arise in analyzing the cash flow which do not turn up in the instance of models.

MR. MICHAEL E. MATEJA: From a position of relative obscurity just a few years ago, the idea of matching assets and liabilities has catapulted into the forefront of major issues facing the managements of life insurance companies. The meteoric rise of this issue is attributable to the dramatic increase in interest rates which began in October of 1979, the unprecedented volatility of the bond market since then, and the general state of unpreparedness within the industry to deal with the issue. These conditions have combined to provide a sense of urgency to the work of the C-3 Risk Task Force, which was charged with the responsibility to analyze and understand the asset/liability issue.

Just three years ago there was relatively little known about the asset/liability matching issue in this country. During 1983, as Mr. Ohman has just reported, the formal work of the C-3 Risk Task Force should come to an end. The reports produced by this Task Force provide more than enough material for the serious student to understand the mismatch risk issue.

It remains now to consider how the profession can use the knowledge and insights developed by the C-3 Risk Task Force. My initial remarks are broadly responsive to the first item in the program, "The Proper Role of the Actuary in Matching Assets and Liabilities." The focus of this role, I believe must be control of the mismatch risk, and I will share with you

some of the insights I have gained within my own company as we prepared to understand and ultimately control this risk.

It perhaps goes without saying, but for the sake of completeness, I think we must establish that the first responsibility of the actuary is to thoroughly understand the risks associated with asset and liability mismatch. The mismatch risk is often quite subtle, and it is essential to establish convictions about its nature before making an attempt to control it.

Once the nature and magnitude of the C-3 risk is understood within the actuarial staff of a company, the next logical step is to assure similar understanding in other areas of the company, particularly in the investment area. After a common understanding of the risk has been achieved, it should be possible to consider positive steps to control it. Without a broad base of understanding and support, I am convinced that efforts to control the C-3 risk will not be effective. This should become clearer as I explain what is required to achieve effective control of the C-3 risk.

Our preparations to control the mismatch risk included a reexamination of the concept of control within an insurance company, and a reexamination of how other risks that we assume are managed and controlled. Let me first share with you the views we developed about control of an insurance company.

An insurance company is basically a risk manager; therefore control of an insurance company fundamentally requires some discipline to keep risks consistent with the surplus or risk management capacity of the company. An insurer blessed with unlimited surplus can manage any risk and need not be concerned about control. In the real world, however, insurers have limited surplus, and they must rely on control of the risks assumed to assure their survival.

As our business evolved, we developed effective disciplines to control the basic investment and insurance risks which have been labeled C-1 and C-2 risks. Let us first look briefly at control of C-1 and C-2 risks.

Control of the C-1 risk, i.e. the risk of asset default, clearly has been the responsibility of the investment staff. Through a combination of quality underwriting and diversification standards, the investment staffs have managed to keep asset default losses within acceptable limits.

Control of the C-2 risk, i.e. the risk of inadequate pricing, clearly has been the responsibility of the insurance staff. Within this group, I include the actuarial and underwriting staffs. Efforts to control the C-2 risk include conservative pricing assumptions, strict underwriting standards and appropriate reinsurance arrangements. Over the years these efforts have proven very effective in keeping insurance losses within acceptable limits.

What about the C-3 risk? Who is responsible for controlling it? Does such responsibility belong with the insurance staff or the investment staff? I submit that this responsibility reaches to the top management of the Company for it is here that we find authority over both insurance and investment operations. Unlike the C-1 and C-2 risks, which can be

controlled by investment or insurance personnel acting independently, the C-3 risk can only be controlled by an appropriate structuring of insurance and investment operations such that the personnel from the two areas work effectively together to achieve the desired control. Control of the C-3 risk thus somehow brings into focus the functions of management of an insurance company. After considerable reflection about the role of management in controlling the C-3 risk, I developed some convictions as to just what it means to manage an insurance company.

Fundamentally, management of an insurance company requires the blending of "insurance" operations and "investment" operations, and success has been achieved when these two operations work effectively over time to match insurance needs and investment results. Needs and results in this context are defined in terms of cash flows. This conceptual approach to the operation of an insurance company was more fully developed in Mr. Ohman's formal presentation.

This line of thinking has forced a review of how insurance companies have been managed in the past, i.e. how they have operated at a practical level to match insurance needs and investment results.

For the many years that the business of the insurance industry was concentrated in the individual life insurance line and the investment climate was relatively stable, it was relatively simple to achieve the desired matching of insurance needs and investment results through a pooled general account with average portfolio credited rates. Both insurance needs and investment results had a long term orientation, which by design or plain good fortune assured reasonable control of the mismatch risk. Moreover, there was a steady inflow of cash during this period which would have masked any mismatch risk that did develop. This approach operated well for many years and endured until the late 1950's.

As the business of the various companies grew and expanded into different lines and interest rates began to increase more rapidly, the problem of achieving effective matching of insurance needs and investment results intensified. The specific problem in the late 1950's was yield oriented. The pension departments of most insurance companies were struggling to find a way to compete with the trust departments of banks that were in a position to offer higher interest rates on new assets. The industry responded to this problem by developing the investment year method of administering the general account.

The investment year method of administration basically assumes a consistency or uniformity of cash flow needs among the lines of business. This method worked reasonably well for 25 or so years until volatile financial conditions of the recent past revealed the not so startling fact that our various businesses have widely different underlying cash flow needs. These needs determine liquidity levels, investment horizons, participation levels in public and private placement markets, advance commitment levels, and similar criteria which define required investment results. In short, the insurance needs for investment results of our various businesses have been revealed to be very different and fundamentally incompatible with a pooled general account where each line shares in investment cash flows based on the principles underlying the investment year allocation methodology. These principles make it impossible to vary investment results at a line of business level.

Failure to achieve reasonable matching of needs and results at a line as well as a company level has produced losses which have proven difficult to allocate based on established investment year methodologies.

The current challenge to management of an insurance company is to simultaneously offer competitive yields, maintain control of C-1 and C-2 risks and improve control of the C-3 risks by better matching of asset and liability cash flows. One practical means to achieve this best of all possible worlds result appears to be segmentation of the general account, which Mr. Ohman has mentioned as one of the options available to control the C-3 risk.

Segmentation is just evolving as an investment income allocation approach, but we have come to view it as more than an allocation methodology. It is in fact a fundamental change in the way an insurance business is managed and controlled. Creating segments within the General Account is conceptually equivalent to establishing separate companies within a company. We have found that this configuration of the General Account will produce some fundamental changes in the financial and risk management processes of the company.

In retrospect, it seems fairly obvious that cash flow characteristics of our various business are very different. Cash flows associated with Group Life and Health Insurance are different than the cash flows associated with Individual Life Insurance, and each of these cash flows is different than Group Pension cash flows. Just where to stop in differentiating among our various businesses and products based on cash flow characteristics becomes the new challenge to insurance company management intent on controlling the C-3 risk. The decision will ultimately reflect perceived management and control needs, organizational considerations, and perhaps most importantly costs.

Perhaps the major unanswered question that has been raised by our analysis is why insurance company management did not choose a separate company route to write group insurance or group pension business when they entered into these new markets. I can only surmise that it was the failure to appreciate the nature and magnitude of the C-3 risk that produced the combination of businesses we find in our companies today.

The bottom line message to those of you who conclude that you must do something about controlling the C-3 risk in your company is that you need to talk to your senior management about how to manage the company. Based on a recent experience I had in this regard, I think I can promise you some spirited discussion. It is hard to appreciate that efforts to manage the mismatch risk can have such a far reaching impact, but based on our experience I think I can assure you that this is what it takes.

Another item in the program addresses the question of surplus requirements to manage the risks associated with disintermediation. Surplus would be the first line of defense in managing losses attributable to the C-3 risk. During the past ten years, we have expended considerable effort in trying to understand surplus requirements in a life insurance enterprise and how to allocate surplus among the lines. Most of our work focused on the C-1 and C-2 risks. The C-3 risk was addressed only at a product level and did not anticipate anything like the mismatch of insurance needs and investment results that we experienced in recent years.

Our general concern about the potential magnitude of C-3 risk at the total company level motivated us to take a very hard look at our inforce asset and liability maturities to see if we could understand something about the level of mismatch risk that we may have to cope with. Our methodology was crude and there are many caveats that I could recite about our analysis. Nevertheless, I think you will be interested in some of the observations and findings that have flowed from this work.

Basically, we tried to do the same kind of analysis of asset and liability cash flows for our total General Account business that we did with respect to our GIC business in order to fulfill the requirements of the New York regulations that would permit use of the higher valuation rate for this business. While our GIC asset and liability records were clearly designed with an analysis of asset and liability cash flows in mind, it should come as no surprise if I report that no one ever anticipated a need for a similar analysis of General Account cash flows. As a result, our first pass at such an analysis was painfully slow.

On the asset side, we found that our records were primarily designed for aggregate cash flow forecasting purposes in support of our planning process. They were not designed to provide insight into how the cash flows would vary with changes in the interest rate environment. Specifically, they lacked call information. The call risk, while it is well understood within the investment community, is relatively unfamiliar within the actuarial community. How many of you, when you have used a declining interest rate assumption for pricing purposes, have thought that all prior investments could be called, forcing reinvestment at the lower assumed yield? I suspect very few have done so.

We have basically operated in a period of increasing interest rates for the last 40 years. As a result, we are insensitive to the problems that can be caused by a declining rate environment. Under rising interest rate conditions, of course, borrowers are not very anxious to refinance their loans. Under a falling interest rate scenario, on the other hand, we must expect borrowers to act in their best financial interests and refinance at the lower prevailing market rates when they are permitted to do so by the terms of their loans. Thus, few assets would remain on the books to their scheduled maturity dates in a falling interest rate scenario.

On the liability side, we of course have rather elaborate systems to produce reserves required for statutory valuation purposes. While there is a cash flow stream underlying many of these liabilities, no one ever anticipated a need to see the underlying cash flows laid out. Moreover, our analysis had an experience focus so we wanted to reflect the same kind of assumptions present in pricing or GAAP loss recognition testing. Varying these assumptions for high and low interest assumptions also proved difficult.

One unanticipated problem with respect to liability cash flows was that a material portion of our liabilities had unspecified maturities. This was particularly true with respect to Group Pension liabilities, e.g. thrift plan business where covered employees have book value withdrawal rights. There were similar problems on the asset side with respect to equity and real estate investments.

Suffice it to say that with enough assumptions and effort it was possible to get a picture of what the asset and liability cash flows within reason would look like. We developed cash flows for both an increasing and decreasing interest rate scenario as well as a level interest rate scenario. Despite all the limitations, analysis of this information proved very revealing. Here are a few of the observations that came from our own study.

- (1) Profitability - If liability cash flows include provision for expenses, then the present value of the difference between asset and liability cash flows represents the present value of the profits inherent in the book of business. Some adjustment must be made for experience rated business where part of the experience gains and losses would be shared with policyholders. Comparison of the present value of all future profits with current dividend payouts and growth expectations is useful in assessing the reasonableness of long term business plans. In fact, if dividend payouts are included in the liabilities, you are left with the present value of surplus available for growth.

It is also interesting to note how the inherent profit of the business changes as the interest rate used for discounting changes. The stability of the inherent profit of the business, of course, depends on the relationship of asset and liability cash flows.

- (2) Solidity - The present value of the difference between asset and liability cash flows represents a market value assessment of the financial strength of the insurance company. Comparisons with statutory surplus which is based on book values proved very revealing. For both increasing and decreasing interest scenarios, it was clearly evident that we could expect a material erosion of our financial strength relative to what was presented in the statutory statement. The real surprise was that in the declining interest scenario, which precipitates wholesale call of assets, there appeared to be much greater risk than in the increasing interest scenario. Upon reflection it is easy to see why this is the case. Asset cash flows are influenced by decisions of professional financial managers who will more quickly act in their best financial interest.

At this time we do not have sufficient confidence in the analysis to specifically address the down side risk in the actuarial opinion. However, we are sufficiently concerned that we are committed to further investigation of this problem.

- (3) Cash Flow Shifts - Our analysis provided graphic evidence of the tendency of anticipated cash flows to shift with changes in the interest rate environment. Such shifts were clearly evident in the various studies conducted by the C-3 Risk Task Force, but it was somehow sobering to see the shift potential with respect to our own book of business. These results reinforced the convictions we had developed that we need to pay more attention to the mismatch risk in the future.

Our plans for this year anticipate a refinement of the cash flow analysis that was completed last year. Our primary goal is to extend the analysis from the company level to the line of business level so we can develop a better insight into where we have the most serious mismatch problems.

Ultimately, I anticipate that the analysis of cash flows can be combined with our previous work on surplus requirements to develop an integrated methodology for all risks that should be reflected in a surplus allocation methodology. This approach will undoubtedly be one that will be addressed by the newly formed Task Force on Combination of Risks which has been charged with the task of combining the research work of the C-1, C-2 and C-3 Task Forces.

Our work to control the C-3 risk in retrospect seems only to have scratched the surface. There is still much to be done at a practical level within house to understand the relationship between insurance needs and investment results and to assure adequate control. We understand enough about this risk to have great respect for it, and we ultimately want to have the same sense of comfort about it that we have for the C-1 and C-2 risks.

MR. McCARTHY: If you look at the list of questions which appear in the topics of discussion for this panel, it is interesting to note how things can shift during a rather short period of time. For example, the last question deals with the indexation of assets. The question of indexation of assets was contemplated and put into the program a number of months ago when people were still, and may of course again someday be, much more concerned about rising interest rates than about falling interest rates. It is interesting to reflect in the light of Mr. Mateja's comments, that if a company concludes after some analysis that it has more risks from falling interest rate environments than from rising interest rate environments, instruments which include for example, commercial mortgages with rates that are redetermined annually or every three years, may serve to accentuate the more serious problem of declining interest rates, even though they may solve some of the problems on the upside. Each company will have to address this problem in terms of its own portfolio of liabilities and present structure of its own assets.

Let us think about the subject of "Product Design". Historically, the design of individual insurance and annuity products began with a consideration of the anticipated design needs from the point of view of sale. The investment question was limited to likely yield rates, current and long term. The focus was on designing the product, and after the product was designed it would be priced consistently with the current perceptions of investment yield. We went through a time a couple of years ago when that process was rather substantially reversed. Companies were out of cash and had to borrow money to cover shortfalls. Some companies designed products whose principal objective was to get money into the house as quickly and cheaply as possible, so that the investment characteristics really over-shadowed design considerations and were focused on helping a company balance out its needs for cash.

What is currently happening, and I suspect will happen more in the future of product design, is a blending of the two. It is no longer entirely possible to design the kind of product we would like to have and then simply alter the pricing parameters to meet a perceived investment

environment. Similarly, it will not be entirely possible to decide the kinds of investment we would like to make, and design products to fit those investments. Products designed this way will not necessarily meet a perceived need on the part of the buyers. Somewhere there has to be some give and take.

One of the questions in the topics of discussion deals with the subject of products with market value cash out adjustments. While the question addresses itself to the future of such products, there is already a very substantial present for such products. In the last two years, and even before the recent stock market run up, individual variable annuities have been selling very well. Companies in the variable life insurance market have been experiencing considerable increases in their sales. To a certain extent, companies have shifted the investment risk back to the purchaser, and this appears acceptable in a product which does it very explicitly. Certainly a variable annuity does it very explicitly, and a variable life insurance contract does it very explicitly with respect to the investment risk.

On the other hand, the general account kinds of products, traditional types of insurance and annuity contracts or more recent universal life types, historically assume a certain risk on the part of the company; they assume the risk that money can be returned at book value. Apparently, this protection is still something that people want to buy, but what are the alternative investments which provide this kind of guarantee? The alternatives are fundamentally two-fold. One alternative is a short term investment structure, a money market fund for example or short term bank C.D.'s. These offer security of principal, and they offer either a guaranteed rate in the case of C.D.'s or a current rate in the case of money market funds. However, they do not offer any long term promises as to the rate. The second alternative is the savings account. These offer long term rate expectations, if not guarantees, and security of principal, but do not offer anything by way of high current rates which we are accustomed to nowadays in insurance products.

The life insurance products and annuity products that we are seeing today, general account types of products, in effect, try to go these others one better. That is to say, they try to offer a high current rate, some kind of long term guarantee, and still guarantee book value. Obviously, it can be done if there is sufficient risk margin in the pricing to take account of this risk, and most people would concede that there has probably not been an adequate risk margin in these products, and had there been they probably would not have sold as well as they have.

Over the next few years we are going to be dealing with general account types of products which do not shift the risk entirely back to the purchaser, not going entirely with a market value adjustment. After all, you can do that with a variable life insurance contract and a variable annuity contract. On the other hand, the companies are not going to assume all of the risks to the extent done in the past for the simple reason that it is not profitable to do so, except with risk charges that make the product unattractive.

We have already begun to see, particularly in the thrift plan market, products that begin to walk a middle line, products that have a structure that provides some, but not all, of the effect of a market value cash out

adjustment. A formula is given which relates the difference between current interest rates and rates at the time the money was placed, but does not go all the way toward making a full market value adjustment. Usually, these formulas are stated in a way that a purchaser can understand. They are not the types of formulas that you will see in some of the more complicated group pension contracts which require pencil and paper and little time to figure out. They are designed to be, if not consumer oriented, at least disclosed in a way that consumers can understand.

There will be a trend toward the design of products which give some protection to the insurance company, but nonetheless, do not shift all of that risk of market value versus book value back to the purchaser. This will pose several kinds of problems: it will pose regulatory problems, which, as we have seen in the last couple of years, can be overcome with time; it will pose problems with sales forces who traditionally have been accustomed to selling, without even thinking about it really, products that have a book value guarantee; and, it will pose disclosure problems for management, presumably problems of more frequent reporting to a customer. In the past, there really was not much to report to the customer. He could take out his contract and look up what his cash value was, and if we wanted to tell him what his dividend was or what the current interest rate was, we would do that. Whatever his cash surrender value was, it was that under any and all circumstances. So we will have to face different kinds of disclosure requirements. The trend will be, if only because neither of the alternatives is totally acceptable, toward designing products which begin to pull-in from either end; that is to say, all this risk will not be with the company, but all of it will not be with the purchaser either. Products of these types have already begun to appear in selected markets. I think it is only a matter of time until they turn up in a more mass market as well.

At this point, I would like to ask Mr. Ohman to comment on the New York Insurance Department's requirements concerning the opinion letter for annuity reserves from the point of view of someone who had to put that letter together in a complex company situation.

MR. OHMAN: This is the second year the Equitable has responded to this New York requirement. I was responsible for signing the opinion letter and actuarial memorandum covering both the guaranteed interest contracts and annuities. Just to give you some idea, we were talking about something like \$19 billion of reserves, of which \$12 billion was interest guarantees and the rest was annuities.

We learned a great deal in the two years we spent on this. This was not an easy job. There was a major commitment involved in doing the calculations, projections, and analysis. This was an expense that we would have been incurring anyway in analyzing our own business, but it was still a major expense and a major commitment.

Probably the most difficult thing we had to learn and decide was how to identify the assets that go with a given product. How do you identify the assets to attribute to your interest guarantee business for the purpose of comparing cash flow streams? If you are analyzing the entire company, there is no problem. You look at all the assets and all the liabilities, but if you are looking at a piece of the company, you have

to identify a piece of assets to go along with it. Segmentation, which we introduced a year ago, clearly helped, but you still had to identify a particular dollar amount of assets. It is not difficult to do as long as you are aware of the consequences; if you pick these particular assets for this product, what are the consequences of leaving the other assets for the rest of the company.

Next we had to learn a great deal about the process of actually projecting cash flow, most importantly, the cash flow on the investment side. We had always used various devices of IYM projection. We would assume continuity of investment income rates for various generations and assume various investment mortality tables for turnover, and these were the devices that we used for projecting cash flow. Perhaps in an earlier era they were pretty good. Last year we were able to analyze the expected cash flow from specific investments, and we found the actual run out from those assets very different than expected.

We had some major decisions to make in this project. When you talk about matching assets and liabilities everyone thinks of bonds and mortgages. We came to the realization that close to ten percent of the market value of our assets were in real estate equities. It is a very interesting question as to what you do with real estate equities in any kind of analysis like this, and we tried a number of different approaches before finally selecting one. A problem in dealing with real estate equities and also common stock is projecting cash flow streams.

Most important are the various dialogues that have grown out of this regulation. For this type of regulation to work, there has to evolve a workable dialogue between the insurance companies' valuation actuaries and the regulators. We are beginning to develop that kind of dialogue. I spent an afternoon last week in Albany with the New York Insurance Department's actuaries going over our actuarial opinion in a very frank and open discussion. It was a very useful dialogue, and I suspect it will be followed up by some formal questions from the Department which we will welcome. This form of dialogue is part of an emerging pattern of regulation that is very important.

Probably more important than all this has been the involvement of company management. Our company management has become very much in tuned to concerns over disintermediation and asset liability matching. The company's asset/liability structure is becoming a very real concern to the company's senior management, and I think that their efforts in responding to this New York Opinion Letter have been very useful in this regard.

Finally, we get down to the question of what is the future of these actuarial opinions. What is the future development of valuation laws? The tradition, of course, has been statutory valuation requirements in the form of very rigid and inflexible formulas which resulted in over reserving for companies that were doing an appropriate job of managing their assets and liabilities and which were clearly inadequate for companies in different situations. This process has led us to a situation of more flexible reserve requirements under the 1980 N.A.I.C amendments, but accompanied by greater reliance on the actuarial opinion. The process we are going through in New York is going to contribute a great deal toward establishing credibility in that greater reliance on the actuarial opinion.

The question then becomes where are we going to be in 1990 or in the year 2000. There is the hope that by that time we will get to the point where you can throw the rigid formulas out the window and we can have a valuation requirement totally based on an actuarial opinion. I am not certain how rapidly we are going to get to that point. In complying with the New York requirement, I think I had a pretty good idea of what I was doing in testing whether this reserve, which was calculated under some specific rules, was sufficient to fund the liabilities under various interest rate scenarios. One of the parts of the process was to see how awful a scenario can become while the company's reserves remain adequate. That kind of testing I can understand; under what future interest rate scenarios will the present reserve hold up? If, on the other hand, I had to go out, do the test and determine what the reserve is, I suspect I would have to come back to company management and say the reserve should be somewhere between \$18 billion and \$20 billion. That is a reasonable range, and therefore, I have determined that the reserve is \$19.2 billion. I can just imagine them promptly writing \$19.2 billion down as the liability and going about their business. I think we have a little bit to go before we get to that stage.

Mr. McCARTHY: Mr. Ohman raised a point that I want to discuss and that is the question of how this will get into the standards of practice. I spoke the other day with Mr. Alan Affleck, who heads the Academy's Task Force which has been monitoring the development of standards of practice in this area. As Mr. Ohman mentioned earlier, there is some question of how rapidly such standards would be developed. The Academy's feeling at this juncture is that there is a good deal more learning and education needed before standards of practice or an opinion letter could be developed and before actuaries could be expected to use them with some confidence.

There is, however, an expectation that regulators may not wait that long. The regulators are beginning to see things which lead them to believe that such tests should be performed and such opinions should be required. The Academy's posture is not to charge ahead and promulgate something quickly, but at least to be prepared to respond should the regulators put on pressure. It would be better to have standards announced by an actuarial body a bit prematurely, than to have the alternative, which might be some arbitrary surplus formulas or something else written into laws of the various states. It is entirely possible that we will be overtaken by events, and our learning curve will have to proceed very rapidly, in order that, as a profession, we can respond to what I think would be the legitimate concerns of the insurance regulators.

MR. MATEJA: I have one thought that is relevant to this whole question of actuarial opinion which gets down to something very fundamental, and that is the question of what is a reserve. When you look at a reserve in an accounting sense, it is a representation of some assets held in like amount. When you start considering mismatch risk, the question becomes whether or not the cash flow stream underlying the determination of the reserve is reasonably consistent with the cash flow stream of the assets that are held in support of that liability. As Mr. Ohman's remarks bear out we have been making the assumption for many years that there is in fact a reasonable match of the assets backing liabilities with the cash flow stream underlying the determination of those liabilities. We make assumptions based on statutory valuation standards about the maturity of

those liabilities, and you have to ask yourself, in an increasing interest scenario, is that the way those liabilities are going to mature. I think we all have figured out they are going to come in a lot quicker. Then you have to take a look at your assets and determine what the financial situation will be if that indeed occurs.

I have come to feel that the C-3 risk is more of a threat to the solidity of our company than C-1 risk or C-2 risk. In the last fifty to sixty years we have had one experience of a dramatic risk presence with respect to C-1 risk and C-2 risk. The 1918 epidemic was a great example of C-2 risk and the depression was an example of C-1 risk. The period 1979 - 1981 is an example of this C-3 risk. You can flip a coin in your head and try to decide which of those are most likely to reoccur at some point in the future. In examining our own financial affairs, I found that we survived the C-1 and C-2 risk experiences in pretty good shape. We survived the C-3 risk as well, but when you start getting familiar with the kinds of things that can happen, it provides a real sense of concern.

MR. CARL RICE: I have a practical question for Mr. Ohman concerning New York Circular Letter 33.

As actuaries we tend to think of New York extraterritorial requirement only in conjunction with Section 213. My practical question is in regard to using the higher interest rates on annuities and guaranteed interest contracts. I am with a foreign company licensed in New York which presumably will not have those requirements if Ohio ever passes the law. Am I correct in assuming that if I wanted to use those same reserves in New York, they would have to meet the New York requirements, or otherwise, I would be forced to revalue at the lower interest rate.

MR. OHMAN: I believe that is the way New York views their requirements. They do apply extraterritorially to all reserves for companies licensed to do business in New York.

MR. McCARTHY: The alternative is to produce a separate statement for New York if you wanted to revalue those liabilities. As a matter of practical compliance, if it did not cause significant surplus problems, a foreign company with small amounts of such liabilities could do that for New York purposes alone. I think that would be a short term expedient, rather than a long term solution to the issue.

MR. CHARLES C. McLEOD: I should like to make a few comments from a Canadian perspective.

In general, the products being sold today in Canada which reflect current (as opposed to portfolio average) interest rates do not have guaranteed cash values, and may not even permit surrender, other than at renewal or at maturity.

It is still necessary to consider the relationship of the assets and liabilities, particularly the relative terms of each, but the risk of disintermediation is normally small or non-existent. Issuing a G.I.C. type plan, with current (new) money interest rates, and guaranteed cash values, would be considered an unsound practice by many actuaries.

In view of the recent, and possible future volatility of interest rates, is it possible to properly assess the risk of disintermediation on U.S.

G.I.C. type products? Even if it can be assessed, is the risk charge likely to be so high that it cannot be reflected in pricing without making the product uncompetitive?

It seems that the risk charge has not been properly appreciated or evaluated in the past. As pricing actuaries become more aware of the extent of the risk (and possibly as a few companies experience financial difficulties resulting from disintermediation), do you anticipate a trend over the next, say, five years to products incorporating a market value adjustment on surrender?

MR. MATEJA: I have been leading a personal crusade within our company to the effect that we are giving away the store in the design of some of the products that we have on the market. Some of our annuity products just represent too good a deal. Of course, when you start analyzing what represents a fair deal, you might as well withdraw from the market. You only need to suggest that, stand back, and await the kind of response that you are going to get from the marketing side of the house and product center managers who see themselves fundamentally withdrawing from the market. It is going to take a few more shocks to convince us that we need to be more intelligent about this. We just cannot offer the public the best of all possible worlds.

I have one final thought related to the idea that the public with which we are dealing is increasingly growing more sophisticated. Four years ago when interest rates went up, there were some financially astute people who went right out and at the first opportunity selected against us. Many of their friends held back through a sense of lethargy and inaction, and did us a favor by not withdrawing cash values and exercising some of the other options that could really hurt the various insurance companies. Reliance on that happening again is suicidal.

MR. OHMAN: Our perceptions of customer sophistication have certainly changed a great deal over recent years. As a result we are less optimistic about some of the products that we offer. A particular case is the use of guaranteed interest contracts for thrift plans where the plan participant has various options, usually a common stock option and a fixed income option. Although the plan sponsor cannot withdraw funds before the end of the guarantee period, the plan participant can withdraw his funds from the thrift plan in accordance with the terms of the plan.

In the early days this seemed like a fairly safe bet. The plan participant can move his money from a fixed income account to a common stock account, or the plan participant can pull money out of his thrift plan. Now, what is the risk of him selecting against the company? You are assuming here that you do not have the plan sponsor playing games and persuading everyone to move their money in mass. The judgment was that you probably were not going to be selected against. You were not going to be selected against in moving money from fixed income to equity and back, because the individual participant is probably going to move his money at the wrong time. He is going to move money to the stock market when common stock is high, as it is now, and that probably is going to be to the company's advantage.

That particular assumption has not been thrown too much into doubt. Problems did occur, however, with the assumption that plan participants

would be reluctant to withdraw from the thrift plan because of tax penalties. In the early years, that was certainly reasonable, but we had not considered the possibility of fifteen, sixteen and eighteen percent interest rates. With the potential for those kinds of returns, the tax protection became less important, especially if you could obtain those returns from tax exempt securities. So we found plan participants pulling out of their thrift plans and selecting against the plan. Also, we had not taken into account that the same conditions that were causing high interest rates, might be causing industries to cut back, lay people off and might be forcing people to draw money out of their plans to live. Again, the tax considerations become unimportant in these situations. It was those kind of things that were not anticipated at the time we designed those products, and I think we are going to see major changes in the products. The open guarantees are going to be for shorter periods. It is very difficult to write thrift plan guarantees with market value adjustments, and it will always be very difficult. The insurer is still going to assume some risk. After all, that is our business. However, that risk can be drastically cut down by limiting the frequency of withdrawals and the conditions under which withdrawals can be made.

MR. McCARTHY: It is no more possible to cover the C-3 risk in the worst possible economic environment, than it is to cover the C-2 risk in the case of all out thermonuclear war, and neither one matters very much. Don Cody has been fond of telling us in the C-3 risk committee meetings, that the objective of a large insurance company should be that it would not want to be the first such institution to go under, the presumption being that if things fell apart so badly that all major financial institutions in the country began going under, in effect, we would be moving into a different environment, possibly through government action. There would not be any way to protect against that sort of a total reconfiguration of what money means, and what the products that we issue mean. The key, and it is a very difficult one, is to identify possible environments that need to be protected against with some kind of a hazy probabilistic notion in one's mind that these represent a reasonable spectrum of what is possible. If you can survive that, you have probably done about the best you can. I apologize for the vague wording, but this is an area that we barely have begun to think about, let alone act comfortably in. I do not know of anyone who can make clear, explicit statements about the degree to which we are trying to protect the integrity of financial institutions. There is some limit on the degree of economic dislocation in which that can be done.

MR. OHMAN: Although it is very important that the insurers learn to understand and plan for their risks, it would be unfortunate if the insurers did everything they could to avoid the risk. Part of the planning process, if we believe that the product we sell and that our customers want to buy are going to have substantial risks in them, is to lay-off part of that risk through some form of reinsurance. It may well be that insurers move to a much larger extent into the use of interest futures or other devices for hedging the risk. Interest rate futures can be used in several ways to mitigate the risks under these products. For instance, an insurer will go out and issue a guaranteed interest contract, guaranteeing 11% interest or 14% interest on a block of money that is not going to come into the house for another three months. You have guaranteed an interest rate today and are not going to receive the money for three months. There is a risk there. That risk could be laid off through an interest future.

On the other end of the spectrum, if we are going to have large direct placements, we are going to have to go on with the traditional advance commitment process of agreeing today to make a loan at a specified interest rate. By issuing direct placements for delivery of money in the future at specified interest rates, you have the risk that interest rates will have moved by the time the money is delivered and that it will cost you more to deliver that money. That risk could be hedged by interest rate futures. Similarly, if you have a large existing portfolio of interest guarantees and a mismatched portfolio because of past history, you could hedge your risk by some form of futures, bond swaps or some other form of hedging. If you wanted to back cash value life insurance and other cash value products by long term investments, then some form of interest rate futures could be used to hedge that risk.

So, there are a variety of ways of developing these hedging devices. Admittedly, interest rate futures are still not permitted under New York law, but at least there are efforts being made to remedy that. The facility will be there, we hope, for insurers to be able to use the hedging device and this is another way of controlling this risk. The insurance company management will have to make the decisions concerning the balance of risk and profit.

MR. McCARTHY: In the long run of course, this kind of reinsurance, like other kinds, has a cost. In particular cases you may win or lose, but in the long run the reinsurer, or whoever is doing the pricing, know their business and obviously will protect themselves. Much of the discussion about hedging has seemed to suggest that these hedging devices take place with zero cost. When the record comes out for the Philadelphia meeting, which took place a few weeks ago, you might look through the discussion that Mr. Alan Sibigroth presented. He gave some detailed practical illustrations of hedging strategy and illustrated their strengths and weaknesses, including measures of what those costs are. We should not rule out hedging just because there is a cost associated with it. We did not ignore the existence of reinsurance because of its cost, but that is a cost that has to be taken into account in the course of pricing, just like other costs.

MR. MATEJA: I have a comment on the use of financial futures. A couple of years ago, the Aetna set up a small separate company that is geared specifically to experiment with financial futures. It was set up as a separate corporation, so that we would not run into the problems with New York. They have just been capitalized at \$10 million and are trading in the financial future markets trying to get some hands on experience. If, and when, we get the go ahead we will know what we are doing and can get up to speed quickly. I keep looking at the results on a periodic basis, and it is very clear that the material part of the risk can be hedged. The problem is that the treasury, which is the market that is most readily available for hedging, does not move in tandem with your industrial markets, and therefore, there is still what is called the process risk. With the kind of environment that we have had here in the last two years, I can assure you that a material residual risk remains, perhaps, far more such risk than people would like you to know about when they start talking about the conventional profit margins that we have had with this business. I would suggest that you need to look at this very carefully. Of course, this is a form of reinsurance where passing part of the risk also entails passing part of the profits.