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SETTING ASSUMPTIONS IN A CHANGING WORLD

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MR. JEFFREY C. HARPER: Let me briefly introduce the panelists. I am in the Tillinghast/TPF&C office in Jacksonville, Florida. My main interest in this topic comes from the side of financial statements, pricing, and appraisals. I have been a consultant for about seven or eight years and have worked for insurance companies for about an equal time prior to that.

Looking at the topics we need to cover today, you can get an idea of the sort of problems we have to address. First is the area of expenses. It used to be fairly easy to set expenses. There weren't peaks and valleys, it was just a long

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gentle Colorado ski slope. Unfortunately, it always went up. But that is not necessarily the case, currently, and with technological changes, mergers and acquisitions, and so on, expense rates are not easy to set. Mr. Leonard is going to talk to us a bit about expenses.

Second are the areas of mortality and persistency. In the old days that was fairly stable. Mortality was reasonably stable and generally improving, and persistency was somewhat predictable, at least by line of business. Sometime in the 1970s or 1980s persistency became very sporadic, and I have reason to believe (as I am sure many of you do), that mortality is about to do the same thing. If you combine the two, you obviously have a potential for disaster to an insurance company. Mr. Boyd is going to talk about that a bit.

Finally, there are investments. It used to be fairly easy to describe the investment practice of a life insurance company. It might have been something like 40% bonds, 30% mortgages, 20% stocks, and 10% cash. Now, you could probably spend a week or so just defining what each of those types of investments are. Mr. Aloisio is going to try to describe some of the problems in investment assumptions.

We are going to try to hit just what we think is going on currently, without trying to highlight what has happened in the past or predict too far into the future.

Mr. Leonard is a Vice President and Actuary at Jefferson Pilot in Greensboro, North Carolina. His role there is that of the product development actuary, primarily involved with ordinary products. He has been there over twenty-five years, and since Jefferson Pilot just merged, it might be interesting to see what he has to say about expenses.

MR. WILFORD A. LEONARD: In the whole context of product development and pricing, I like to think of expenses as maybe being a blue-collar ingredient. A current fad of some television sports announcers, especially for basketball, is to refer to certain players as blue-collar players. This means they are a necessary part of every game and they do the dirty work, such as rebounding, defending, picking up loose balls, etc. While they aren't flashy and don't get a lot of

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attention, they are always there. Actuaries, of course, are always aware that expenses are there.

I think perhaps the fact that they are a blue-collar ingredient counts for the fact that there really hasn't been much written. It is not a very exciting topic to investigate. There have been a lot of attempts to do a comprehensive industry-wide expense study to determine how one company's expenses compares to other companies' expenses. None of these have proven very successful. One of the things I did in preparing for these remarks was to go back to the index to Society of Actuaries publications to see what was in the actuarial literature. It was very shocking to find there really isn't very much in the way of major papers or even definitive speeches. One reference was to a 1970 Houston seminar on the actuary's role in controlling expenses. The moderator said, "You know, there just hasn't been much written about expenses." Well, not much has happened since 1970 to change that statement.

Another thing I did in preparing for this panel was to go back and look at some of our recent pricing studies to get a little better feel for just how important expenses are. Now, you could spend a lot of time on that as you all know, but here is just one statistic. For an age 45, \$100,000 policy, on a whole life, low-commission, standard type universal life (UL) current assumption product, I have found that 35% of the present value of premiums over the first ten years is required to cover expenses. Now this includes general expenses, and selling expenses and so forth. I am sure all of you would get different results if you made that same study for your own company. You would get different results, of course, if you looked at a smaller policy. You would get different results if you looked at a young age, where you would find that the percentage is much larger than that. For smaller amounts you would get a much larger percentage, and perhaps for an older age or even larger amount, you might get a smaller percentage. Now 35% is a very large percent of the premium dollar going into expenses. I don't know whether it is too high or too low. The important thing is that it is 35%. We need to consider whether we have spent too much of the premium dollar on expenses.

Now, the rest of my remarks are going to be directed to the way we do things at Jefferson Pilot, our new company. More specifically, they are going to be directed towards the way we have done things at Jefferson Standard.

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I want to talk about a process for formatting and analyzing expenses in such a way that they fit in our pricing models. Let me give you a little background. J-P Life is a new company, formed January 1, 1987. However, J-P Life represents the physical merger of two major stock life sister companies, Jefferson Standard Life and Pilot Life, each of which is over 75 years old. We have had ties for a long time, and while we operated separately before the merger, we have had common ordinary products since 1972. Jefferson Standard offered individual ordinary life and annuity products, par and nonpar, traditional, universal life and current assumption life through a career shop, regional agency organization. Pilot Life offered the same thing through a career general agency organization but also has a home service division and a large group division offering group life and group health products. That is background.

The procedures and techniques we have developed over the years for analyzing general expenses start with our life insurance general expenses, Exhibit 5 of the Convention Blank. Jefferson Standard, my previous company, offered only individual life and annuities. Starting with Exhibit 5 general expenses meant that only the annuity general expense portion and perhaps some expenses allocable to things such as supplemental contracts, disability waiver of premium, accidental death, reinsurance, and so forth, needed to be allocated away from the total Exhibit 5. That was a fairly simple process, x cents per \$1,000 or x dollars per policy. Allocation by line will be quite a bit more difficult with our new merged company. A lot of expenses will be allocated through ledger sub-accounts. I will talk some more about that a little later.

After we obtain our ordinary life general expenses, our objective is to split those total numbers into a six-way set of unit expenses: first year per policy, per \$1,000, and percent of premium plus renewal per policy, per \$1,000, and percent of premium. This is the format we have been using in our pricing models for a number of years. We have also used it for GAAP valuation, profit projections, and all other actuarial analyses.

There is a lot to be said for using a consistent method over a period of time to develop unit expenses. Being able to compare these year-by-year numbers is always satisfying to the actuary, even though the numbers seem to always be increasing and are not always exactly comparable over a long period of time.

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I am not suggesting that our approach is the only way, or even the best way. But it is a factual way that can be used. Some people have referred to it as an armchair method; but with experience and the information you can develop in ledgers and insurance records, and with sound consistent application, we think it is a practical, usable method.

There are other methods, of course. Some actuaries use a functional cost approach for functions such as premium collection, claims, surrenders, etc. Several years ago Life Office Management Association (LOMA) tried to do a functional cost study and collected information from a number of companies. We participated in that for a number of years because we hoped to develop some cost figures that would allow us to compare our companies with many other companies. It turns out that the results never were very comparable, and LOMA finally dropped that study, which is not to say that the functional cost approach is not a proper and usable method for unit expenses.

Back to our six-way armchair split. Analyzing the specific expense items in Exhibit 5 can give the actuary insight into a reasonable assignment of a particular expense line to first-year or renewal; and then to per policy, per \$1,000, or percent of premium. Some expenses need to be split all six ways, some fractional portion going to each of those categories.

Obviously, there is a lot of judgment involved. No two actuaries will come up with the same allocation. We try to keep the same actuary working on that for more than one year because when a new person takes over the job they will put their own personality in it and give you slightly different results so that you wind up getting different pricing results. A lot of times you need to experiment with allocations until you get results that are practical. It gives you prices and profit margins that appear usable and practical in the real world.

Now, equally important with the total dollars of general expenses, or perhaps even more important, is the volume of business supporting those expenses: the number of policies sold and in force, the face amount of insurance sold and in force, and the premium dollar, new and renewal. Without substantial increase in sales results and without reasonably good persistency to keep your *in-force* numbers growing, it is impossible to keep unit expenses from growing completely out of hand. Growth and volume are really the name of the game in unit

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expenses. We must make some assumptions as to growth, and growth, of course, comes about not only from new sales but from keeping your existing in-force business. That has been a particular problem for a lot of companies in the last few years, including us.

In developing unit expenses the base of units is very important. For instance, what do you do with term rider amounts of insurance? What about decreasing term amounts of insurance? All of those things must be looked at and handled in a logical and consistent method from period to period or you can impact your unit expense derivation significantly. Following are some special features for our particular company. We have always sold participating and nonparticipating business, and fairly large percentages of each. We know that there are additional expenses involved in servicing and selling par insurance compared to nonpar. We have insurance records and a significant number of ledgers, including premiums and commissions, but not general expenses, split between par and nonpar. We have been able with some approximations to develop different par and nonpar unit expenses over the years.

In recent years universal life has come along. Here is a new product, rapidly growing, which is a more expensive product than anything we have sold before. It represents the major sales efforts in place for many of us, including Jefferson Pilot, with probably 70% to 80% universal life for new sales. Again, it is a more expensive product because of monthly processing, the ledger proposals that every agent must have to sell, expensive new life insurance administrative systems and more information being passed out to the policyholders.

On the other side you have term insurance, a simple basic product, which with today's competitive prices won't support very large expenses. After developing basic unit expenses we have modified them by major plan types. We have done that in a practical way by taking weighted base units -- the number of first year par policies, nonpar policies, UL policies, term policies, etc. -- and dividing into the total dollars of expense allocated to first year new policies sold. This assigns more total expense to UL, some more to par whole life, some less to nonpar whole life, and even less to term insurance. This is a refinement which is a practical necessity. Another refinement we have developed over the years is making selection expense be age specific. Obviously, it costs more to underwrite a \$100,000 for a 55-year-old than it does for a 25-year-old. Since

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underwriting expense is usually allocated on a per policy and per thousand basis, we modified the regular unit expenses so that we have a lower per policy and per \$1,000, and then added an ingredient that provides x dollars per \$1,000, perhaps for each age in excess of 15, so that we get additional selection expense assigned properly to the older ages where the expense occurs and where the premium flow will support those expenses.

A number of modifications can be made in unit expenses. Oftentimes, the actuary can get himself in a box because the purpose of modifying frequently is to develop some lower unit expense for a special purpose. If you do very much of that you end up not covering the total company expense.

A lot of our traditional plans' management compensation has been paid on the basis of factors rather than being directly related to the premium, or even directly related to the commission. We have in recent years been moving those expenses out of general expenses, and allocating them as a percent of commission. This management compensation had been included in ledger general expense. Over time, an increasing percentage has been moved to commissions. This means that you lose some of the advantage of having that counted as overhead, where growth can reduce your unit expense. Expressing it as a percent of commission tends to be standard for each unit of insurance sold.

With UL, all of our management compensation is totally a percentage of premium, so none of it shows up in general expenses. This means we can assign those expenses directly in the pricing process, which is a lot simpler and easier, and less judgment is involved. The other expenses that we try to move and load as a percent of commission, as opposed to treating them as general expenses, include agent pension and fringe benefit cost. We think this movement towards loading certain expenses more as a percent of commission will help us in our merger with Jefferson and Pilot. Pilot has been a general agency shop, but a lot of expenses are home office paid. As a result, the differences between the two field organizations are not really as great as they might be. We do anticipate problems, but one of the major reasons for the merger was for Jefferson Pilot Life to become a more important organization in life insurance and, of course, to try to achieve some economies of scale. Hopefully, we will realize that.

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Another aspect of general expense allocation often discussed is that of direct expense versus overhead expense. Those names almost speak for themselves: direct expense meaning that expense that is directly related or associated with putting each new unit of business on the books; overhead expense being those that will be incurred, whether or not another unit of business is sold. If you have a relatively large amount allocated as overhead, you can reduce the impact of those expenses with growth, whereas, additional direct expenses are associated with new volume. As a matter of fact, except for commissions, there aren't a whole lot of things directly related to sales and unreduced by increased volume. There is almost always some economy of scale. So, in a sense, an awful lot of business in a life company could be deemed overhead.

We try to make some major expense allocations between overhead and direct expenses. We look at each individual expense line in making the allocation. We do have some sort of preconceived notion in mind as to the percentage we want to get in each category. Obviously, this is art, not science, and different actuaries will get different results. I imagine most product actuaries have had to consider the question, "Do I price with direct or marginal expenses, or how much overhead do I cover?" It is very tough practical problem today.

Since unit expenses have gone up rather steadily for most companies over a long period of time, the question of whether to provide for increasing maintenance expense in pricing seems rather obvious. The same is true for margins for adverse deviations. Obviously, we need those things.

I want to suggest that it is inappropriate to consider expenses without looking at other elements. Mortality improvements have been going on for a long time. Persistency has been deteriorating for a long time. Interest margins have gone up and down, generally down in recent years. My point is you need to look at all of those major components involved in pricing, including, of course, the amount of surplus the company has, and the company's needs and objectives for both the level and incidence of profit emergence.

In conclusion, I would like to mention that being a stock life company, when we develop unit expenses we are not only interested in pricing, we are interested in GAAP, demonstrating recoverability of deferred acquisition expense, and demonstrating to our accountants and outside actuaries that we have no need for loss

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recognition. The unit expenses we are able to develop primarily for pricing are those that we use, modified to some extent, for these other purposes. When you do that, of course, with your accountants being pressured by their peer groups, you must have well-documented and consistent unit expenses from period to period.

MR. HARPER: Mr. William Boyd is the Assistant Actuary in the reinsurance area at BMA. His role there includes reinsurance pricing, reinsurance studies, reinsurance valuation, and software. He has been there 2.5 years and prior to that was with CIGNA. He has been exposed to assumptions in the individual area, as well as in the reinsurance area, and it is not really surprising that working for a reinsurance company, he is mostly interested in mortality and lapse.

MR. G. WILLIAM BOYD: For the most part, persistency has been improving for the past five years. Improvement was most dramatic in 1982 and 1983, but then it was fairly easy to improve on 1981 experience. There are a number of reasons for the prolonged improvement in persistency.

As far as insurance is concerned, the economy has improved drastically since 1981. Interest rates have fallen from record highs to their current modest levels. Likewise, inflation has, for the moment, come to a screeching halt. Unemployment is not out of control.

We have developed more sensible products and compensation arrangements over the last five years also. Remember when we tried to see who could pay the highest first year commissions to entice high producing, fast-lane brokers to sell our select and ultimate annual renewable term (ART) products? At BMA, we still reinsure a number of select and ultimate term products, but most of them now have fair to excellent persistency. This is because commissions have generally been reduced, and many are now level or near level. Also, many companies have been much more selective in who and why they want to sell select and ultimate term, and term products in general.

When we did silly things with select and ultimate term products a few years back, wasn't there always a line of reinsurers at the door of the direct writer vying for the reinsurance with first year coinsurance allowances of 120% to 130%?

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In the aftermath of the early 1980s, your chances of getting cash from reinsurers just for selling are slim for permanent products and just about none for term. This change has shifted much of the burden for persistency back to the direct writer, as it should be.

Another reason for lapse rates improving is just that most of the vulnerable product blocks that we had at the start of the 1980s have pretty well lapsed off.

Much has been written in recent years about the measurement of lapses for universal life type products. Is a lapse when a policyholder skips a premium? When he skips several premiums? Or when his or her product account value is completely exhausted? I think all of these figures could be of interest, although for different reasons. LIMRA will complete its first persistency study for UL type products some time this summer. At BMA our early reinsurance experience on interest-sensitive products is excellent. Nearly all cells under study had lapse rates of three to five percent. These figures are based on two credible years of experience, and they are based only on reinsurance in force with no consideration of policyholder premium paying habits.

In summary, I think that future persistency experience will depend on what happens to the economy and how much our industry really learned from the early 1980s.

We all price fully underwritten life products assuming some degree of selective lapsation. Renewal mortality rates are higher than the first year mortality rates for the same attained age in any select and ultimate mortality table for two reasons. One reason is that some of the lives that were healthy at issue have since developed conditions or suffered injuries that increased their mortality expectation. The other reason, and what I am supposed to talk about here, is that healthy lives generally lapse off more rapidly than impaired lives.

The classic application of mortality deterioration due to selective lapsation is reentry or revertible term. When a group of insureds is reunderwritten for reentry, some will be select risks, and these will be allowed to continue their coverage using select premium rates. The risks that don't pass underwriting are allowed to continue their coverage at higher ultimate rates. The ultimate premiums and mortality experience are usually considerably higher than select

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because those insureds all have some impairment, except for, perhaps, a few healthy insureds that didn't bother to be reunderwritten. It stands to reason that ultimate mortality rates after a reentry period could be significantly higher than ultimate mortality rates according to your normal pricing assumption, because there are almost no healthy lives left in the group.

An important point here is that selective lapsation doesn't happen only with reentry products; it just happens more abruptly and more certainly with reentry products. I've told you that you're already pricing using an implicit assumption for mortality deterioration due to selective lapsation. Whether that assumption is too lenient or too harsh depends mainly on whether your lapse experience turns out to be better or worse than that underlying your select and ultimate mortality table.

I think this theory makes great sense. Unfortunately, the process of quantifying the theoretical effects of selective lapsation is extremely cumbersome, and I believe that studies on the effects of selective lapsation will be almost impossible to perform.

Several actuaries have made valiant attempts to quantify the theoretical effects of selective lapsation. The techniques they have developed are similar, but there are some significant differences. Some methods assume that deterioration occurs only with respect to nonaccidental mortality. Each method has a different means of accounting for the fact that all excess lapses are selective. In other words, some of the lapses obviously are impaired as well. Most methods put a cap on the increase to select mortality. Some methods limit the mortality rates in any select year to the corresponding ultimate rate. Others have limitations in excess of the ultimate mortality rates, while some only limit the adjusted mortality rates to 100%.

Which technique is correct? That is very much a matter of opinion. To my knowledge, no studies have been done to quantify the effects of selective lapsation. Obviously, such a study would require a tremendous exposure in both lapse and mortality experience.

Mortality deterioration due to selective lapsation is an important assumption in pricing most term insurance, quantitative difficulties notwithstanding. Most

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models increase renewal mortality rates by around 50% by the tenth year and in excess of 100% by the fifteenth year. These increases are based on Linton AB underlying lapses and test lapses of 20% in all years. The Canadian Federal Department of Insurance required that deterioration due to selective lapsation be considered in calculating reserves for renewable term insurance products in 1985 and subsequent years. This had the effect of doubling renewable term reserves for many companies.

I'm also to address the interaction between underwriting and mortality. I think just about all of you can align yourselves with one of three groups. Either you would like to see mortality rates improve in the next few years, or you are hoping mortality rates will improve because your company is selling products that have very little margin in them, or you've recently priced products explicitly assuming mortality improvement. We're all in similar boats. I'd like to suggest that unless you have a superior underwriting function, there will be luck involved for mortality rates to remain at 1975-1980 levels in the near future.

Let me share a synopsis of what has transpired in U.S. mortality in the twentieth century. At the turn of the century most people died of infectious diseases. The leading causes of death were tuberculosis and pneumonia. Mainly because of the development of many sophisticated antibiotics, these diseases are no longer the killers they were. The void left by these and other antiquated maladies has been filled largely but not completely by cardiovascular disease and cancers.

As we know, our industry and society have enjoyed tremendous improvements in mortality throughout this century. It was around 1960 that we began to make significant progress in the treatment of cardiovascular disease and cancer. The Surgeon General boldly asserted that the risk of both diseases was increased by smoking, and cholesterol levels were linked to heart disease. Margarine and vegetable oil increased in popularity overnight. By 1980 we had isolated some ten cardiovascular risk factors. We had also identified some risk factors for cancer. And by 1980 we had made great progress in emergency care for victims of acute cardiovascular illness. We also increased the life expectancy for non-acute illness of all types.

Now it is 1987. Since 1980 we've launched massive media campaigns to encourage people to change their lifestyle to improve their health. Some new medical

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techniques have been found that should extend the lives of some patients by a few more years. We have not stemmed the tide of pollution, and incidence rates for many cancers are increasing. The brightest hope we have for curing or preventing cardiovascular disease and cancer is for each individual to lead a lifestyle in strict accordance with the advice of the American Cancer Society and the American Heart Association. I think we may see some mortality improvement in the higher socioeconomic strata as a result of the education campaigns, but the improvement will be minimal for many segments of the population. The road to future mortality improvement is by superior underwriting or major medical breakthroughs. I say this without considering the most obvious area of challenge in underwriting today, AIDS.

I am going to talk about what we should be doing about AIDS. Either you already know or you should find out that AIDS has a devastating potential for our industry due to ever increasing estimates of the percentage of people infected with the human immune deficiency virus (HIV) that will ultimately develop AIDS, the increasing incidence of HIV related encephalopathy, the spread to the heterosexual community, the mutation of new viruses, and the pessimistic outlook for prevention or cure. While none of our companies can avoid the AIDS risk completely, there is a great deal we can do to avoid being the victim of potentially massive losses due to antiselection.

The only conclusive means of ascertaining HIV positivity is through blood testing. The most common conclusive protocol is positive results on two out of three Enzyme-Linked Immunosorbent Assay (ELISA) antibody tests, confirmed by a positive result on the Western Blot test. Nearly all life insurers now do some blood testing at least on a for cause basis. Many companies are now testing every applicant under age 35 applying for \$250,000 or more. Others test at half a million dollars, a million dollars, or even two million dollars. I'm concentrating on the younger ages because over two-thirds of the positive test results found in 1986 by the Home Office Reference Lab (HORL) were from applicants under age 40. By contrast, just over one-third of the tests were run on applicants under age 40. Over one percent of the HIV tests were positive in 1986 for applicants ages 20 to 29. That rate was 25 per 10,000, or a quarter of a percent, for ages less than 20, 102 per 10,000 for ages 20 to 29, 49 per 10,000 for ages 30 to 39, 19 per 10,000 for ages 40 to 49, 15 per 10,000 for ages 50 to 59, and 6 per

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10,000 for ages 60 and over. Overall, 30 per 10,000 of HORL's 1986 tests were positive, yet 59 per 10,000 were positive for ages under 40.

Most estimates are that the U.S. population averages on the order of 75 HIV positives per 10,000. I think that the population percent is more than double HORL's percent for a few reasons. One reason is that the second largest group of carriers, the intravenous drug users, are probably not, by and large, long-standing life insurance purchasers. A second reason is that, looking at the situation from the infected person's eyes, health insurance, disability insurance, reserves for medical bills, and possible legal fees would, in many cases, exhaust funds with none left over for life insurance. HORL now does very little blood testing in connection with medical or disability insurance, although there is a movement in that direction. A third reason is that if a broker specializes in the placement of HIV positive risks he will probably be more inclined to conduct this business under conditions where he knows a blood test will not be required. Obviously, such agents and brokers are potentially a great danger to the industry.

We should all probably increase our mortality assumptions to account for the AIDS risk. Undoubtedly, a significant increase is warranted, at least where little or nothing is done to avoid the risk.

We have some reinsurance clients who send us nine avowed nonsmokers for every smoker, and others who send us three nonsmokers for every smoker. No doubt there are other forces at work here besides the quality of the screening program, but I think it is unlikely that a company that sells less than 15% smoker policies has a particularly clean nonsmoker class.

We're all aware of the cocaine epidemic that is sweeping our nation. I'd like to suggest that if you have never seriously underwritten for drugs before, now may be an excellent time to start with cocaine. The National Institute for Drug Abuse estimates that 20 million people in the United States have tried cocaine, 5 million of these are regular users, and 2 million are cocaine dependent. Cocaine is of particular interest to the life insurance industry because it is abused by people in all walks of life. Athletes and entertainers draw most attention, but cocaine is also abused by high school and college students, blue collar workers, and many executives. I believe our risk is greatest for the successful executive

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who is in all other respects a preferred risk and can financially justify a million dollars or more in life insurance coverage. It is likely that the numerous cocaine arrests at a Wall Street brokerage firm a couple of weeks ago were only the tip of the iceberg.

Like alcohol, cocaine increases both the physical and accidental risk of death. Four physical cocaine induced causes of death are: (1) central nervous system stimulation that induces convulsion followed by respiratory collapse; (2) cardiac arrhythmias culminating in cardiac arrest; (3) myocardial infarction; and (4) stroke due to intracranial hemorrhage. Cocaine is also associated with higher mortality due to accidents, suicides, murders, and even AIDS, due to contaminated needles.

Cocaine abuse can be determined from urinalysis. The Home Office Reference Lab's 1986 positive cocaine rates are almost exactly 150% of the corresponding HIV rates. The average for all ages was 42 positives per 10,000 tests. It was 39 per 10,000 for ages less than 20, 149 per 10,000 for ages 20 to 29, 80 per 10,000 for ages 30 to 39, 31 per 10,000 for ages 40 to 49, 15 per 10,000 for ages 50 to 59, and 3 per 10,000 for ages 60 and up. Once again, the heaviest concentration was at ages 20 to 29. The average age for cocaine positivity was a ripe 37.

I'm afraid that what I have said regarding underwriting has not been very cheery. I am going to intersperse some qualified good news in my remarks in underwriting breakthroughs. I think recent underwriting breakthroughs will have a significant positive impact on future insured mortality. I will address techniques that were breakthroughs a few years ago for some of your companies, and will hopefully be future breakthroughs for others.

I think the greatest underwriting breakthrough has been the widespread use of blood profiles. Insurance blood profiles provide a wealth of underwriting evidence that can't be obtained from other sources. Specifically, insurance blood profiles are presently the best means we have of detecting elevated cholesterol levels and subpar high density lipoprotein (HDL) ratios; elevated glycosylated hemoglobin and A1C which are indicative of diabetes; elevated blood uric acid (BUN), serum creatinine, and uric acid which typically indicate renal failure; and elevation of the liver enzyme gamma glutamyl transpeptidase (GGT)

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which results from chronic heavy drinking or liver damage. Thus, blood profiles contribute significantly to the underwriting of cardiovascular disease, accidents, suicides, homicides, renal diseases, diabetes, and cirrhosis of the liver.

Studies by my company and others have consistently shown that blood profiles pay for themselves several times over when it pertains to applications of \$200,000 or more for ages less than 40, and \$100,000 or more for ages 40 and over. And now we have AIDS to contend with. Because of AIDS it will be possible to justify even lower limits for drawing blood, especially at the younger ages. The ELISA, T-Cell, and Western Blot tests are independent of the blood profile, but the same blood sample can be used for both purposes. I believe many companies will continue the trend of lowering their blood testing limits, especially for younger applicants, in the next few months.

Urinalysis is an indispensable underwriting tool for ascertaining the use of tobacco, cocaine, and blood pressure medication, and for detection of a variety of renal disfunctions. Urinalysis is both convenient and inexpensive for medically examined business.

Paramedical exams are an underwriting breakthrough because their lower cost has enabled many companies to lower their nonmedical limits. Also, paramedical exams are more convenient, and can provide more consistent and higher quality underwriting information. There is a significant industrywide trend to substitute paramedical exams for medical exams. SOA studies have shown paramedical mortality experience to be slightly worse than M.D. examined experience. This is largely because a higher proportion of the M.D. examined business also has other significant evidence such as electrocardiograms (EKGs) and blood profiles. Frequently, paramedical exams are the most minimal level of physical evidence and no other corroborating evidence is obtained.

The underwriting techniques I have mentioned offer a great deal of promise for improving mortality. We should all be aware that the United States Office of Technology Assessment, or O.T.A., is currently studying all laboratory tests currently and potentially to be used by the insurance industry to classify risk. This study was requested by a host of politicians, including Representatives Henry Waxman and Pete Stark, and Senator Edward Kennedy, all of our good

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friends. The congressional interest is summarized as follows in an O.T.A. memorandum:

Congress is concerned over the possibility of increased federal health care costs if insurers use these tests to substantially decrease their financial risks, and in the social consequences of identifying persons at risk for an untreatable disease.

This is a legitimate concern, but I am not so blindly patriotic as to welcome a federal ban on AIDS and other tests with open arms. Clearly, our struggle to retain the right to accurately classify risks may intensify in the next few years. The O.T.A. study is scheduled for completion in March of 1988.

From time to time we all ponder the implications of epidemic and catastrophic risk. About all any of us do from an assumption's standpoint is to plug in some level of required surplus in order to provide a buffer against mortality deviations. In fact, I think that most of us would be very disappointed if and when our mortality buffer was suddenly swallowed up by one or more years of bad experience. Catastrophe and stop-loss reinsurance are special coverages that serve to smooth the profits on the ceding company's retained business.

Stop-loss coverage is in the limelight today as a means of controlling the potential epidemic mortality from AIDS. A typical stop-loss agreement might cover retained claims in excess of 110% of expected. There is almost always some maximum indemnity amount. Typically, there are separate treaties for life and health insurance, but group, ordinary, industrial, and accidental contracts are often covered under the same treaty.

Most larger companies typically find stop-loss to be cost-prohibitive in order to achieve meaningful limits. Premiums per million dollars of life claims covered generally range from around \$15,000 to \$100,000. I emphasize that that is per million dollars of claims, not insurance. The price typically depends on the corridor between the stop-loss attachment point and the expected claims, the geographic distribution of business, the extent of any catastrophe coverage, any anticipated changes in underwriting practices, and any underwriting practices to limit the escalation of AIDS claims.

Catastrophe coverage is typically payable only when, say, three or more insureds die in a single accident. Thus, catastrophe coverage is of no help with

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respect to the AIDS risk. This coverage has nothing to do with expected claims, rather the ceding company must keep a deductible before catastrophe reinsurance pays. This deductible is often somewhat more than the ceding company's normal retention times the number of lives that must be involved. Having such a high deductible serves to significantly lower the catastrophe premium while ensuring that coverage is only being purchased when a bad year would otherwise result. The cost of this coverage is typically three to five dollars per million of net retained exposure. There is always a maximum coverage amount. This can range into the hundreds of millions of dollars. Catastrophe coverage pays on events such as plane or train crashes where you insure several of the passengers or if San Francisco falls into the ocean. Both stop-loss and catastrophe reinsurance are typically optionally renewable.

MR. HARPER: Mr. Michael Aloisio is a Senior Associate Actuary with John Hancock in Boston. He has been, for the last 18 months or so, involved in life product development, especially including variable life. Prior to that he was with Great West, just right up the street, and is another CIGNA alumnus. A lot of the effort Mr. Aloisio is involved in these days is trying to set an investment assumption, so he is going to talk about investments.

MR. ALOISIO: For the past seven years I have had a hand in developing a variety of new concepts in individual life products from indeterminate premium whole life to fixed premium universal life to my current variable life product. Throughout this process, a basic theme has been to allow the policyholder to share more directly and concurrently in the experience of the policy, especially in the investment returns. So why, given my involvement with a variable life product, with an apparent complete pass through of investment experience, would I be selected to address the subject of setting investment assumptions? Could it have anything to do with that sense of volunteerism? You know the one -- when your boss comes over and starts to talk about commitments to the profession and wonders if you have any free time during the last week in April. But actually it is timely for a life product developer to hold this discussion.

Two industry developments of the last seven years or so are now combining to forever change how we set our interest assumptions. The change is likely to extend to the fundamental pricing process itself. These developments were due to somewhat different responses by the life and annuity product lines to key

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forces over this period. One principle force was, of course, the volatility of interest rate levels. The emergence of smaller, more affordable, and faster computers was the second force.

The life line responded by developing its series of pass-through or bundled products. The annuity line responded by placing the investment assumption itself under scrutiny. That scrutiny produced new and powerful methods and tools to understand the nature of the assumption, the risks involved, and the resulting profitability. We have come to know the buzz words -- *asset/liability matching, scenario testing, stochastic modeling*.

Today we are on the threshold of seeing these tools and methods applied to our life products and profit methodologies. There appears to be much benefit on the other side of this threshold. We should get a clearer picture of the risks assumed and the pricing processes in our product. We should be able to better manage our in-force under changing conditions. And we should have a greater comfort level with the ability to achieve our stated profit goals. But do we know the price we may pay once we cross that threshold? Is there a danger of attempting to gain too much of a good thing? I will leave that to your judgment through the practical parable I will tell you at the end of the discussion.

Setting assumptions -- why so much excitement at this time with the interest area? It wasn't too long ago that an investment assumption meant producing a set of new money rates by duration and selecting a rollover rate. Today, these new tools are available, and in order to apply them the sophistication of the profits has greatly increased. Now the numbers to be set have just skyrocketed. We now have categories of assets to control. How long of a term will that be? Do you want three to five years? Do you want five to ten? Do you want anything longer than ten? How much mix of the assets do you want in each of your durations? How will that change?

The system resources required are also large. You need new processing power for the analytical tools to be applied, and you have to have excellent data bases on the investment side and on the product side.

But I don't think it stops there. I believe that these new tools and techniques have fundamentally changed the nature of what is meant by an investment

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assumption itself. I no longer think it is correct to speak of an investment assumption as a single given. Instead, now it is more appropriate to speak of it as an investment assumption that encompasses a plan of operation.

A plan of operation is a much broader concept. It means an assumption of not just rates alone, but rates, an investment policy, and a system of assessing the risks involved in those two items. This systematic review of risks involves the combination of the investment policy and the policy design under reasonable and plausible future experience.

A plan of operation would include the asset mix referred to above that is being used to back the product liabilities. Now this almost presumes that you have a segmentation method of some basis in the company. The plan might include or describe the choice of methodology for the matching process. This again will be related to system capacity and actually the trading orientation of your investment area. Often, the particular program will tell you to do something and the investment error may just go on its way.

The plan would cover the frequency rules for matching assets after issue. This notion of rebalancing will require much additional staff to study the in-force product and handle the administration of the results that come out of the balancing tests.

The plan would also involve an agreement on how results will be treated or acted upon after they have been analyzed. We now have a new financial monitoring function to review this, and again the additional coordination with the investment and product areas.

Lastly, a plan of operation would include an explicit quantification of the level of risks to be assumed and its effects on the desired profitability of the design.

The development of a plan of operation is an extensive undertaking and requires a large cast of characters. At Hancock, we are pretty much able to have one person play each role, but in smaller companies you are going to have to have one person assume more than one role, and there may be certain conflicts or considerations that are going to be difficult to separate.

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The first person involved will be the product manager or the pricing actuary. He is going to coordinate the development of the plan and will accommodate plan design where required. You will have your marketing representative, who will be commenting on the strength of the design after the proposed changes. You will have your profit center financial officer who will make sure that the plan design and plan of operation meets line of business standards. Lastly, you will have the profit center manager who is ultimately responsible for the success of the profits on the design.

Those are pretty much your line of business representatives. You also have your corporate side represented by investment consultants. The use of the word consultant is key. It is not the investment professional -- the person charged with actually analyzing which assets to buy. This is really a bridge between the product design area and the professional and investment advisors. This is somewhat akin to the system analyst concept, where when systems were first introduced into the insurance area, they were black boxes and only a few people knew how to use them, and to talk to them you developed a system analyst function to figure out what the needs were and then talked to your system professional to see how he might accommodate those needs.

You also have a corporate actuary involved in the plan of operations. This is a new role and the industry is moving to call this a valuation actuary. I will have more on this important role later.

Lastly, the board of directors or a committee of the board of directors is trying to get actively involved in the plan of operations. They are going to need to set limits and constraints on the amount of risk that the corporation deems safe to assume. They will be ultimately charged with the accountability of the plan of operation.

Those are the players from the company side. We now have some outside influences. Some are well known and have been with us for a while. Others are fairly new with regard to insurance companies. We have always had our regulators. They now are actually prescribing the form and content of certification regarding plan of operation. They will put additional constraints on what may or may not be in the plan. They may also limit the types of assets that can be used to support a plan of operation.

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A new player on the scene is the rating agency. If your corporation wants to get a commercial credit rating, these people are now asking very pointed and very exact questions. They have outside control of a different nature and much broader views than that of just solvency.

Lastly, on the large pension cases, you have brokers who will look for a quality of plan of management in the companies. They will also screen the company and its plan of operation before a presentation to a client.

There is a new growth of awareness in the consumers themselves. They are beginning to ask questions about a company's plan of operations, how it does its matching, what methodologies are used, and how it plans to support its funding after sale.

I wanted to talk a little more about the role of the valuation actuary because I believe he is going to have one of the larger impacts on the investment setting process. He is going to be the ultimate judge of the plan of operation. In fact, New York State requires that he must express an opinion on it. This is in regard to annuities. Your valuation actuary will have the power to allocate surplus to the line of business if he feels uncomfortable with the plan of operation. Now, as he does this, this is going to have an effect on the reportable profitability of the product design.

Finally, the valuation actuary must be comfortable that the operation of the plan provides for adverse deviation from the expected profit assumptions.

It is becoming a bit clearer how the valuation actuary will assess and test the plan of operation. The annuity tools of scenario testing and stochastic modeling have evolved in a certain sequence of events. First, they performed a technical analysis of matching. Then they linked that to the risk and cost of being mismatched. Finally, that was linked to the determination of the price for a risk. Once the price is set, the valuation actuary may use the same tools to judge the risk reward balance that was developed in the final product design. He will also use them to test compliance with the risk constraints set by the corporation.

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A few practical observations for plans of operations: first of all, you need extensive communication and standard procedures between the line of business and the valuation actuary and the investment department. The valuation actuary and the line of business will have to be sensitive to regulatory requirements and will have to assess their ability to conform. We have had situations already where the nature of the request and the model that is generated just exceed the capacity to produce the results that have been requested.

The extensive use of these tools for life products is clearly more complex than in the annuity field. The liabilities are more complex. The experience factors can actually be viewed as policyholder options and these experience factors are no longer independent of the interest assumption and plan of operation.

Finally, you have to question the ability to actually manage a plan of operation. You may assume that certain assets will be available in certain circumstances to cover all your mismatch situations. It may be that those assets are no longer available in the marketplace when you go to buy them.

As mentioned previously, you also have to get the commitment from the investment area that they will believe the results of the profits and that they are willing to purchase and sell the assets that are identified.

Finally, you have line of business acceptance. You have a voice in all circumstances that is just asking you to get the rate. "Do whatever you have to but just get me the best rate you can." Clearly, that individual has to be won over to the process.

To summarize, the investment assumption is becoming important in the establishment and testing of a plan of operation. The testing allows for the systematic analysis of risk and associated profitability on reasonable and plausible futures. Once the relationship is understood, the cost may be reflected in the price, which may even take you out of the market at certain periods of time, or the cost may be funded through surplus allocation, which will reduce the profit you can report to the corporation.

It seems fascinating to me what has evolved in the area of plans of operation. Originally, these plans were an academic study to study the very technical area

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of asset/liability matching. They are now being codified in the regulations that insurance companies will be subject to. This could be extended to all insurance companies large and small. You have to ask whether the actual regulations and methods that are codified will apply to these smaller companies. Will they be requested to comply? Can they comply?

Also the role of the valuation actuary is just getting off the ground in the United States. It need not be static. The role in the United Kingdom is quite comprehensive and actually includes direct responsibility for product pricing. This, of course, would have to make our whole vision of line of business readdressed.

Lastly, we have the effect of the international financial market. The financial power has been shifting recently, and I am not sure if this is reflected in our scenarios. It was recorded at the end of last year that Japanese control institutions that held 25% of the world's banking assets, compared with 18% in U.S. counterparts.

Now I am not too sure how long this will remain an exogenous variable. It used to be that government spending and federal activity were exogenous variables when it came to setting interest rate assumptions for life insurance. I am not sure that we cannot have a view of the international marketplace and the actions of the other foreign powers separate from our scenarios.

In closing, I believe we have already stepped across the threshold. We are going to have more complex models. There is a question that is raised, and that is: Will there be a natural end to the growth and complexity of these models?

At this time I will end with a parable.

The king knew he could better rule his country if he only had improved maps. The Royal Society of Cartographers was newly commissioned to study and produce such maps. The king was pleased when a 10,000 to 1 scale map was presented and even more so with the finer detail of the 1,000 to 1 scale map. Well, seeing the games to be had with a pleased king, the cartographers knew that if enough time and money could be spent, a map even under the scale of 1 to 1 was possible. Of course, when they completed their work and presented it to

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the king, the king determined that it was just too unwieldy to carry about. He decided that forever after he would use the country instead of the map.

MR. RICHARD G. FIELDING: Bill, which states do not allow AIDS testing, and also what do you give up by using the T-cell test versus the ELISA and Western Blot test?

MR. BOYD: Washington, D.C. doesn't allow testing or much of anything else with respect to AIDS. California also does not allow antibody testing or ELISA testing. Wisconsin didn't allow antibody testing but thanks to tremendous efforts of the HIAA and NAIC, that has been recently overturned. I am not sure when it will change officially. In California you can use the T-cell test. The only problem with that is that it will not be positive until someone has actually developed immune system abnormalities or AIDS, so you could take in HIV positive people.

MR. FELDING: Also, isn't there a period of time where no test will detect the presence of the virus, the incubation period?

MR. BOYD: Yes, there is. Of course, it is typically hard to tell when people got infected, but it looks like a minimum length of time is three weeks after infection and it can range up to six months.

MR. HARPER: Dub, you said that something like 80% of your sales are now universal life and I think you said that you thought it was going to be more expensive to administer. What do you think would happen if you got 100% of your business UL?

MR. LEONARD: Hopefully, we aren't going there, but I definitely think that the sale of UL adds to the total expense of the company. On the other side of that, the average size policy tends to be higher so that works to help control unit expenses.

MR. HARPER: What might the companies do if interest rates continue going up as quickly as they have in the last couple of hours?

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MR. ALOISIO: Actually, it will all depend on what they have done over the past three or four years. With no immunization programs, I am sure some of them are going to spend some sleepless nights, especially over value sheets on a market value basis. With immunization, the companies are going to have a real world test of their methods. We will see if the practical results anticipated actually emerge. I think we will also have a chance to gauge the financial sophistication of our policyholders. We will also be able to gauge and judge those experience factor dependencies that are under their control. I think that if they go high enough long enough, there will be a new round of repositioning as new current interest series are introduced.

MR. JONATHAN E. MILLER: To pursue this a little bit further, what we have discovered is that if we actually immunize exactly we can't possibly make money. So we have to do some risk reward analysis and decide what risks we are willing to take. But those risks don't really seem to be insurance risks to me. They seem to be gambling.

MR. ALOISIO: I think you have identified one of the biggest gains of this very complicated scenario testing process. That is, we are getting a much deeper insight into the kinds of risks we are assuming. I have heard it said that insurance risks now are almost the least of our concerns, but after hearing Bill I will reassess that. But we are actually in the business of analyzing credit risks and repackaging credit risks. Part of that definitely involves whether your board has to get involved in establishing a risk that you are going to take on these ventures.

MR. ROBERT J. JOHANSEN: My question concerns improvement in mortality and where it is going. The last individual annuity intercompany study ended with 1976 and I haven't seen anything about a new study being published and I am on the committee.

MR. LEONARD: I think that the Society should do all it can to encourage up-to-date studies of intercompany experience. If you want some recent figures on mortality, the National Center for Health Statistics produces a free monthly bulletin which among other things includes mortality rates by age group for year to date and current month. Unfortunately, they are not split by race or sex,

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but they do give you an indication and at the higher ages, by my observations, month-to-month, they indicate that mortality rates continue to trend downward.

On the other hand, a few years ago I was looking into the question of improvement in mortality and in particular, improvement by cause. I looked at the opinions of several experts on mortality by cause, and if you read the opinions of 5 experts, you got more than 5 reasons. I think the essential reason that they all seemed to agree on was they didn't know why. That particularly applied to mortality from stroke and from other cardiovascular diseases. I think it is pretty risky to try to prognosticate where mortality rates are going, especially from sources other than insurance and annuities, because there are so many factors involved, including the extension and now the more costly aspects of medicare, and the effects of the economy on improvements in the income and disposable income of people over 65, which may or may not apply to annuities. I think we have a very wide range of supposition which we can indulge in to see which way mortality rates are going. If you want to toss a coin, that may be just as accurate.

