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MATCHING ASSETS AND LIABILITIES

Moderator: DAVID R. JOHNSTON. Panelists: ALLAN BRENDER, J. IAN DALRYMPLE, MICHAEL ROSENFELDER. Recorder: STUART F. WASON

Discussion of the problems and possible solutions arising from the matching or mismatching of assets and liabilities, including valuation and regulatory implications, particularly in a Canadian context.

MR. DAVID R. JOHNSTON: The general topic of matching assets and liabilities has been perhaps the most discussed matter at recent society meetings. The C-3 risk has been defined and studied for several years now by Society committees. The volatile interest rates that we've had since 1979 has made this a really practical problem for a lot of companies, particularly those that have been selling the GIC type of products. In 1984 alone there has been a special topic meeting in New York on Investment Management for Interest Sensitive Products; there has been a seminar this fall on Investment Strategies and another seminar this fall on The Role of the Valuation Actuary. This latter seminar was sponsored by the committee on The Role of the Valuation Actuary; a valuable output of that committee is a bibliography of the literature available to the Valuation Actuary. This has been prepared by Don Cody. It contains a very readable summary of items which concern the C-3 risk in some aspect or another. The Society of Actuaries is not the only body that's been studying this risk. The LOMA 1984 meetings have featured this topic on two or three occasions and one of the more important papers written this year in the English Institute of Actuaries has been titled "The Matching of Assets to Liabilities".

In our discussion today, we are going to try to talk about the practical aspects of assessing the degree of match or mismatch and what actions can be taken to deal with it. Later at this meeting there are several workshops following up this panel discussion. There is a set this afternoon at 2:30 and there is another set tomorrow afternoon at 2:30, so there is ample time to go into some of the details in quite a bit of depth.

The three panelists this morning will be approaching the topic from different viewpoints. The lead-off panelist is Allan Brender who is a Professor of Actuarial Science at the University of Waterloo. Before his present position, Allan studied and taught mathematics at four universities with a geographic normal distribution across North America. Allan is also a consulting actuary who has done work on surplus and solvency standards for several years for a major Canadian mutual insurance company and he has worked closely with the Canadian Federal Department of Insurance on the same topic. Allan will be covering the subject somewhat more generally than the other two panelists who work for companies that have had experience with particular problems. He is also in a good position to comment on the regulatory aspects in view of his work with the Department of Insurance and I believe he will relate the Canadian regulatory situation to the situation in the United States.

The second panelist is Ian Dalrymple who is your typically aggressive profit centre manager and incidentally a fine actuary. Ian has been in charge of the U.S. Pension Division of a Canadian stock company for the last three years. At the same time he has also been a Vice-President in the Investment Department. His company has a fully segmented asset portfolio. During the time he has been in charge of the Pension area, it has more than doubled in size with the business including a lot of GIC type products. So Ian is in a unique position to discuss the asset and liability sides of the problem, how the two can be tied together and how the problems can be solved.

The third panelist is Mike Rosenfelder who is a valuation actuary for a large mutual company operating in both United States and Canada. Mike's company is the earliest one I know of to have used a segmented approach to its asset portfolio. They have followed this approach since the early 1970's. Mike will be talking about problems he has encountered and will be able to bring out considerations pertinent to the valuation actuary.

MR. ALLAN BRENDER: As lead-off man I would like to put the asset/liability matching problem in perspective; discuss some methods of dealing with the problem, in particular, methods of formulating investment policy; and finally discuss the problem from the point of view of the insurance regulator.

The problem of matching assets and liabilities has been very much discussed in the past three or four years, particularly in view of the marked swings we've seen in interest rates and the emergence within the industry of very interest-sensitive products. However, the problem has been around a lot longer than that. Any real discussion of the valuation of actuarial liabilities has as an underlying feature the problem of matching assets and liabilities. In fairly modern times the problem was first raised explicitly in the actuarial literature in 1952 in Redington's classic paper on immunization, about which I will have more to say in a moment. The problem was discussed in the North American literature and the Society's publications in the early 1970's in two papers in the Transactions and later, in a well-known study note, all by Mr. Irwin Vanderhoof. When you read this literature, bearing in mind the relative stability of interest rates at the time, you get the impression that these papers were regarded as of somewhat theoretical interest but of no great practical importance. Times have certainly changed as I see by all the people sitting here. The term "matching" I think is very widely used and it means many different things to many different people. To establish a frame of reference let's first agree to use terms such as "absolute matching" or "perfect matching" to mean that the cashflows from assets are equal in amount and timing to the cashflows required to meet the policy liabilities. Now an often unspoken actuarial goal is to have the assets structured so that "absolute" or "perfect" matching is achieved. Notice that the emphasis on structuring the asset portfolio implicitly assumes that liability cashflows are essentially predictable and are independent of the level of interest rates. In an era with stable interest rates and an environment in which the law of large numbers operates so that claims are essentially predictable, this is a reasonable assumption. However, modern experience has shown that liability cashflows are indeed a function of interest rates and we have had brought home to us very forcefully the fact that there is something called a C-3 risk. We also realize today that the problems arising from mismatch can't be handled only by techniques of asset selection. Adequate surplus is also

an important part of the solution. It should also be noted that although the actuary might prefer a perfectly matched situation, the investment manager and the proprietors of an insurance company might have a different point of view.

Let us adopt the actuarial stance for now. Traditionally, the actuary has dealt with long-term liabilities. In the North American environment, there haven't been assets of sufficiently long duration to match the liabilities perfectly. Hence the focus has been on finding methods of selecting assets so as to minimize the risks arising from mismatch; in its generic sense the term "matching" refers to a method designed to measure mismatch and make up for it. Recently we have developed products for which the duration of the liabilities has been shortened considerably. So we should ask now whether absolute matching is possible for these products. In at least one important case I think we can come at least quite close to matching. Consider the single premium deferred annuities which are currently sold in Canada. Interest rates are usually guaranteed for one, three or five years. Cash-outs are normally subject to a market value adjustment and the assets backing these contracts are primarily residential mortgages which, in Canada, are usually written for terms of at most 5 years although they might be amortized for periods of up to 25 years. There is some reinvestment risk for the longer interest rate guarantee terms but this can be handled by a small increase in the valuation interest rate margin. I think it is fair to say that the annuity product we are talking about in fact was designed with this asset base and with perfect matching in mind. In fact people who sell this, I think, very often will consider themselves in competition with the trust and loan companies in this country who issue guaranteed interest certificates and invest mostly in residential mortgages. What is interesting to note is that in fact the trust and loan companies in this country are regulated by the same Federal Department of Insurance which regulates the life companies and as of the last two years, the trust companies are required to show the degree of matching in a schedule of maturities in the financial statements. Life insurance companies aren't required to show this in the statement. The justification is generally that life companies have valuation actuaries and considerable trust then is placed on the profession.

Suppose we are in a situation now where perfect matching is not possible. Then what other matching techniques are available? Probably the best known is Redington's immunization. This is a method or a set of criteria for choosing assets so that if interest rates should suddenly jump, then surplus will either stay the same or increase. In other words, surplus considered as a function of the interest rate has a local minimum at the current interest rate. Since this is a local minimum, the method does not offer protection in the event of really large swings in the interest rate, but only relatively small ones. Remember that Redington was writing at a time when the change of even 1/2% in a single year was regarded as a major shift. Today we can experience that in a week or two. As with any mathematical method, classical immunization is based on a model of reality. Before applying the method, one should check whether the assumptions made in the model are appropriate in the current situation. There are three fundamental assumptions in Redington's model - 1) that the liability cashflows are fixed or known, 2) that interest rates jump suddenly and only once and 3) that the yield curve for investments of different terms is constant or flat. I have already remarked that the liability cashflows

have definitely been seen to be a function of interest rates. The frequent fluctuation in rates which we have seen these past four years certainly call the second assumption into question. The yield curve has changed shape many times over the same period and has certainly not been flat. Moreover any practical implementation of immunization requires a constant trading of assets to maintain the immunized position. There is then reinvestment risk and it would be folly to ignore the term structure of the interest rates.

Several authors have attempted to generalize Redington's approach and have introduced other immunization (in the generic sense) methods. An important paper in the actuarial literature along these lines which was awarded the first of the Society's Halmstead prizes, was by my colleague at the University of Waterloo, Phelim Boyle. The basic idea is to assume interest rates move by a random or stochastic process. The process affects not only the level of interest rates but also the shape of the yield curve. Each such process leads to a different model and for each there is an appropriate measure of duration of an asset or liability generalizing Redington's concept of mean term. Immunization is achieved when the average duration of the asset portfolio equals that of liabilities. Now there are many models to choose from and the trick, of course, is to know which one to use. Since you are trying to model reality, if you pick the wrong one, you are modelling the wrong thing and the method gives you no protection. To extend the medical metaphor brought up by the use of the word immunization, if we immunize against type A flu virus and this year's epidemic is type B, then we aren't immune. North American actuaries don't seem to have made use of these generalized immunization methods; however, these concepts have been adopted by the investment community, particularly with respect to bond portfolios where various notions of duration are extensively used. There have been studies to determine from empirical data, past experience, which of the many measures of duration is best. It seems that the jury is still out on this as different studies have come to different conclusions. Another family of generalized immunization methods depends upon the choice of the asset portfolio so as to minimize some function of the investment risk. One such method currently getting a lot of play is due to A.J. Wise and is to appear shortly in the Journal of the Institute of Actuaries of Great Britain. I think this is the paper that Dave was referring to. Wise minimizes the second moment of final surplus. It is not clear why one should use this particular measure of risk. Moreover, his method gives a unique solution, that is, a unique investment portfolio and I'd suggest that that might not be very attractive to the investment manager. He is very much locked in by the results of the method.

Any of the immunization methods which I have mentioned force the investment manager into a rather passive stance. A range of acceptable assets is the input to the method. The output is a specification of how much of each type of asset is to be acquired. Strictly adhering to the method leaves the investor and the investment manager little freedom to use his or her skills to improve the yield on the portfolio. What is really desired is a method which combines the protection of immunization with the possibility of actively managing the investment portfolio and increasing investment earnings. A method of this type presented in the context of managing a bond portfolio but adaptable to an insurance environment is called Contingent Immunization, introduced by Martin Liebowitz and Alfred Weinberger of the investment firm Salomon Brothers. According to this method, the manager establishes on paper a portfolio which would achieve immunization at an

interest rate somewhat lower than, perhaps by one or two percent, the current interest rates or available yield. The portfolio is not immunized but is actively managed as long as current yields remain sufficiently above the immunization rate. If yields drop below a specifically defined trigger point, the method specifies moves toward the fully immunized position. It is assumed that the actively managed portfolio wouldn't be radically different from the fallback immunized position and that it wouldn't be too difficult to make the switch from the active mode to the passive or immunized mode. I think the approach is particularly attractive for insurance products. The valuation actuary could use as his interest assumption the rate at which immunization takes place. Since this rate is below current yield, he has a very definite interest rate margin presented by the method. On the other hand the insurer is in a position to profit from the investment skills of his manager. Another approach to protecting against the risks of mismatch while providing reasonable latitude for investment managers to actively manage the portfolio involves extensive computer simulation. This approach has been described by Jim Tilley in a paper, Volume XXXII of the Transactions, and in another which he presented at the Society's Interest Sensitive Products seminar in New York last May. Using these methods, a universe of possible investment strategies is defined and set to be tested. A set of possible interest scenarios is specified with future interest scenarios. The various investment strategies or some critical subset of them are tested by simulation. Those which maintain solvency under all interest scenarios are considered acceptable. Analysis of the results may lead to measures according to which some acceptable strategies are preferred to others. In general, there are many acceptable strategies and the investment manager then has considerable latitude in selecting his strategy while still providing for the mismatch risk. An important advantage of this simulation approach over all the others that I've mentioned is that with simulation it is possible to allow for the influence of the level of interest rates on the liability cashflows.

Now this brief review certainly hasn't covered all possible methods of dealing with the mismatch risk. I know that Ian and Mike will certainly have more to say on this topic. My main concern has been to point out that there is more than Redington's method available. There is a wealth of useful information available in the finance literature with which I would encourage more actuaries to become familiar. If you are looking for a place to start in a very readable publication, I would suggest the Financial Analysts Journal. This is written in magazine style for the practitioner and contains many descriptive articles which summarize important developments contained in more scholarly or theoretical publications.

Turning to the regulatory side, I first want to preface my remarks on the regulatory aspects of the asset/liability question with a disclaimer. Dave already referred to the fact that I had something to do with the Department of Insurance, Canada. Last year I was fortunate enough to be able to spend five months of my sabbatical at the Department. While some of my views are the result of that experience, I am not a regulator and I am not speaking for the Department. The opinions expressed are solely my own.

Perhaps it is best to begin with a brief description of the regulatory situation in Canada. Foreign insurers operating in Canada on the branch basis are registered with the Department of Insurance, Canada under the Foreign Insurance Companies Act. The provisions of this Act, with some

obvious adjustments to allow for the nature of a branch operation, are similar to those of the Canadian and British Insurance Companies Act under which the great majority of domestic insurers are registered. Therefore, I'll restrict my comments to this Canadian Act. The Department has two major concerns, solvency and equity, particularly with respect to the rights of participating and non-participating policyholders. It should be noted that both stock and mutual companies can and do sell both participating and non-participating business in Canada. Participating and non-par funds are distinct entities in the annual statement, but this separation of funds applies only to the income statement and to liabilities and surplus. Assets are not separate, but are commingled. Section 84 of the Act requires that capital gains be allocated between the funds in proportion to the mean amounts in the respective funds during the year. By extension, this has usually been interpreted to require allocation of all investment income in proportion to mean funds. However, the use of the investment year methods has been interpreted as allowable under the mean funds approach.

Section 82.1 of the Act requires an insurer's Valuation Actuary to certify that the reserve makes good and sufficient provision for all the unmatured obligations guaranteed under the policies in force, where the reserve is calculated using assumptions which are appropriate to the circumstances of the company and the policies in force. There are currently no statutorily specified interest rates or mortality tables. The choice of tables and rates is left to the Valuation Actuary, subject to the appropriateness clause, although the Department can disallow them. With respect to the choice of interest rates, the Department has issued a memorandum to all valuation actuaries which contains the following statement:

"If significantly different valuation interest rates are used for different blocks of business, the valuation actuary should match his assets and liabilities by duration and quality as discussed in the recommendations of the Canadian Institute of Actuaries. If there is a significant mismatching, the valuation interest rates should be more conservative. Such notional matching of assets and liabilities for purposes of developing the valuation rates of interest should be monitored by the company to ensure that the valuation assumptions remain appropriate."

This statement doesn't explicitly spell out what the Department means by "matching", whether it means absolute matching or in fact, some method of making up the mismatch. In fact the standard of measurement intended is perfect or absolute matching.

By virtue of the Act requiring a mean funds approach and the statement I just quoted, the Department of Insurance is in a somewhat contradictory position. On the one hand a strict separation of assets by product or line is not allowed, at least not for the purposes of income allocation. On the other hand, some form of putative segmentation of assets supporting a particular block of business is required for purposes of demonstrating adequacy of investment income for meeting policy obligations. The difficulty arises because it is felt that the mean funds approach spelled out in the Act cannot be legitimately stretched to allow asset segmentation beyond the segregation specified in the Act which separates assets required for life insurance, for accident and sickness insurance and for segregated funds. There are also valid concerns with respect to the equitable treatment of participating policyholders if segmentation were to be allowed

for statutory purposes. Nonetheless, I believe there is a measure of sympathy in favour of the segmentation approach. However, the act would first have to be amended to remove the current mean funds approach. Now the Act is up for revision and there is considerable discussion going on about it. Tomorrow afternoon there is a panel discussion on regulatory changes in the Canadian Life insurance environment and the Superintendent of Insurance, Bob Hammond, is a panelist. I am sure we will hear a lot more about this topic. As a personal opinion, I personally can't see how you can really discuss the asset liability matching problem if you can't identify exclusively the assets that back a particular line of business. It would seem to me that segmentation is not only useful, but logically necessary.

Segmentation can be advantageous to both the insurer and the regulator for several reasons.

1. It would provide guidance in selecting valuation interest rate assumptions.
2. It would lead to a better understanding of the risks involved in the insurer's business and therefore stimulate increased attention to solvency.
3. It could promote a fairer allocation of investment income.

I feel a strong case can be made for requiring the segmentation between participating and non-participating business. It would also be reasonable to require segmentation of assets for all new-money and interest rate sensitive products. Of course, company size has a great deal to do with the ease with which segmentation can be accomplished and any changes in regulation would certainly have to allow for this. If the segmentation approach were adopted there are several important questions which would have to be addressed and I want to raise two right here.

Firstly, regulation currently places quality of asset restrictions on an insurer's total investment portfolio. For example, there are limitations on funds which can be invested in shares and real estate and rules regarding bond quality. When we come down from a company wide level to a segment backing a particular type of product, we realize that not all types of investment which are allowed for a company may be appropriate for a particular segment. The question now is whether the quality of asset restrictions should apply on a segment-by-segment basis and whether such restrictions should recognize the nature of the product being supported by the asset segment. For example, might there be segments for which equity investments should not be permitted? I don't know the answer to this and I really don't expect that the regulators or the insurers are too anxious to get into it. However, I do think it is an important issue and I think it really will have to be faced.

The second question is actually independent of the segmentation issue. By its very nature the asset/liability matching problem requires the use of market values for assets. Moreover, any method of dealing with the problem involves frequent trading of assets to maintain the "matched" position required by the method. In Canada, capital gains and losses are brought into income gradually. For bonds, the adjustment is made over the remaining lifetime of the bond. For shares, realized and unrealized gains or losses are brought in at the annual rate of 7% of the outstanding difference between book and market forever. This procedure distorts attempts to match

at least on a statutory basis. Consideration will have to be given to alterations in the recognition of capital gains or losses. Ultimately the question is whether it makes sense to use other than market values for assets, or at least for those which back interest-sensitive liabilities.

In the U.S. the recognition of capital gains doesn't present the same problem, however, use of book values still distort attempts at matching and we still have a problem. I parenthetically should note that any time I talk to people who teach finance, they are just amazed that we would talk about anything other than market values.

I want to take a brief look at what regulators are asking and doing with respect to asset/liability matching. As far as I am aware, the matching question enters into the valuation actuary's report in Canada in two places. The first is in the choice of interest rate assumptions and I just quoted the instructions relating to this. Last year the Department of Insurance began asking the valuation actuary to answer a number of questions regarding individual policies with an adjustable cost basis. These include most of the interest-sensitive products which are of concern to us today. One of the questions asked for a description of the matching method being used to support these products. I am personally pleased that the question is being asked, but I suspect that it is posed too generally to generate the type of technical response which would enable the regulator to properly assess the quality of an insurer's matching program.

The situation in the United States in this regard I think is much more interesting. In 1982, New York began to allow actuaries to choose higher than previously allowed interest rates to value certain annuities and guaranteed interest contracts. The actuary is required to file a report justifying the choice of the interest rates. The justification must be based on extensive simulations of future experience of the contracts being valued, under a variety of possible future interest rate scenarios. The investment policy of course is an integral part of the computer models which are used to run the simulations. In principle, the regulator armed with the results of such simulations, is in a much better position to assess the insurer's matching methods and his prospects for remaining solvent. In December of last year, the N.A.I.C. adopted a new model universal life insurance regulation. For interest indexed universal life insurance policies, a special actuarial opinion must be filed which must be based on a similar simulation model. Reference to investment policy is more explicit in this opinion than in any other of which I am aware. Particular reference is also made to consideration of the effect of interest rates on cash flows.

Now I think the development and use of this type of simulation model is extremely important. It is really the only way available to us today of assessing the quality of a matching policy. Such models are useful in choosing an investment policy, as has been shown by the work of Jim Tilley. They are useful in studies of solvency - for example the work of the C-3 task force is based extensively on use of these models - and of course they are of use in valuation. I understand from reading particularly discussions from the Society's New York meeting that there is some discussion in the U.S. on extending the use of such models to the valuation of all insurance and annuity liabilities. I expect we will hear more about this tomorrow morning at the session on the changing role of the valuation actuary in the United States.

Finally, we realize that all the risks presented by asset/liability mismatch require, in addition to a proper investment strategy, an allocation of surplus. Now regulators have been paying increasing attention to surplus requirements. The State of Wisconsin introduced surplus requirements effective for the 1982 year of business and at least one other state of which I am aware has the similar requirements under consideration. In Europe, uniform surplus requirements became effective in all E.E.C. (European Economic Community) member countries this past March. Canada is currently considering some requirement of this type. The surplus requirement should be tied to the types of risks inherent in the business being conducted by the regulated insurer and I would expect that any well-formulated requirement would have as an important component a provision for the risk due to the asset/liability mismatch.

MR. JOHNSTON: Thank you, Allan, for a very thought-provoking start to this panel. I agree with some of the remarks you made on the regulatory side and you've said them better than I could have said them. It was also interesting to bring out references to other industries and other countries. I found it quite interesting this past year-end to look at trust company annual statements for example, the published ones, and the way they treat the mismatch problem. Certainly trust companies and banks refer to the matching situation in pretty well each case in their published annual report. They disclose the situation by running out their cashflows rather than attempting to alter their valuation of liabilities. Ian, can you come and give us your presentation.

MR. J. IAN DALRYMPLE: Good morning. It's a pleasure to be able to talk to you this morning about asset/liability management. As Dave said, I don't practice much at being an actuary any more and actually I was surprised that Dave asked me to speak this morning, so the topic I've chosen is one from the "business end" of asset/liability management. In a recent Wall Street Journal editorial, Lindley H. Clarke said, and I quote "when E. Gerald Corrigan was chosen to head the Federal Reserve Bank of New York, he was asked whether in fact he did not consider himself a monetarist". E. Gerald Corrigan in reply said "that is very correct", however he added that he opposed such "economic rules". He went on to muddy the waters by saying that he does believe in controlling money supply growth "over time". It appears to me that economists are another profession besides ours where not being able to make up one's mind is a virtue.

The title of that article interestingly enough was "Among Economists, Eclecticism is all the Rage". Now I've really got you wondering what eclecticism is.

The title of my speech today is "Asset/Liability Management - The Eclectic Approach". Well, when I read the article it sounded good, so I went to the dictionary and found out about it because this is the way I feel about asset/liability management and I hope you'll share some of these concerns and problems with me. An eclectic, according to the dictionary, is someone who selects his ideas from various systems, doctrines or sources.

It seemed to me as I hope it will to you later that there is a distinct parallel between the history of economic practice which is intended to be based in economic theory and the actuarial practice of asset/liability management which is based on a lot of articles on theories of immunization.

The economists are beginning to make the transition albeit because of a world that's far more volatile, from the theory-based to a pragmatic eclecticism - can we? This transition, if it does occur for us, will be brought about, I believe, by outgrowth of thinking by us in four key areas:

1. "The Bottom Line"
2. New Investment Technologies
3. New Insurance Markets and Products
4. Organization.

Before embracing these four issues, as Dave Johnston has said, my background is Vice-President responsible for American pensions at Crown Life. For a long time we have, as have many of your companies, been selling investment vehicles to pension plans in the form of guaranteed investment contracts. This type of "insurance product" was one of the first in the industry beginning in the 1970's to find its way to the portals of the traditional financial services industry. As many of you are now, we are now actively moving into other investment/insurance products to market to pension plans and other markets in the United States.

The entire industry is moving into financial services competition. In America, the boundaries between banks, stock brokerage houses, savings and loans, and insurance companies have crumbled. They don't exist and I don't think I could find any one in this room who would argue that point. I believe it is these changes which will require a new eclectic asset/liability management approach.

"THE BOTTOM LINE"

We are all members of companies whose bottom lines are increasingly under attack. This is caused by the disintermediation of insurance products into separate risk and savings vehicles and it will become very important for asset/liability managers to establish correctly what their bottom line is.

I do not believe the bottom line of asset/liability management is to eliminate risk. I do not believe the bottom line of asset/liability management is to match cashflows, if I can use that expression, Allan. I do not believe the bottom line of asset/liability management is necessarily to immunize. I do believe the bottom line of asset/liability management is to identify the greatest risk/reward opportunities for your corporation of the many that are available to us in the marketplace. This is a very proactive asset/liability management stance. We, at Crown Life, have a very strong focus on the marketplace. The marketplace dictates the risk/reward trade-offs. Asset/liability management at Crown involves the assessment of proposed new products and the asset/liability positions, both risk and reward. The assessment is determined by such standards as duration, immunization and cashflow projections. However, we believe the basis of profit is risk-taking and it is our goal as profit centre managers at Crown to find the market need with the maximum risk reward potential for the corporation, within the limits of the company to take risk. This usually involves two steps of which the first is assessing in the marketplace the risk reward opportunities. Products can differ, characteristics can differ, all with a risk and reward opportunity. The second step involves carefully modelling the opportunity against the bottom line and I have a lot of sympathy, Allan, for your speech this morning where you discussed how simulation and modelling must be used in asset/liability management.

Let me give you a small example. This isn't the first time this has been raised. Immunization of compound liabilities requires the purchase of longer assets which are subsequently traded shorter to maintain the immunized position. Following the prescribed Canadian rules of accounting for assets, this leads almost surely to a volatile set of earnings if as interest rates fluctuate, gains and losses are amortized over the remaining term of the assets. I recommend highly to you understanding the bottom line of your asset/liability decisions.

"INVESTMENT TECHNOLOGIES"

As competition among financial institutions in America becomes fiercer, the birthing rate to new investment technologies is phenomenal. I could characterize this period as the baby-boom of new investment technologies, dedicated bond portfolios, interest swaps, interest futures options on interest futures, and so forth. It's hard to keep up!

What's the simple way of dealing with new investment technologies? Well I think an eclectic asset/liability manager will welcome them because there are new opportunities to manage the bottom line. However, it's often too easy to either accept or reject new technologies as managers. It's too easy to accept or reject adding another theory or something we don't understand on top of theories we already have about immunization, cashflow matching and duration. It will be like building your house on sand. To design a workable asset/liability matching program it is important to test new investment technologies in an eclectic mode. By this I mean, test out specific examples; use modelling; determine the impact on the bottom line, I would even suggest month-by-month, quarter by quarter for one year, for five years, for ten years however long the liabilities are going to be around. That's really the good news though. This aspect of asset/liability management is perhaps the easiest one because it is something that you and I are comfortable with, modelling liabilities and cashflows.

The difficult thing is really the other side of new investment technologies. It's knowing how the technologies themselves will change historical yield curve and other relationships. A great number of new investment technologies are based on "historical relationships". We feel comfortable with that except for the last twenty-four months there has been nothing historical about the relationships. New technologies will change both historical yield curve patterns and interest spreads. The most predominant and interesting pattern I have seen in America today is a flow from fixed long and medium term investment instruments towards the shorter-term. Interest futures do that; adjustable rate mortgages do that; interest swaps to that. What will happen to interest rate spreads over the next five years, what will happen to immunization; what will happen to cashflows under these new technologies? Whether you participate in them as a company or not they will alter the value of your asset portfolio. Basing your corporate hopes and strategies on new investment technologies should be done with some care. We at Crown Life believe strongly that any new technologies should be tested carefully.

Let me digress for a minute and talk about a few examples of these new investment technologies. Interest rate swaps can unlock the high cost of liabilities. These are the non-asset based interest swaps and they can alter a cashflow mismatch significantly, by changing the timing of

cashflows. This can be done in a variety of ways and with a variety of risks. As an example, many companies may be looking at assets which are too long for the liabilities in their own segment of portfolio. Of course, if your company is like ours these situations were created by, and I quote, "previous management", and how companies arrived at this juncture is of course long lost in antiquity.

An interest swap could be done which would unlock the high cost of these liabilities by:

1. Agreeing to swap-in, as they say in the trade, or receive fixed interest payments, say for a five year period, at a 5 year U.S. treasury rate plus 30 to 50 basis points. The effect of that swap-in is to pay the high cost of the liabilities that you have locked-in on your books.
2. The other half of the transaction would be to agree to pay a three month commercial paper or LIBOR floating rate. Again under a 5 year contract with a 90 day reset. Well, the effect of that transaction is to give you effective liabilities for 5 years for the floating commercial paper or LIBOR interest rate. Of course' the rewards to this transaction are greatest the more positively sloping the yield curve. The risk is rising interest rates and a flattening yield curve.

Let me talk about another specific example. Interest futures at Crown Life are actively used to immunize our American pension portfolio. Interest futures are a useful tool for immunization because of their liquidity and low cost. Immunization however using interest futures from our experience has its challenges.

Firstly, interest futures are primarily U.S. Treasury based instruments. This means that futures can only partially immunize against changes in the treasury yield curve; however, unless some of you have some magic the portfolio assets are not surprisingly corporate bonds and mortgages so that you have sufficient yield. Futures will not and as far as I am aware there is no way you can structure them to immunize against the change in sector spreads, that is the difference between treasury and corporate yields.

Even against the treasury yield curve futures are an imperfect hedge for two reasons:

1. Futures are only available as hedges in any volume, at specified terms such as futures against the 3 month bills, 10 year notes and 30 year bonds. Even if these three points on the yield curve shift in parallel which as we know is needed for the earlier versions of immunization, the right result I can tell will never happen, because the yield curve is much like a snake, pinned down at three points and wiggling in between.
2. The yield curve absolutely and I repeat absolutely, never moves in parallel. In modelling for this we have designed a computer program to monitor our future position against the treasury yield curve and the movement in corporate bonds. This computer program attempts to analyze the yield curve snake and what it does is it breaks down the change in our portfolio and in the US futures position into twist, slope and level - it all sounds like a new name for a rock group! Twist by our definition is the change in the yield curve from 0 to 10 years. Slope

is the change in the yield curve from 10 to 30 years - that's the head of the snake, if you like - and level is the change in the yield curve right at 10 years.

This helps me and others in our company as senior management to identify how the gains and losses on the futures position can be matched against gains and losses on the portfolio. Finally, a challenge of futures is knowing how to set the correct target for the number of duration years in the future program. Now this would seem like a relatively simple thing to do. However, our experience is that the duration of corporate bond assets are generally shorter than the treasury equivalent at the same term. You have to be careful to use durations of your actual portfolio even though you are using futures hedged against the US treasury yield curve. Also as interest rates change the targets change and they change in a way that's kind of self-defeating. As interest rates fall the futures position automatically will go to an over-hedged position. At the same time as interest rates fall of course your futures position will have an unrealized loss. The only way to get the futures portfolio back into a hedged position is by selling the futures at the unrealized loss, so of course if interest rates go back up you have to buy it back in. In our experience it is something that has to be managed daily and weekly in order to immunize the portfolio using futures.

You might believe from my comments that new technologies should not be used. I believe that new technologies are some of the greatest opportunities in the financial markets today. They offer opportunities for those who are willing to subscribe to them, understand their impact on the bottom line, and make a careful assessment of the risks.

NEW INSURANCE MARKETS AND NEW PRODUCTS

The eclectic approach to asset/liability management will use liabilities as a creative tool. I've already spoken of how the insurance industry is being brought to the brink of the financial services world. Universal Life Insurance, Variable Life Insurance, Pension GIC's, SPDA's are really just the forerunners of what I believe are new investment vehicles sold as insurance products. In your strategic planning I am sure you share the belief that the main advantage of our industry is providing a tax-advantaged product in the United States and in Canada. The opportunities that we have as business managers to manage asset and liabilities in an eclectic fashion is to package liabilities in such a way as to beat the competition and maximize risk and reward trade offs. We have discussed at previous meetings ways of using single premium deferred and immediate annuities together to manage cashflows. Also many companies strip the interest on the first year of five year assets backing certain pension products to provide more attractive funding for Universal Life products. You have also heard of ways of creating packages of liabilities in a way that is similar to stripping interest coupons to create zero-coupon bonds. It seems to me that this type of liability packaging is at the base of our industry and in fact is the forerunner of eclectic management which uses liability packaging to the fullest. Our competitors, the banks, the savings and loans, and regional broker-dealers, have been constantly creating new liabilities and new market opportunities. They are now selling in our market place. Our competitive advantage however, is that many of our liability packages are unique to us as insurers, and therefore, cannot be created by our competitors. And this

means we can create risk-reward opportunities through asset/liability management that our competitors cannot! Asset/liability management, the eclectic kind, deals in creating liability packages which more effectively create risk-reward opportunities for us in the new financial services world.

ORGANIZATION

As I see it banks, savings and loans, and other financial institutions have for many years dealt on a daily, weekly, or very frequent basis, communicating relevant and necessary information between the asset side of the balance sheet and the liability side. They have not perhaps had the same actuarial interest immunization type background in the banks particularly in the United States as we have, but they have been good communicating between their asset and liability sides. We on the other hand, have been missing the need for the liability side and the asset side to work together. Today, it is as important for us to market the asset side of our balance sheet by aggressively seeking out new opportunities and investments.

In one sense I am disturbed by the move of some insurance companies to segregate investment operations from insurance operations. Many companies are considering or have removed investment management from the insurance operations side of their organizations. What is required today is increased closeness between investment managers and the business managers and actuaries. The greatest need of insurance companies is to ensure cross-fertilization, cross-training of executives, an understanding of investment management from the liability-side and an understanding of liabilities from the investment management side.

Two technical sides, the professional actuary and the professional investment manager not talking to each other, I believe will achieve nothing. But the ability to create liability packages and new investment technologies together is fundamental to eclectic asset/liability management and in fact it is fundamental to the survival of our industry in the larger financial services arena.

At Crown we believe strongly in daily, weekly communications, and management of bottom line strategies through asset/liability management. This means making practical use of new technologies, and new liability packaging discussed on a day-to-day basis.

Let me conclude with a number of succinct rules on eclectic asset/liability management:

- First. Determine your bottom line. The discussion of this will last for a long time but will be really worthwhile. Spend a significant amount of time on risk/reward relationships in the market place.
- Second. Any asset/liability legislative rule or management policy should not be interpreted as master of the bottom-line. Rules can and ought to be changed from time-to-time as market conditions, the real world where we all have to operate, changes and knowledge accumulates.

- Third. Any asset/liability management rules should have to leave some discretion with the asset/liability management group of your company.
- Fourth. New investment technologies heighten the opportunities to meet market needs and must be used after careful pragmatic testing.
- Fifth. Liability packaging, in the context of the eclectic asset/liability management, creates very practical opportunities to improve profit and reduce risk. In fact it is a competitive advantage.
- Six. Lack of daily communication and secrecy between insurance and investment operations can frequently lead to the wrong result.

An eclectic is one who selects his ideas from various sources, various systems and doctrines.

It is my hope that we as an industry move to eclectic liability management of our business. Eclectic asset/liability management needs to come to be seen as a virtue to compete in the entrepreneurial financial services marketplace by maximizing risk-reward relationships for your company.

MR. MICHAEL ROSENFELDER: As the last speaker I guess I have the benefit of having heard the previous speakers and having had the opportunity to pick up some of their points and put them into my own remarks and pretend they are my own idea. On the other hand a lot of the powerful points that I was going to make have already been made, so I am not sure whether I am better or worse off, at this point of the program. I also have been presented with three good acts to follow and this will be a hard thing to do.

My assignment this morning under the terms of reference given to me by the moderator was to discuss the subject from the valuation point of view. That is how does the valuation actuary react to what he finds rather than what is perhaps the more interesting and more important aspect of the matching problem, how to manage the matching question, both at the point of sale of the liability and the purchase of the asset and also how one monitors the continuing matching or lack of matching that exists as the asset and liability proceed towards ultimate maturity.

As the moderator explained to you my background is with a Canadian mutual life insurance company which operates in Canada, United States and United Kingdom. At the present time the bulk of our interest sensitive products are in Canada but with the U.S. and the U.K. products of this nature growing very rapidly; however most of my remarks are made against the background of Canadian style products in a Canadian environment and unencumbered by such things as New York State Insurance department requirements and so on.

Let me first of all say that my view would be that mismatching per se is not necessarily improper in the right circumstances. In fact in the right circumstances and some people would say with a bit of luck or with a lot of luck, mismatching can even produce a profitable result although this is a matter one might debate for several hours. Many would argue that the pricing of many interest sensitive products, particularly today in Canada, can only be supported on the assumption that the company will ultimately make some trading profits. I am not sure what we mean by trading profits; I

suspect it is really a polite term or perhaps a code word for attempting to use a deliberately mismatched position to generate profits, that is, taking a position as to the future course of interest rates and attempting to benefit from it. This is a legitimate albeit very risky investment posture to take, but it is a posture that does make the job of the valuation actuary more difficult; certainly the valuation actuary is put in a much more comfortable position if he is presented with a bunch of liabilities and a bunch of supporting assets which some kind manager has already nicely structured so that they exactly fit. This doesn't happen very often. The improper aspect of mismatching is a mismatching policy or sliding into a mismatched position without recognizing the associated risk, without the ability to measure and monitor the risk, and without having the analytical tools which would alert company management to a situation where the extent of the mismatch and risk to which the company or the specific profit centre is exposed being so great that it will exceed the capacity of the profit margins or the stomach of the company to absorb. The job of the valuation actuary, which to some extent is a reactive one, is to identify the existence of these mismatching risks, to measure the risk involved and to ensure that to the extent that the company or the specific profit centre has exposed itself to a mismatching risk, that this risk has been appropriately provided for in the financial statements.

When we talk of matching or mismatching, we generally tend to think of annuities and other interest sensitive products - the GIC or deposit-type liabilities. I'm not sure, but possibly in recent years the largest mismatching losses have occurred not so much in the so-called interest sensitive products but among the traditional cash value, periodic premium whole life or life business. Most companies have suffered from premature cash value payouts and from unexpected large loans, and in times of high yields, these clearly generate mismatching losses. If the company writes a lot of par business with large dividends, these mismatching losses can be passed on through dividend action or by lack of dividend increases or dividend reductions. In some cases, they have to be absorbed by the company. In the case of non-par business, they clearly have to be absorbed by the company.

However, it is obviously true that mostly the mismatching question relates to interest sensitive products - products which have fixed high interest promises associated with them and where the liability is expressed pretty well in a fixed term, and for the rest of my presentation, it's this kind of product which I will have in mind. These would include what we call GIC's, i.e. deposit-type liabilities with a fixed maturity date. It could be one year or ten years out in the future, but is typically three or five years out in the future. If there is an early cash-out privilege provided that the cash-out privilege is associated with market value adjustment, then they could still be viewed as fixed term, fixed interest liabilities. Single premium immediate annuity business can also be included in this category. They are not quite as fixed term as straight deposit liabilities, but the mortality risk is much more predictable, particularly where the product has a guaranteed period associated with it. S.P.I.A. or Single Premium Immediate Annuity business really has many of the characteristics of deposit-type liabilities albeit with a longer term or a longer tail.

I am not sure whether this is universally accepted as the right way as to how you look at how you measure matching, but I personally find it convenient to look at the mismatching risk in two separate compartments. There is a current yield mismatch and there is a term mismatch. Some companies can find themselves with a yield mismatch, but well matched by term; conversely you can have the converse situation or you can have both situations existing at the same time. It is convenient I think to measure and examine separately the yield mismatch and the term mismatch and when both exist, then the exposure to loss would be additive. Furthermore, I think there is an important distinction between these two types of exposure. A yield mismatch in most cases will produce a certain loss and under the actuarial rule book, the valuation actuary really has no option but to recognize the present value of this loss immediately. The term mismatch is a contingent risk which may produce a loss or may produce a gain depending on the future course of interest rates. The company is again exposed to a risk of loss, but unlike the yield mismatch, it is a contingent risk which may or may not ultimately materialize, but nonetheless has to be recognized in some form or another which we will discuss later in the valuation process.

There has been much discussion about segregation of assets and the first speaker referred to this at some length. The job of the valuation actuary is made mechanically much easier if the company has already separated its assets into various categories and specifically identified the investments which support interest sensitive products. My own company has in fact operated internally segregated funds for many years. Each fund supports a specific block of liabilities with each block of assets having its own distinct fund manager. Typically, we would have divided our insurance and annuity obligations into various profit centres by asking ourselves whether particular blocks of liabilities have similar or differing objectives. Where a block of liabilities has similar characteristics they would be put together into a single profit centre. Where the liability has different characteristics, it would be put into a separate profit centre again with a separate fund and each fund then having its own fund manager. Finally, there is a corporate surplus or surplus profit centre which represents the residual assets which do not support specific insurance liabilities, but in fact represent the company's surplus funds. Each of these fund managers would deal with each other on an arms-length basis. Our own experience has been that this is a system which works very well, at least it has worked well for our company, and I would strongly recommend it to anyone, any company which is selling different types of products with different liability characteristics.

A very convenient by-product of the segregation of assets is that it makes the job of valuation a lot easier. This is a nice reason to go through the heartache and headache of segregation, but I think the primary motivation and the major benefits would be to facilitate better management of the company's operations. The fund manager who is looking after the insurance profit centre has as his objective to meet or to produce a sufficient yield to support the promises made to the policyholder. There may or may not be enough margins in the product to support a mismatch risk. Under an internal segregated asset type of approach, the one we have chosen to adopt, we have taken the attitude that the manager supporting the insurance fund should not be required to assume a mismatch risk because generally the risk of loss and the size of possible losses from taking a wrong mismatching stance can be

such that they would swamp and far outweigh the margins available in the pricing of these particular products, especially the way things currently stand in the very-competitive Canadian market.

The way this is operated in my own company is to say that each insurance profit centre should be well matched and to the extent that the company in total is willing and has the financial capacity to assume a mismatch risk, this is accomplished by an arms-length deal between the fund manager of the insurance profit centre and the fund manager of the corporate surplus profit centre whereby the corporate surplus fund manager would undertake to provide a fixed rate of return to the insurance profit centre. The surplus profit centre manager would then take a position if he so chooses on the future course of investment yields in the expectation that the ultimate return on the assets would exceed that which he has promised to the insurance fund manager. If his view on future long term interest rates is right, he comes out as a hero. If his view on the future course of interest rates is wrong, then the surplus or corporate surplus profit centre would generate a loss; however, it is very very important that the extent of mismatching assumed by the company in whatever profit centre it chooses to set up these mismatching risks is measured and controlled in order to ensure that the overall exposure does not exceed the ability and willingness of the company to assume such risks. The bookkeeping is done by establishing interfund loans as I said before, pretty well on an arms-length basis.

This is a procedure which happens to have worked well for us. I think it would work well for most companies. However, if a company has not pre-established an internally segregated block of assets, or chooses not to, then for the purposes of valuation, the first step of the valuation actuary must be to initially allocate assets in some form or another among the various types of liabilities and in fact it would be my view that without such segregation, whether it's notional or actual, a sensible valuation would be difficult to perform. In a mutual company, this type of allocation is made a little easier because as a mutual company one is unencumbered by considerations such as equity between par and non-par, equity between policyholders and shareholders and if one happens not to operate in New York, one is also unencumbered by any requirements of the New York Insurance Department. However in any allocation process, a company obviously has to operate within external constraints such as the need to maintain equity between policyholders and shareholders and these are some of the issues that Allan Brender touched upon earlier this morning.

In the allocation process the next question is - who gets first crack at the assets? It is my view that no great disservice is done subject to the constraints I just mentioned, in first allocating assets to the interest sensitive products. This normally produces a more efficient result and in fact it can be done without specifically determining whether or not those assets were purchased to support the particular liabilities to which they are being allocated. This apparent favouritism may appear to be unfair on first sight, but again looking at the total results for a company or for a line within the company, such favouritism does not invalidate the overall result, it merely shifts any mismatching losses or any needs for strengthening from one line to another provided you do not cross between policyholders and shareholders interests, or something of that nature. I think the apparent favouritism does not invalidate the valuation process, in fact I think it is more likely to produce a fairer result. Once again, such

favouritism should be limited to coming up with a proper valuation result, it is not necessarily appropriate for dividend action.

I'd like to come back to my earlier thesis which was that in assessing or measuring the mismatch loss, it is convenient to consider the problem in two parts. There is the mismatch by yield and the mismatch by term. Let's first talk of a mismatch by yield, because that's a little easier to measure and a little easier to identify. Assuming that we have gone through an allocation process, either pre-existing or a notional allocation process in connection with a valuation, the valuation actuary then has a block of liabilities supported by a block of assets and each of those has associated with it a current yield and an anticipated future yield. The valuation actuary must be satisfied that there exists an adequate margin, both currently and in the future, between the yield generated by the assets and the interest required to support the promise made to the policyholder; sufficient to support reasonable maintenance expenses and by this I would include not just the incremental costs of maintaining the business but also a fair share of overhead and any additional margin required for the recovery of deferrable acquisition expenses where this is appropriate. There must also be a margin for a risk of default, particularly where the supporting assets are of a risky nature. The actuary should also adjust for differences in frequency. For example, the asset yield is received half-yearly, yet we are required to make monthly interest credits to the policyholder or conversely, if the interest income comes in half-yearly and all that's been promised is an annual yield, it's appropriate to make an adjustment for differing frequencies between the investment income on the one hand and the interest promises on the other, and then finally consistent with actuarial tradition, some additional margin for contingencies. If he is short, before he goes through the rather difficult process of strengthening the reserves and explains to everybody why it is necessary, the valuation actuary is then very tempted to poke around to try and find reasons why the inadequate margin in fact might prove ultimately to be adequate. There is a great temptation to take credit for possible future yield improvements and great care needs to be taken when doing this. If the company has investment commitments generating a higher yield than current short term investments, it may be appropriate to take credit for such investment commitments provided that there is a fairly high level of certainty that the commitment will in fact be drawn down at the stated rate. An expectation of further trading profits, particularly in the expectation of a change in future yields or some change in the present yield curve is normally not something for which the valuation actuary can take credit, and if this is all he has got to make his margins adequate, he probably needs to strengthen his reserves. If the hoped for yield improvement occurs, well and good, but I think it will be difficult for the valuation actuary to take credit for this in advance. If at the end of all this calculation he finds that the spread between asset yields and liability yields is sufficient to support all these things I've just discussed, fine. If he finds that the margin is inadequate, the valuation actuary at least in my opinion, has no option but to recognize the shortfall immediately and what has to be recognized is not just the current year's shortfall, but the yield shortfall between now and the ultimate maturing of the obligations, so in fact, he has to take the present value of the yield shortfall and this will generate the required reserve strengthening.

The arithmetic for yield mismatch is a little easier than the arithmetic for term mismatch. As I have said before, this is a contingent risk and it can only be measured precisely if you have precise advance knowledge of the future course of interest rates. Before I get into the question of how you measure the mismatch by term, let me just throw out a number of what I feel are misconceptions on the subject of mismatch by term. A company which happens to have the average term of its assets equal to the average term of its liabilities has made an important first step towards accomplishing matching by term. However, merely having the average terms equal, although it's a major step forward, does not in itself eliminate the risk of mismatches. The interest environment is not static. It doesn't move in one direction - it moves up and down and you can be in a situation where the average terms are perfectly matched but where you still can be faced with very substantial mismatching losses or mismatching gains if in fact the interest rates move in the wrong or right direction about the average term. Another misconception is that if the present value of asset cashflows and present value of liability cashflows discounted at a single rate of interest - for example the present yield - produces a perfect balance, this is certainly a necessary condition to test for mismatching, but not a sufficient condition. Good evidence of a well-matched fund by term would require that the present value of asset or liability cashflows are equal at all rates of interest certainly within a large range of rates of interest. Finally, interest rates do not stay static from January 1st to December 31st. They do move around throughout the year, and matching by calendar year is a very excellent first step and perhaps all we can hope to accomplish in a short time. Nonetheless, it is not total good matching by term, but is a good first step.

So much for a number of misconceptions that I thought I would throw out. How do we measure the potential loss from a term mismatch? Unlike a yield mismatch, there isn't a single mathematical answer and the valuation actuary has to test a number of possible future scenarios and then make a judgement decision as to the extent of risk to which the company is exposed and the extent to which this risk must be provided for within the financial statements, within the actuarial reserves. If the company has invested long, that is if the term of the assets is generally longer than the term of the liabilities, then what does the valuation actuary do? Does he provide for the loss that will occur if interest rates stay level forever at 15%? Does he have to provide for the potential loss if interest rates immediately climb to 18% and stay there? Does he have to provide for the loss that would be generated if interest rates went up to 25% and stayed there? Conversely, if the assets are invested for a term shorter than that of the liabilities, the risk of loss arises from interest rates being low when the assets mature prematurely. In that scenario what does the valuation actuary do? Is it sufficient to assume that interest rates will go down to 10% and stay there, or must he also consider scenarios where interest rates drop - if anybody can believe that - to 6%, 4%. Also if a company is in a situation where in some years it has excess asset cashflows and in other years it has excess liability cashflows, is the valuation actuary entitled to assume there will be some gains and some losses? Or does he have to be very pessimistic and assume that the course of interest rates is going to be such that he is going to lose everytime irrespective of whether the cashflow happens to be positive or negative. And this is possible if interest rates move in the converse direction from the one you hope it will.

I'm not aware of any definitive actuarial literature on this subject, but there are some principles which I think are very clear. If the company is mismatched by term, it is exposed to risk of loss and quite clearly the valuation process requires that the actuary incorporate into his valuation a provision for the adverse deviation which would occur if interest rates move adversely. The size of the provision in my opinion is something that requires the judgement of the valuation actuary, but clearly the size of this provision must be a function of a number of specifics. First of all if the spread between the asset maturity dates and the corresponding liability maturity dates is longer then clearly a larger provision for adverse deviations is required. If the earlier maturities of either asset or liabilities are a fair way out in the future, then the risk of loss is not going to occur immediately but is going to become more and more evident as the maturity date becomes closer and closer. Therefore the actuary would be permitted to build up a reserve or drop it down as the maturity date gets closer and as the likelihood of loss appears to become larger or smaller. This last point is very much a function of the relationship of the current yield or the range within which current yields seem to be moving compared to the valuation yield.

Some examples of gross mismatching require a very large provision for adverse deviation and some might even argue whether the investment stance is even legitimate to the extent that a company backs fixed term, fixed interest liabilities with real estate investments or stock investments which don't have a fixed maturity value or a fixed term to maturity or where the assets are of a different currency from that of the liability. Those are very, very substantial mismatch risks for which a company clearly has to make a large provision, if in fact the investment posture is proper or defensible in the first place. A more normal situation is where a company has blocks of fixed term and fixed yield assets supporting fixed term, fixed yield liabilities and those are much more susceptible to the type of mathematical analysis I've just discussed.

This brings me to the end of my remarks this morning. As Allan Brender very forcefully discussed, we are now entering a new world. Some of the old principles and methods are less valid than they were. Most companies are finding themselves in the position where the biggest problem is not necessarily the arithmetic but a struggle to develop data, to ensure that we have good and up-to-date data which will give the valuation actuary and management a handle on whether or not the company is well matched, the extent to which it is exposed to a mismatching risk and the job of the valuation actuary is to ensure that he or she has the best possible data to ensure that the level of the mismatch risk can be properly measured and properly reflected within the financial statements. The lack of good data or the lack of timely data and the lack of an effective monitoring system will prove very, very expensive for those companies who don't pursue this vigorously.

MR. JOHNSTON: The time is fairly close to when we should close-off and I have also heard a few stomachs gurgling. Each of you have raised a number of issues that beg some practical questions. I had a few that I was going to ask but I think in view of the time and the fact that there are workshops this afternoon and tomorrow afternoon, I'll refrain; but if people are anxious to ask one or two questions, I'd be glad to entertain them at this time.

MR. JOSEPH J. BUFF: I have a question for Mr. Dalrymple. You said that using futures as a way to hedge is a problem because the durations that are available are limited - I was wondering whether some kind of intermediary like investment banks might develop a series of over-the-counter customized instruments that would make the method more applicable?

MR. DALRYMPLE: I think that's right. The problem when you use the investment bankers is that it always gets more expensive. Yes, some investment bankers now are developing a package where they'll guarantee to immunize you against a treasury yield curve and then you don't have to worry about it. You are going to have to value these investment dealers to see whether they are fully capitalized in that sort of thing, because they are taking some risks that you and I might not be prepared to take. I was making that statement in the context of assuming that you are doing your futures trading by yourself.

MR. DON OODY: As chairman of the Society's Committee on Valuation Related Problems, I am interested in finishing up the presentation of the research and education and background responsibilities of the valuation actuary. I don't expect this question to be answered, but I want to throw it out. The valuation actuary will typically do all the things that Mike mentioned. I mean he did a perfect job obviously based on years of experience of working in this area, of exactly what all valuation actuaries are going to have to do. There has been a complaint from the pricing actuaries that the work done by the committees on the role of the valuation actuary has not paid enough attention to them and that I think is true. I wonder whether they've paid enough attention to what the committees on the valuation actuary have done. Very particularly, how does the pricing actuary live with the valuation actuary in the same company. The valuation actuary is known to be doing certain things. He is going to be forced by law to do them. A new line of business, especially rapidly growing, is going to require a considerable advance of capital to meet the kind of surplus that is going to be required by the valuation actuary if the kind of risk the pricing actuary feels he is charging properly for are going to be present. Does the pricing actuary as part of his pricing, charge for the use of this capital in advance? Does the valuation actuary in your company, Mike, get together on a month-to-month or a day-to-day basis with the product and pricing actuaries and, Ian, the other way around. Do you talk to your valuation actuary as you do your pricing, and this is very important to us. As I say, I don't expect an answer on it but I think it is going to have to come down the line.

MR. DALRYMPLE: Absolutely, absolutely - is that enough of an answer. Are we going to give the same answer, Dave? Dave's my valuation actuary. We spend a lot of time trying to develop the information systems which were just absent - you know cashflow information we now look at weekly; futures positions we look at daily; present value of cashflows of the asset/liability portfolio we look at weekly. So it was a bit of a struggle until we got the information systems down and we still struggle with it a bit. I think you have to take the perspective though that the pricing actuary is facing a world that is increasingly competitive and the valuation actuary is the one that creates the business form on which we operate the insurance companies. When I create a Guaranteed Investment Contract for Pension Funds and compete against trust companies who may not require some interest margin, if you like, what happens if there is an interest

deficiency or a mismatch is that it just flows through earnings as it occurs. What happens in an insurance company is that the actuary has to place a value on it today, and yet we both have to compete in the same real world, so I think information is probably the leading edge of good communication, but the bottom line is that the competition is real fierce out there.

MR. JOHNSTON: I can attest to the fact that we do communicate. We communicated before the session today and I think we will be communicating later this afternoon.

Our time is up and if nobody has something that they are really keen to ask right now, I would just thank the panelists for their good presentations and suggest that you don't forget the follow-up workshops.

