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## ACTUARIAL CONSIDERATIONS REGARDING COST AND RESERVING FOR DISABILITY PRODUCTS

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1. Unisex cost/non-smoker discounts
2. Contingent benefits, indexed benefits, partial loss, guaranteed insurability
3. Valuation standards
4. Claim reserve estimation

MR. ROBERT J. SHLIFER: The recent past as far as classes 1 and 2, the professional, executive, managerial, stable white collar classes are concerned, has been what I call the silly period. We have all read articles about what is happening. Companies are in desperate competition for a relatively small portion of the marketplace and this has pushed various kinds of benefits to their absolute limits.

When I go through our contracts, I can rarely find anything else to liberalize and then some other company comes out with some other liberalization. Most of you are familiar with many of these kinds of liberalizations. Issue limits have gone from \$2,000 or \$3,000 a month ten years ago to \$10,000 a month on a regular basis. I have seen companies, including mine, that have issued contracts up to \$20,000 a month, and that is for lifetime benefits. It has really gotten somewhat out of hand. Earned income limits are up and, of course, liberal definitions of disability and liberal definitions of almost anything else.

There has been almost as much fiddling around with the rate structure. Everybody is trying to outdo everybody else with respect to discounts. Someone comes up with a non-smoker discount, someone else comes up with a volume discount, someone else comes with some other multiple sales discount. It has been a period of having to watch very carefully what is happening in the marketplace. Each company, obviously, must decide where it wants to compete and how it wants to compete.

Within the fundamental framework, legality, loss ratios and equity, (including multiple sales discounts in many states) all have to be taken into account including, obviously, profitability and the competitive framework that I have already mentioned.

When people ask me about the competitiveness of our products, especially our field organization, I try usually without much success to get them to look at the whole picture. You should not pick out one rate and tell me that we are uncompetitive. Take a look at the whole rating structure; take a look at all of our issue rules and underwriting rules; take a look at our occupational classifications; take a look at our policy provisions and benefits in all of our classes; and then one can form a judgment as to how competitive we are.

When people ask me about profitability I can tell them with somewhat greater success that, and this is terribly profound, the object is to charge an appropriate premium for the risk. But we do not know much about disability. The industry and many companies such as Monarch who have been in the business for a number of years have good experience for the first year of disability, some experience for the second year of disability and absolutely no experience worth talking about after the second year of disability. Certainly, for all of the newer benefits that have been coming out there is no experience and there will be no experience for a number of years. If you have a product with a high claim frequency, maybe you will get some good experience in the first year of disability very quickly. If you do not and it is some other kind of a product, it will take quite a while. I tell people that I hope, if the experience is bad, that it is going to be credible the year after I retire.

With these general thoughts in mind, let us take a look at the basic contract. I know that is not an agenda item, but obviously these benefits do not exist in a vacuum. They have to be attached to a basic contract.

We calculate the pivotal age premiums, using a fairly standard Anderson type approach. We do a lot of interpolation. We use our own morbidity experience to develop three basic continuance tables. For our best classes we have a 30 day elimination period continuance table and for the lower occupational classes we have both 14 and 30 day elimination period continuance tables. Then we modify these tables for the longer elimination periods. As you may know, studies have shown from time to time that the longer the deferral period, the better the experience. I have always wondered about that looking at it from a practical view, because to the extent that somebody buys a 365 day elimination period from our company, they probably have something up front for the first year of disability and what is the overall effect? Do you really get a better continuance curve?

After the second year of disability we assume no terminations from disability, just deaths. People say well, Bob, these benefits are so liberal you are selling these people an annuity. I said, fine, we can price an annuity. We have priced an annuity, so we feel we are reasonably conservative there. It is difficult to put a value on disability definitions, but no matter what the definition is, it is hard to get a person off of disability after the first few years.

Our tables are ultimate, with a minor selection modification at the older ages. We have, of course, all of the other assumptions using our own experience where we have it for mortality, persistency by age and occupational class, and the various kinds of expenses - per policy, per one hundred dollars of monthly benefit, percentage of claims paid and percentage of premiums, interest assumptions, margins for profit and contingencies and the one that I always forget until somebody reminds me when we are pricing and that's reinsurance cost. When you are selling \$10-, \$15- and \$20,000 a month, you have very substantial reinsurance costs. As an aside, we have found in recent years that unit expenses are one of the major problems in pricing disability insurance. Maybe it is somewhat peculiar to Monarch in the sense that our volume has been low in recent years, but it has been a major problem and it has concerned us much more than morbidity has.

Unisex

I will now talk about unisex and I have included pregnancy in my discussion. They go hand in hand. People who have been liberalizing in the area of unisex, have also made many competitive moves in terms of removing pregnancy exclusions from policies. People no longer look at me like me like I am crazy as I roam the halls talking about sex and pregnancy. At the moment, there are no state or federal laws that I am aware of that mandate that insurance companies have unisex rates. All of the pressure for unisex rates has come from, first of all, our competition and, second of all, a natural desire to help the employer who, because of the Norris Decision and other reasons, wants to offer unisex rates. It is a minor distinction, but I always am very careful to make it because people talk a little loosely that insurance companies have to go to a unisex pricing structure, and I do not believe that is true.

One legal consideration to keep in mind on unisex, however, is that New York Regulation 62 has a very confusing and somewhat unclear section saying that if you go unisex for part of something, you may have to go unisex for all of something. The something is the unclear part. Is the something the particular policy form? Is it the particular product or is it your whole health insurance portfolio? I do not know, and if anybody has any recent experience with the New York Department on the subject and would like to comment about it later, I would certainly be happy to hear about it.

Monarch has perhaps had the reputation for having started a lot of the unisex competitive leapfrogging that has taken place in the last few years. In 1982, we filed in our best occupational class, which was a fairly restrictive class of the usual doctors, lawyers and highly paid executives, the same rates for males and females. I have adamantly denied that these were unisex rates. They happen to be the same rates, but we basically said, here are our male assumptions, what are our female assumptions? We have no experience and no one has any experience that I am aware of on this very small block of professionals. All of the experience usually mixes in the kinds of things that we have in our Class 2 and Class 3 - the white collar, secretarial, clerical kinds of occupations. I had to ask myself why should a 35 year old female neurosurgeon have different morbidity than a 35 year old male neurosurgeon? We came up with the answer that we have no experience and that it is not unreasonable to assume the same morbidity.

About a year later, people not only followed us in the best occupational class, but they followed us in what would be our Classes 2 and 3, and some companies have gone unisex across the board. It is important to distinguish this sort of arbitrary unisex of simply lowering female rates to male rates, as opposed to a carefully studied question of what the unisex situation is. We did, for the moment, follow the competition in arbitrarily dropping our female rates to our male rates. However, I am very happy to say from my own company's point of view, that we immediately started work on a true unisex portfolio, carefully restructuring our occupational classes and carefully examining the female contents of those classes to make sure that the premium is appropriate to the risk.

It appears reasonable to calculate separate male and female premiums, and weight them as opposed to weighting the claim cost and coming up with a unisex premium directly. It is always important not to fool ourselves. We want to know what we really think the female experience is going to be, what we really think the male experience is going to be. We do not want to hide the whole thing by simply weighting the claim cost. We have made estimates and I will give you some general numbers in a minute.

Of course, we plan to very carefully study the actual mix. A question of antiselection always comes up. Are we going to get a disproportionate number of females over and above what we expect? We think the answer is no. There are so many companies now that have unisex rates, and it does not appear likely that Monarch is going to get a disproportionate share of them. Here are our actual sales, looking at our disability income products only, not our business products. In the best class through September of this year, 19% of the policies were sold to females. In the second best class, the secretarial/clerical class, 35% of our policies were sold to females. In the third best class, 28%, and in the lowest classes, 5%. There is very little credible data on actual female to male claim cost ratios. I will mention a couple of items briefly.

Here are a couple of sample assumptions. For executives, we assume that perhaps 6% of all executives are going to be females, for clerks, 48% females, secretaries, 95% female. In general, for our Class 2, the overall class is perhaps 15% females, and in Class 3, our next best class, perhaps 40% females. What experience we do have is substantially better than the New York study showed a few years ago and it compares very favorably to the Transactions study of female Group I and to male Group I claim cost ratios.

As far as pregnancy is concerned, we just had to ask ourselves the question, given the type people that were in our best class and second best class, what are their motivations? We did find an interesting article in the Boston Globe and it gave some American Medical Association guidelines that apparently they have adopted for how long people in various occupations can work during pregnancy. I will mention a few of those. Secretarial, light clerical, professional, managerial, 40 weeks (10 months). If the job involves standing, prolonged standing, more than 4 hours a day, 24 weeks. Stooping, bending below the knee, more than 10 times an hour, 20 weeks. Climbing ladders or poles not more than one to four times in 8 hours, 20 to 28 weeks. Lifting repeatedly more than 12 kilograms, 20 to 24 weeks. We took a look at these numbers and it became very obvious to us that there is a major pregnancy risk. We could not really see that we could afford to remove the pregnancy exclusion from our policies below our Class 2, and we had to be very, very careful as to who was in our Class 2 and in our Class 1 for that matter. Motivation is the key. If a pregnant woman goes to her doctor, the doctor is going to play it safe - he is going to say you can not work or it is best to take it easy. Removing the pregnancy exclusion is a calculated risk.

#### Non-Smoker

Moving on to non-smoker, there is very little or almost no credible data on health insurance, but it is very reasonable to assume that there is some impact. Our application asks whether cigarettes have been smoked

in the last 12 months. We do not count pipes or cigars. If the applicant lies, we are not going to contest the policy.

I reviewed a few articles that I thought had something to do with health insurance and I noticed that there was a somewhat lively discussion in the Academy publication, the Actuarial Update, of September 1984. The discussion had to do with the need to differentiate by sex and by the various classifications, i.e., a person who has never smoked, a person who smoked but gave it up, and people who smoke but how much to they smoke, and there are various breakdowns. I looked at some material from talks given at the Paul Revere disability seminar in 1984. Mike Cowell had some comments about female frequencies, durations, and claim cost ratios. As far as current habits are concerned, he seemed to indicate that perhaps 30% of men and something less than 30% of women are current smokers. Early durations are affected; the effect of smoking has not been deferred to the older ages as much as people perhaps originally would have assumed. Male smoking decreases as the socioeconomic class goes up. He did not find the same thing for women, but he admitted that perhaps there simply was not enough data. He indicated that non-smoker claim costs were perhaps 70% of smoker claim costs, but this simply may reflect a difference in occupational classes.

On the subject of establishing a non-smoker discount, I already mentioned our question in the application. The question arises, should you try to analyze the urine specimens for smoking? There was no conclusive answer, but there was the comment that perhaps 15% of the people applying for non-smoker actually tested positive for nicotine in the small sample quoted. Part of that could be that cigars and pipes will test positive for nicotine according to various tests. The only reasonable way to proceed, from our point of view (we came out with non-smoker discounts in 1982), was to give discounts and try to accumulate as much data as possible. We give 5%, 6%, and 7% discounts - 5% discounts for the shorter benefit periods, 6% for the 5 year benefit periods and 7% discounts for the longer benefit periods. We want the same aggregate premium, so if we give the non-smoker discounts, obviously we have to raise the aggregate premiums for smokers. In the best classes, we raised the premium from 3 1/2% to 5%, varying by benefit period, such that our assumed aggregate premium would be the same as if we did not give non-smoker discounts. The smoker loading also varies by benefit period.

There is a question whether to give non-smoker discounts to sub-standard risks. It never made much sense to me to tell a person, we had to rate your policy 30%, but we are giving you a 7% non-smoker discount. I thought it was more reasonable for our underwriters simply to take smoking into account and come up with an appropriate rating. However, from a competitive point of view, it may be important to give an explicit non-smokers discount, even for sub-standards, and I believe the comment was made in one of the articles that State Mutual does that.

In our best class we are finding that 87% of all policies sold come in as nonsmoker or are issued as nonsmoker. That is greater than the 75%-80% we had originally anticipated. Surprisingly, nonsmoker percentages do not go down very fast by class. In our Class 2, nonsmokers are 72%, in Class 3, 71%, and in our lowest occupational classes, we are issuing 67% nonsmoker. Either we are finding more nonsmokers than other companies are or there are greater problems with false statements than we would like to believe.

Contingent Benefits

There is a great deal of design variation and there is a great deal of difference in the purpose for which these benefits are used. The three basic government programs are Social Security, Workman's Compensation and State Cash Sickness.

In our issue rules, we take care of the question of potential overinsurance from Workman's Compensation and from State Cash Sickness. Social Security is the only program we deal with through a contingent benefit. Despite the fact that theoretically you can get benefits after five months, we assume that people do not receive benefits for a year, so we have a long deferral period for our rider.

Our rider is a fairly standard rider. We pay if Social Security does not and vice versa. The purpose of the rider is basically to provide us with some protection. But we did not want to get into hassels about whether Social Security changed its benefit level in a particular year so we sell a flat \$600 in all family situations and ages and do not sell more than that under any circumstances. We sell the benefit rider to age 65 only. It has the protection that you have to apply for Social Security and you have to appeal if Social Security is denied. The critical pricing assumption is the denial percentages.

Our denial percentages vary by occupational class and age. When we first came out with them, they were so simple that I could remember them by heart. In our best class they were .6, .5, .4, .3, .2, by decennial attained ages, 25, 35, 45, 55 and 62. We have not really tried to do an in-depth study of what the current percentages are, but we did raise them in our latest pricing. For example, at the lowest ages now in our best class, we moved the percentage up to .7 and we may even raise it further. In our lowest classes we also raised them slightly. These percentages are slightly less than the percentages given in the paper by Emanuel Halpern in the Transactions. Again we are going to look at this very carefully. It is a critical issue, but one thing that has helped to ameliorate part of the problem is that in our two best classes we offered to sell fully guaranteed benefits instead of contingent benefits. It appears that the risk of doing so from an overinsurance point of view was very minimal and certainly I would prefer to get a full premium from people as opposed to getting a lower premium and having to pay the full benefit anyway. Many companies do that now and it may be a trend toward the ultimate oblivion, I suppose, of contingent benefit provisions.

Our sales of this rider have paralleled our decision to sell guaranteed benefits. Approximately 13% of the policies in the best occupational class are issued with the rider, 30% in our second best class, 32% in our third best class and 29% in our lowest occupational classes. We also pay contingent benefits during residual disability, but they are not really contingent benefits. We assume that if a person is residually disabled, he or she will not get Social Security benefits, so we simply assume that the denial percentage is 100%. The states still require that you keep careful track of the experience under these riders; many times that requirement takes the form of tracking policies with and without this particular benefit.

Indexed Benefits

More fooling around has probably taken place with indexed benefits than anything else. The key design features in a contingent benefit are the percentage of increase, whether there is a cap, are the benefits tied to the Consumer Price Index or are they guaranteed, and the frequency of indexing. Companies were not satisfied with these particular features, so they added buy-back provisions and changed when indexing starts.

We offer two choices for percentage increases - 5% and 7 1/2%. Some companies offer up to three choices. As far as the cap is concerned, we used to have a cap of 2X, some companies went to a cap of 3X and then companies took the caps off altogether. Some companies take the cap off of indexing on predisability earnings if it is a residual contract and leave it on the benefit while others take it off both (we take it off both). Some companies put indexing on predisability earnings right in their basic residual contracts, while others have it as part of their riders. I was shown some demonstrations that surprised me. Even when we had a cap of 2X, when we were talking about residual disability benefits we could have had a situation where by the time people theoretically reached the cap of 2X they were actually receiving up to 6 times as much as they were before we started indexing. And a very surprising fact, at least to me, is that the additional dollars paid under a cost of living benefit are the same no matter whether you are dealing with a total disability or residual disability, or how residually disabled the individual is. The proof of that is left to the student, as they say, but I found it very surprising.

If the increases are guaranteed, then this is the most exactly priced of any benefit. Monarch does it this way - we guarantee the increases. We simply take the difference of a premium with indexed claim costs and the premium without the indexing and there it is. We do take account of the long deferral period of cost of living benefit and we start indexing one year after the end of the elimination period. We actually end up with two separate sets of rates because if somebody has a 14 or a 30 day elimination period it seems that their experience should be a little different than somebody, for example, who has a 365 day elimination period and their indexing does not start until almost a full year later.

Regarding the question of whether to have guaranteed benefits or benefits tied to the Consumer Price Index, inflation comes into the picture. When we first came out with consumer price index rider in 1971, we had it tied to the Consumer Price Index - it was a 5% rider and we felt very comfortable. We made the benefits guaranteed around 1980 and we still did not feel terribly uncomfortable with inflation. Some people have questioned the impact of having a 7 1/2% rider and some companies have up to 10%. It is something that we will have to look at and so will other companies which have guaranteed indexing.

If benefit increase percentages are not guaranteed, then you have to look at historical data and try to figure out how to price it. For our 5% rider that was tied to the consumer price index, we used to price at 3% and then later on in the mid 70's we priced it at 4%. New York State objected and I still have a letter that I treasure from Max Schwartz. He disapproved of rating our 5% rider at 4% because he claimed that inflation

would never get above 3%. I was feeling very good about that letter in the late 70's and early 80's, and maybe Max was right from a historical point of view. We researched the historical consumer price index and we thought that we had justified a 4% benefit.

Another key and intangible question in pricing an index benefit is how does the existence of the benefit affect the individual's motivation to stay on claim. It is the most exactly priced benefit we have from a purely mathematical point of view, but from the intangible point of view it is not at all clear.

About 17% of the policies in our best class have the cost of living rider. That figure is almost certainly low because we do not have a breakdown of the policies that are eligible for the rider. We do not sell a cost of living benefit if a person only has a one year benefit period or a two year benefit period. About 11% of our policies sold in Class 2 have the cost of living rider, and 7% and 5% of policies, respectively, in our lower occupational classes.

#### Guarantee of Insurability Benefits

There has been much liberalization of these benefits in recent years. The key design factors are obviously the option dates and the amounts. It used to be when we first came up with our rider, we would offer \$100 a month increase every 3 years. Now companies are offering thousands of dollar increases on each option date up to very high total aggregate maximums and a not uncommon design is to allow people an option date every year starting on the second anniversary. Perhaps a saving grace to all of it is that we, like most other companies, get the agents out to see the insureds and encourage the exercise of guarantee of insurability riders while people are healthy and that may have some effect. Usually the riders allow people to exercise options through the early 50's. Another feature is that some riders have carry forwards. If the option is not used this time, then there could be a double option the next time. And, of course, some riders also have special option dates, birth of a child, marriage, etc.

Pricing the benefit involves coming up with a series of pure endowments. Each pure endowment being a function of laying out the option dates and making assumptions as to the percentage of people who will exercise the options on those dates, and the degree substandard that the people will be at that time. We also have to make an assumption as to how much in the aggregate people will exercise. We used to assume that by the last option date everybody exercised the full option amounts that were available at that time. Some states have recently begun to question that assumption. In any event, guarantee of insurability is a very inexpensive benefit.

If you look at schedule pages where somebody has bought a large amount of disability benefits and his premium is in the high hundreds or thousands of dollars, somewhere in there is \$50 or so for a guarantee of insurability rider. It is one of our most popular benefits. In our best class, 48% of the people buy it, in the second best class, 25% of the people buy it, and in the third and lower classes, about 26% of the people buy it. We have looked at what little experience we have and we see nothing alarming as far as the use of the rider or the extra morbidity we



are getting on people who exercise the option. Once the option dates come up, we find about 40% to 45% of the people exercise an option. I found that to be a surprising high figure. That may go down now that the option amounts are so high and with all of the carry forwards and the design of the product.

### Residual Benefits

My last topic is the question of long term partial or residual disability benefits. There is certainly still a very lively, continuing debate about the riskiness of residual disability benefits. Is it an additional benefit or does it actually help the total disability risk? We have assumed that it does help the total disability risk and in pricing the combination of total and residual disability we actually reduce, by some small amount such as 4%, the total disability component.

There are questions as to where the benefit is useful. We believe that it should be sold in our best 2 occupational classes only. We are under a considerable amount of pressure to provide the benefit all the way down through retail merchants and other people who are in our class 3. We think that it is probably sold to many people who really cannot use the benefit. About 78% of all people in our best classes buy the residual benefit and in the only other class that we offer it, class 2, about 28% buy the benefit. There is only very limited industry experience. The next best thing to do without experience is to examine the standard partial disability benefits that companies used to include in their contracts. Those were benefits that for a maximum of 6 months usually paid a flat 50% of the total disability benefit. We reviewed what experience we have and we see nothing alarming.

The rating or the pricing of a residual disability benefit can be as simple or as complicated as you want it to be. We have a very complex formula with all sorts of Greek letters in it that we use. We essentially divide up the period of disability into five sections and, of course, the sections are much more frequent towards the beginning of the disability. We apply factors to each section to represent our estimates of terminations from residual disability during that period of time. We essentially assume that people start off with a 60% or 65% benefit and over the length of the disability that the benefit will eventually proceed according to one of 3 scenarios. There will be people who will recover quickly from an acute disability, there will be those whose chronic disability will degenerate and there will be chronic disabilities that remain stable. For each of those scenarios we try to develop a way that we think the pattern of residual disability benefits will go over the claim duration and try to work with that. We have to put in assumptions, of course, as far as how quickly earnings will increase once people get back to work. The original rating we did assumed a 9% increase in benefits a year, both due to inflation and the fact that they are able to work more and more. We may have to rethink that with inflation currently at fairly low levels.

Not content with the complexity of the residual disability benefit, companies have started to play around with it even further. You are all familiar with the fact that the industry started off with one year or two

year qualification periods, then 180 day qualification periods and then 90 and 60 and 30 and for the last 2 or 3 years, it has been fairly standard not to have any qualification periods at all. Everything in the residual benefit has been tinkered with. Companies paid a 50% minimum benefit for 6 months, others paid a 50% minimum for 8 months, or 10 months. Companies then paid a full 100% benefit if the insured lost 80% of your earnings and others paid a full benefit for a 75% loss of earnings. It is something that companies have to keep very close watch on and try to factor into their formulas and assumptions.

MR. S. MICHAEL MCLAUGHLIN - This morning I plan to talk first about some theoretical considerations involved in the active life reserves, both statutory and GAAP, but with emphasis on GAAP; second with regard to some specific assumptions; third on some practical aspects; and fourth on an outline of the main requirements of the new tax law as regards disability income business.

The statutory valuation of disability income business is regulated and is oriented towards conservatism. A correctly calculated reserve supported by appropriate assets is intended to prove solvency. Recognition of first year costs in excess of those in renewal years is permitted through the use of modified reserve methods (namely the 2-year Preliminary Term). The rate of interest and the mortality and morbidity tables are specified. Guaranteed renewable and non-can business requires an active life reserve, but conditionally or optionally renewable business does not.

The philosophy of GAAP accounting is quite different. Conservatism is no longer the prime objective; instead the purpose is the matching of revenue and expenses. This applies to premium and investment income, as well as benefit and expense outgo. The valuation mechanism should not operate so as to cause profits to emerge at an earlier date than is appropriate, neither should an expected loss be deferred into the future.

Individual disability income is covered by GAAP; the Audit Guide refers specifically to non-can, guaranteed renewable and conditionally renewable contracts. Even optionally renewable contracts may be considered to be long term when it can be demonstrated that such contracts are likely to remain in force for a reasonable period of time.

The procedure followed is to allocate costs to premiums recognized over the current and expected renewal period. A reserve is correspondingly required, which is the present value of future costs minus the present value of future valuation premiums. Note this is the general definition of costs, both benefits and expenses. The assumptions to be used in these calculations must properly reflect the unique characteristics of various types of A & H coverage. They should be "characterized by conservatism which is reasonable and realistic." The conservatism should not be so great as to defer profits to an unreasonable extent.

Each valuation assumption should contain a specific Provision for Adverse Deviation; no part of the gross premium is available as a specific profit loading unless the gross premium exceeds the valuation premium based on assumptions including Provision for Adverse Deviation.

In practice this means that the actuary must avoid the situation where the valuation net premium exceeds the gross premium either for a block of business as a whole or for new business. If the net premium exceeds the gross the actuary needs to take any necessary measures to avoid deferring the recognition of a loss.

The degree of conservatism should be the same for each assumption, taking into account the degree of uncertainty in each assumption and the financial effect of a deviation. Conservatism means that for each assumption the Provision for Adverse Deviation should not decrease the valuation net premium; also for all durations the aggregate reserve calculated with no Provision for Adverse Deviation. However this need not apply for each individual policy, but only for a block of business.

Normally, pricing information is available; pricing assumptions make an appropriate starting point in setting valuation assumptions. The valuation assumptions would not be the same as in pricing, but conceptually both valuation and pricing are related to the same set of "most likely" assumptions. Typically, pricing contains little or no conservatism; in fact, quite often optimistic assumptions are justified on the grounds that lapses will diminish, that expenses will decline, or whatever. Such optimism is not appropriate in setting valuation assumptions.

Sometimes pricing information is not available, for example, in a GAAP conversion process. Setting assumptions may become largely judgmental plus some trial-and-error. First a set of most likely pricing assumptions as at the issue date should be chosen, then a current level of Provision for Adverse Deviation should be added, and the resulting net premium should not exceed the gross premium. Also the Provision for Adverse Deviation should not be excessive, otherwise earnings after conversion will be overstated. The gross premiums should also be adequate with respect to current most likely assumptions.

Now, as to the assumptions themselves:

Morbidity: If pricing information is available, it is a guide to most likely assumptions; company experience should be used if it is credible, if not Inter-company experience can be used. At a minimum some actual-to-expected comparisons should be made in broad groupings.

Company practice will affect the morbidity assumptions to be used, to the extent that (i) a particular market is approached; (ii) there is a distribution of business within certain cells for which no pricing variation exists; (iii) underwriting and claim payment practices vary. Typically, the actuary would modify a standard table or intercompany experience

Any materially different risk classes should be treated separately, for example male/female, occupation classes, or smoker/non-smoker. The 1964 CDF has none of these variations, so the actuary needs to develop his or her own. If the gross premiums contain these variations then that is sufficient evidence that the valuation assumptions should contain the variation. It could be that marketing considerations dictate that certain variations not be present in the gross premium, nevertheless, the valuation assumptions may need to vary in order to avoid material distortions.

If for example you are able to justify unisex rates, it could well be that the slope of the male claim costs varies significantly from the slope of the female claim costs. You could have the situation where the net premiums were equal or nearly equal, but the reserves were materially different.

For variations by occupation class, company experience is the prime indicator. Even inter-company experience may not be usable because the definition of occupation class varies. Broad actual-to-expected comparisons should be sufficiently accurate to develop a ratio between the claim costs at different ages and classes. As an alternative, the variation contained in pricing might be used unless it contained a deliberate bias. The difference that is relevant here is that in the morbidity assumptions underlying the gross premiums, not the gross premiums themselves.

For smoker/non-smoker, I doubt that the great differences observed in life insurance will be observed here. To some extent we have the same situation as we did in life some time ago, where there were no statistics, but you never get statistics until somebody goes ahead and makes an estimate, and then starts to keep track of the experience.

Again, I wish to point out that if you use a 10% gross premium discount for non-smokers, remember that part of the premium is to cover expenses. If expenses are the same for smokers and non-smokers, then a 10% difference in the premium may mean a 20% difference in the underlying morbidity. If you also consider that smoking probably affects sickness morbidity to a much greater extent than accident morbidity, then you are probably implying a much greater variation in sickness morbidity, perhaps 40% to 60% less than that for smokers, particularly at the younger ages. The point here is that a large difference in sickness morbidity results in a fairly small difference in the final premium.

Also it would seem appropriate to include a larger Provision for Adverse Deviation in non-smoker morbidity assumptions than for smokers, because some smokers may claim to be non-smokers, particularly if there is a large difference in the premium.

I saw some population statistics published by the Department of Labor which classified days lost from work by groups of attained ages, and by different categories of smokers and non-smokers. The statistics applied to short term disabilities and, therefore, may not be directly comparable, but there was very little difference between the experience of the different groups observed. In fact, at some ages smokers had fewer days lost from work per unit number exposed than non-smokers. Perhaps smokers have more frequent but more acute disabilities. I think the jury is still out on this one.

Once the morbidity table is established, then the claim costs have to be calculated by modelling the continuance functions into the different plans, basic, increasing benefits, etc. Mr. Shlifer talked about this at some length so I will not add very much here.

For a Social Security Supplement rider, for the first 6 or 9 months after disablement, 100% of the benefit will be payable (following the elimination period); after that interval there is some probability of

the rider paying. Therefore, the continuance functions from 9 months through to the end of the benefit period would be multiplied by an adjustment factor less than 1. The fraction used should not be too low for conservatism, as it reduces the net premium.

For a Cost of Living Adjustment (COLA) rider, the annual continuance functions may be multiplied by a series of factors representing the annual rate of increase of the benefits, in accordance with the terms of the particular rider. If there is a maximum in the benefit, then that also should be used in developing claim costs. If you already have a formula for pricing, then that same formula would be appropriate, although perhaps with different morbidity assumptions. If the rider has a defined rate of increase then that is the rate that should be used, however, if it is indexed then you would likely want to use some rate equal to or just less than the maximum. If there is no maximum (and there should be), then a rate should be chosen consistent with the valuation interest rate. Presumably the rate of increase will be less than the valuation interest rate, but if it is not, then the net premiums and reserves will be very large.

These various adjustments are quite easy to make. For one client we wrote a short program which used a stored table of all the 1964 CDT continuance values for quinquennial ages 22 and up. For different types of benefit we created models of the amount of benefit to be paid, depending on the duration since disablement. The amount to be paid at each duration was \$100 per unit of benefit, times the probability that that amount would be paid. For an SS rider, the probability was deemed to be 1.000 for  $t=0$  through  $t=6$  months, then reducing to a fraction (e.g. 0.600) thereafter.

For a COLA rider the probability was 1.000 for the first year of disablement, then it increased by 1.06 each year to a maximum of 2.000. Note this method gives claim costs for a benefit consisting of the basic benefit plus the COLA. Therefore, to get the COLA piece alone you need to subtract the cost of the basic benefit.

For a residual or partial benefit which commences at the end of a short benefit period base policy, the factor would be deemed to be 1.000 through the end of the base benefit period, then declining linearly to zero over the residual period. As for the COLA, you would be calculating the total base plus rider claim costs. Therefore, for the rider alone you would subtract.

A program such as this is, of course, not tied to the use of 3% or any other specific rate, because that is just another input item.

Interest: Company experience is the guide. The investment income net of expenses should be expressed as a yield on the market value or amortized value of the assets (i.e., not book value - the result will be slightly different than the statutory yield rate). That yield should be compared to the historic new money rates, so that a current view of new money rates can be modified in light of actual company performance. If there was a marked difference, for example because of a large proportion of low yielding equity or real estate investments, then the expected rate in the future should be adjusted downward, compared to a company that was more aggressive or that invested heavily in short term investments when short term rates were high.

The rate for the future is, of course, closer to a new money rate than a portfolio rate; the reserve on issues of the current year will develop entirely out of premiums earned in the current and future years. Therefore, a high rate is appropriate when interest rates are high.

However, a higher rate of interest reduces the net premium. Therefore, to provide for adverse deviation the rate actually used should be somewhat lower than most likely. Also, with increasing distance into the future there is greater uncertainty, and therefore, an even lower rate should be used for years in the distant future. Often a level rate is used for simplicity rather than a declining rate. So, for example, instead of an assumption starting at 10% declining perhaps to 6% over a period of years, a level 8% might be considered appropriate. A level rate is usually used for GAAP conversions, partly because there is often a lack of original pricing date, but also because a varying assumption by policy duration applies differently to each calendar year of issues. This would seem to be somewhat unrealistic.

Sensitivity testing should be performed to determine the magnitude of the Provision for Adverse Deviation.

Withdrawal: Company experience, pricing, or intercompany experience is used as a guide to most likely. Lapse rates will typically vary over a relatively wide range for different situations, such as sex, occupation class, policy size, elimination and benefit periods, etc. The margin for adverse deviation cannot be set without sensitively testing, because a given change may very well affect the net premium differently than the reserve, and may affect the benefit reserve differently than the total reserve (i.e. net of expense reserves). Typically, a conservative assumption is achieved by using a reduced ultimate lapse rate, compared to most likely.

Mortality is just another decrement, and so there does not need to be a great deal of effort spent in getting it exact.

Expenses: Actual costs of acquiring the business may be deferred over the time period in which the policy earns revenue. As an accounting principle this is shown as a separate asset rather than a reserve reduction. Either a worksheet method may be employed, which is more familiar to accountants, or a factor method, which is more familiar to actuaries. Actual expenses are converted to a unit basis, and a reserve develops to the extent that expenses are not a level amount per unit.

The factors must closely represent actual expenses. In particular, if actual deferrable expenses are materially greater than the provision made in the valuation premium, the valuation premium should be increased, although not greater than the gross premium. If actual deferrable expenses are less than the provision made in the valuation premium, then the excess must be removed from the DAC.

Maintenance expenses for disability income business should include a percent of claim expense. This is an increasing time, therefore, a positive maintenance reserve will develop. This is normally included with benefit reserves, not as an offset to DAC.

Other: For guaranteed renewable business there is the possibility that premiums may be increased if experience warrants. This does not indicate that no active life reserve is necessary, but it reduces the margin needed for adverse deviation.

At this point I would like to discuss some practical aspects of two systems with which I am familiar; one represents a fairly detailed approach, the other a broader approach typical of conversions.

First, the individual disability income policies on computer files are read into an editor program which splits each record into components. A component is a benefit, either a basic benefit or a rider, which has a unique elimination and benefit period; a component is either an accident or sickness benefit, and is identified as to policy number, plan, sex, occupation class, and valuation era. An 8-digit component code uniquely identified each valuation component for which reserve factors were calculated. Each component record also carries the plan code, age and duration so that the correct factor may be accessed.

There is some disadvantage of added complexity of programming effort at the outset, but a system such as this is tremendously flexible, and it economizes to the maximum extent on the number of different factors to be calculated.

A single policy might, therefore, be split into many components, one for the basic accident benefit, one for the basic sickness benefit, two more for the Social Security Supplement rider, two more for the Residual Disability rider, perhaps two more for a COLA rider, and there could be other attached benefits such as an Accidental Death benefit, a Hospital Indemnity benefit during the elimination period, etc.

There could be a great many different plans (i.e., combinations of elimination and benefit periods, occupation classes, and so on). It may seem as if the split into component codes is just making a bad situation worse, however, there are several advantages of this system if it is used in conjunction with a plan or rather a component conversion table.

If a conversion table is used, certain adjustments may be made very easily. If for example you segregate plans as to smokers and non-smokers, it may be possible to calculate factors for one and not the other, and to use a linear adjustment factor to apply for the other. This can be refined so that it applies to certain issue ages or ranges only.

The conversion file can also make linear adjustments for occupation class, reinsurance, elimination and/or benefit periods for which there is only a small amount of business, and for some riders.

A residual rider can be modelled as a fraction of some other basic component. As another example, a SS rider could be valued entirely using existing components. The rider would be split into one component whose elimination period was that of the base policy with a benefit period of 6 months, plus a second component with an elimination period of 6 months and a benefit period as for the base policy. An adjustment factor would be used for the latter which represented the probability of not receiving Social Security benefits.

This approach can also help to simplify the situation when several different riders exist in combination. The reserve and/or premium appropriate for a COLA rider and a SS rider, when both are on the same policy, is not the same as the sum of the reserve and/or premium for each individually. It would be a relatively simple extension of the program logic to create a new combined component code for the situations where various riders existed together.

The second system I wish to discuss relates to the need for sensitivity testing of the GAAP assumptions in order to establish the direction and magnitude of the required Provision for Adverse Deviation. It is a time-consuming task to create all the various factors once, let alone many times, each time with slight changes.

One approach we took was to write a factor calculator in LOTUS 1-2-3. This did take some days to get it perfect, but much of that time was required only because that was the first time we had ever used that software. To someone familiar with it (or with another comparable program), writing the program should probably take only one or two days.

Then we entered in composite assumptions as to mortality, lapses, interest rates, and unit expenses. The claim costs used were those of the plan with the largest amount of business as measured in reserve. Each recalculation using slightly different assumptions required only a minute or two and we tested many variations in each assumption in perhaps one or two hours.

This same approach was not considered appropriate to calculate a large quantity of factors. Our client had a program which had been used to create claim costs and for pricing. It was a natural to change the program to handle different interest rates, lapse tables, and so on. The program already had the logic to adjust each year's continuance factors for COLA riders and to apply the exact adjustments used in pricing. The provision for adverse deviation could easily be included, either as an adjustment to the continuance functions or directly to the resulting claim costs.

The program was written in BASIC and run on a PC. At one stage we had three PC's sitting side by side, one was calculating, the other two printing from floppy disks almost continuously. The calculations were somewhat slow because the BASIC program was an interpreted one, not compiled. If you already have a PC, then the investment of \$200 or so for a BASIC compiler is worth it. We had our share of problems converting floppy disks to magnetic tapes suitable for input to a mainframe computer, but it was done fairly quickly and with complete accuracy, once the initial learning curve had taken its toll.

This same program could have been written on the mainframe, however, the compiler was not already in place and time did not permit.

We briefly considered writing the factor calculator program in APL. If there is anyone who does not know what this is, APL is a very powerful, compact programming language, that looks frankly like it was designed by an actuary just for this type of situation. It is fast in operation and very quick for development applications. We do not take that approach in this case because there was already a program that did 90% of what we



wanted, also because we had too few people who knew APL, and finally because the version of the language that we had access to suffered from a weakness in the facility with which data could be formatted for output. But, I would urge everyone here with any computer related responsibilities to investigate APL if you have not already done so.

#### Some Tax Reserve Issues

The 1984 Deficit Reduction Act imposes a tax on the income of life insurance companies. Income subject to the tax may be reduced by the increase in reserves. Reserves are defined as life insurance reserves, plus unearned premiums, unpaid losses, advance premiums, and certain other items as under the old law.

Life insurance reserves, as per Sec. 816(b), are those which are computed or estimated on the basis of recognized mortality or morbidity tables and assumed rates of interest, and which are set aside to mature or liquidate future unaccrued claims arising from life insurance, annuity, and non-cancellable accident and health business involving life, accident or health contingencies.

The reserves must be required by law. Guaranteed renewable A&H business shall be treated in the same manner as non-cancellable business.

The tax reserve is the greater of the net surrender value and the reserve determined according to a prescribed formula, but in no event for any contract greater than the statutory reserve. The test against the statutory reserve is done on an aggregate benefit basis, i.e., for the policy as a whole. The reserve must not include deferred and uncollected premiums unless the premium is actually received, therefore, if you are using mean reserves, the deferred and uncollected should be netted against the statutory reserve before making the comparison.

The amount of the reserve is to be determined by using the tax reserve method, the prevailing state assumed interest rate, and the prevailing Commissioners' Standard tables for mortality and morbidity, adjusted as necessary to reflect the risks (for example, substandard risks) incurred, but not otherwise taken into account.

The tax reserve method is specified for life business as the CRVM, for annuities as the CARVM, if the contracts are covered by those methods, and for non-can business the method is the 2-year Preliminary Term. For any other business, the reserve method is that specified by the NAIC for such contracts as of the date of issuance, or if no method is specified, a reserve method consistent with the above.

An exception exists for non-can business; if, for a particular plan of insurance the company computed all its reserves for such contracts for statutory purposes on a net level basis, and continues to do for both new and existing business, then the NLP method may be used for tax purposes. Any new plans must go the 2-year Preliminary Term method.

The prevailing state assumed interest rate, if none is specified for non-can A&H business, is to be the prevailing rate for a whole life contract issued on that date.

As for any non-annuity business, it is permitted to use an old interest rate for 1 year after the prevailing rate changes.

Individual disability income business is unique among A&H classes of business in that the prevailing Commissioners' Standard Table is clearly identifiable, namely the 1964 CDT. If for a contract there is no Commissioners' Standard Table, then the appropriate table to use will be prescribed in regulations. For contracts issued prior to 1948 the statutory reserve is to be used.

But if you ever have more than one choice of table or method, you must use the one that produces the lower reserve.

MR. CARL L. LOEFFEL: The portion of subject that I will comment on is the claim reserve for the benefits we are now issuing. Over the past 15 years we have introduced a variety of new benefits or new definitions of benefits, with various combinations available on any one policy. Thus consideration in setting reserves must take into account not only what affect each benefit may have, but also what affect a combination of benefits may have. The result may be more or less than the sum or product of the combination.

The classic example of this occurred many years ago when disability income benefits were added to life insurance policies. In that situation the premium had to be adequate to pay for the income benefit and also an additional cost for higher morbidity on the waiver of premium benefit due to the presence of the income benefit.

The standard valuation law may provide some guidance. It has basically two requirements. The first which I will call the general requirement is that the reserves be adequate. The second, which I will call the specific requirement, is that the reserves for claims, more than 2 years in duration, be valued at a minimum at a specified table and interest rate. It is interesting to note that the specific requirement applies to total disability benefit due to accident or sickness and that it is applicable only after 2 years of claim. One of our challenges is applying these principles to benefits other than total disability.

These revised benefits have greater uncertainty as to how much benefit will be paid at each duration and what the continuance pattern will be. In some cases the benefit is subject to whether the insured received benefits from other programs such as Social Security, or to how much he earns, or to the inflation rate. The continuance pattern should take into account the different benefits or benefit definitions. The continuance pattern must also reflect the potential for the insured to recover from total to partial disability and to relapse from partial to total disability.

As in the case of total disability, one must expect that experience will differ widely by company. When companies offered similar benefits at similar prices, we found substantial variance by company attributed to varying markets, underwriting and claims adjudication. Today with a highly diversified benefit structure, we may expect greater variance.

The general approach I would suggest for your consideration is to split claims into those under 2 years in duration and those over 2 years in duration. The reserves for the first group should be adequate to fund the payments for the unaccrued benefits of the first 2 years plus set up the reserve at the end of this period. The reserve for the second group would be some form of disabled life annuity. The reasons for this are as follows:

1. The greatest amount of claim activity occurs in the first 2 years. Most recoveries occur, social security benefits are determined, and a return to part time work is more likely.
2. In the first 2 years, we are more likely to see differences in experience among companies due to the various nuances mentioned above.
3. The experience for the first 2 years of claim will develop far more quickly and the company can respond to its own experience.
4. This approach is consistent with valuation law.
5. Claim activity will occur beyond the second year of claim duration and there will be some variation by company in experience, but I suspect that they will tend to lessen.

At the present time many companies use the 1964 Commissioners' Disability Table at 2.5% to 5.0% interest for claim reserve valuation. This reserve standard may be appropriate for total disability and perhaps partial benefits as well. To obtain some idea of this level of claim reserve, I compared it with the net single premium for a regular annuity at a competitive interest rate. Such annuities are normally sold to healthy lives and the only contingency involved is that of remaining alive. In this comparison I used a lifetime benefit valued on the CDT at 3% interest with life annuity net single premiums based on the 1983 Basic Male Table at 12% and then at 10%. The ratio of the reserve to the single premium depended on the duration of claim and the benefit. Comparing the reserve with the 12% single premium, I found that the ratio for a lifetime benefit ranged from 80% at young ages to 106% at age 45 and down to 99% at age 65 for claims in their third year. In the next year of claim the ratio ranged from 92% to 115% and then in the 5th year the ratio was always over 100%. To adjust to a 10% net single premium, the ratios drop about 14%. It seems to me that these ratios are adequately high and that the low reserve interest rate compensates for any understatement in the continuance rate that may occur after the 2nd duration on the Commissioners' Table. In fact, I have been using this table for both total and partial disability claims.

If the company uses the 1964 CDT or some other table or tables for partial benefits, there is the question of whether one uses the benefit currently paid, the total disability benefit, or some other benefit level. What little experience I have seen on this the question may be academic in that most are receiving the maximum benefit anyway. However, if this is not the case and the benefits currently paid are at a reduced level, the actuary may consider reserving at that level, keeping in mind benefits can increase or decrease depending upon the insured's earnings and, in some cases, on inflation.

These are 2 types of COLA benefits. One increases the benefit by a specified amount such as 6%. The other increases the benefit based on some index such as CPI, but has some cap. Usually this latter type has a catch-up clause wherein in periods of higher inflation the benefit is increased faster to compensate for periods of lower inflation so long as the benefit has not increased faster than the cap over the period of disability. For those benefits which go up a specified amount, the reserves should reflect this directly. For the other type, perhaps some lower rate than the cap could be used especially if the cap is relatively high such as 10% or 12%.

There is one attractive approach to value COLA benefits and that would be to value the reserves at a higher interest rate than say 3%. This, of course, removes some of the conservatism that the lower valuation rate offers, especially on partial disability benefits wherein we do not have a good handle on continuation rates.

The Social Security Supplement benefit will normally pay a benefit for a specified period such as one year, and then will continue to pay benefits if the claimant has been denied Social Security benefits. Such benefits continue until Social Security recognizes the insured as disabled or the maximum benefit period, whichever is shorter. Usually by the end of 2 years, one knows whether Social Security will recognize the claim, although there are situations wherein this process has been delayed beyond this period. My suspicion is that any claim over 2 years old probably should be valued very similar to the regular benefit.

Reserves for claims less than 2 years old should more aptly reflect the particular company's experience. Difference in benefits, markets, underwriting and claim adjudication produce marked differences in experience, and this experience will mature much more rapidly. Even within a given company this experience is likely to fluctuate due to the aging of the business and economic conditions. Different markets are apt to respond more or less favorably as the business ages and as to economic cycles in different industries.

Thus far I have considered only the claim reserve. When an insured goes on claim, normally there are a number of reserves the company holds. They include the active life reserves, the claim reserve for premium waiver, and the claim reserve for the indemnity, and the claim expense reserve. In the case of mature claims, I suspect that the active life reserves become redundant in that the company already has a substantial claim reserve and for one to use the active life reserve he must recover and incur an additional claim, which is unlikely on a mature claim.

In the case of the premium waiver, the main loss to the company is the costs of maintaining the policy, the payment of any commission and any increase in the active life reserve. However, in the reserve testing exercise we typically find that the whole premium is included and hence many companies reserve for the whole premium.

In addition to these reserves, the instructions for completing the statement blank indicate the need for a claim expense reserve. Since most of the unaccrued benefits are on claims which have already undergone the most expensive part of the investigation and verifications of disability,

such expense reserve often reflects only the cost of routine investigation and payment of a claim and is usually expressed as some percentage of the claim reserves.

It is obvious that claim reserves can be found in a number of areas and that they may be called by different names. The important consideration is to maintain an amount that in aggregate is adequate.

MR. LOEFFEL: If we have unisex rates and so forth, does that mean that we may have to redefine who is in what occupational class?

MR. SHLIFER: Yes Carl. I think I mentioned that it is very fundamental. You have to make sure that from a competitive point of view you do not do anything drastic to the male situation, and at the same time you have to be getting an adequate premium. We had to lay out everybody who is in our top 3 classes, and we shifted them around and we gave them to the marketing people and they shifted it back again. But basically we did move a lot of people out of the top 2 classes, or out of the second best class into the third best class, because we do not want to offer pregnancy benefits to people other than very stable women over 40. As far as unisex is concerned, we do not think that there is going to be very high female content in the best classes.

MR. ROBERT SHAPLAND: A comment was made about being unaware of laws requiring unisex rating and there would be some question about that. I am sure that NOW would dispute that. I do not know if you in the room are aware of NOW's lawsuit against Mutual of Omaha, but there are public accommodation laws in Washington D.C. where the lawsuit was brought and many other states, that say that it is illegal to discriminate on the basis of sex, age, physical impairment and residency. The law in Washington, D.C. goes on to specifically state that insurance companies are places of accommodation. It will be up to the courts to decide whether that law is applicable to insurers or not when it comes to the pricing of insurance.

