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SURPLUS NEEDS OF LIFE INSURANCE COMPANIES

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ROBERT A. MILLER

1. Status report of Trowbridge Committee on "Valuation and Related Matters."
2. Steps in one theoretical valuation of surplus will be presented. Is this valuation suitable or useful for solvency regulation or internal management?
3. What is the purpose of surplus? How much surplus is required for group insurance? How much surplus is required for ordinary and group business with a savings element?

MR. JOHN C. MAYNARD: Many factors affecting life insurance are changing today including expense rates, taxes, investment return, types of contracts, distribution methods and, of course, rates of mortality and morbidity. With such a range of change in the environment, it is wise to look at the methods of financial valuation which are being used and ascertain if any adjustments are needed in them. In the course of doing this we can expect to learn about the surplus needs in the business, surplus being the shock absorber needed for fluctuations and changes in direction.

MR. CHARLES LAMBERT TROWBRIDGE: The committee on "Valuation and Related Matters" was appointed by Bob Jackson early in 1977. Our five current members each have board experience; more people may become involved later.

In a sense this committee is a successor to the Unruh committee; in another sense it is not. The general purpose of this committee is to develop a complete and consistent theory for the entire balance sheet of an insurance enterprise.

We do not have such a comprehensive theory today. What theory we do have was developed a long time ago mainly for individual life insurance. It has since been imperfectly adapted to many other products that life insurance companies sell today. The valuation of assets and liabilities are clearly inconsistent. This makes the difference between these two, surplus, to some extent garbage. Surplus theory as such is practically non-existent today.

The committees of actuaries attached to the regulatory process work hard to solve pressing and immediate problems. Our committee has a very long time frame and a different role from these committees. If we are successful, the regulatory structure can be standardized based on solid grounds. Regulators have stated that they would welcome a Society effort to build a theoretical base.

What progress have we made so far? We have had one meeting and will have another one today. This concurrent session has Jock Maynard, an active member of our committee, as its moderator. An informal paper titled "Toward Consistency in Valuation Methods, Assets Versus Liabilities" was presented at the New York University Actuarial Research Conference and copies can be made available to anyone interested. The committee considers this paper a "trial balloon"; it is not the considered opinion of the committee or of this office.

MR. HENRY B. RAMSEY: The Financial Accounting Standards Board is now developing a conceptual framework for life insurance accounting. I would urge the Trowbridge committee to monitor the Board's activity to see that the basic principles which they adopt are not inconsistent with what could be the right approach for us.

MR. ROBERT A. MILLER, III: Mr. Trowbridge indicated that the committee may extend their studies to the property and casualty line. If they do so, I hope that they include at least one member of the Casualty Actuarial Society in any such study. The liability problems are much different in the casualty business from what they are in the life insurance business.

MR. MAYNARD: Probably the most difficult kind of valuation is that of long term contracts. This is so because of the difficulty of valuing the flow of in-payments, the assets, in the same way as the flow of out-payments, the liabilities. One outline of a theoretical method is given in the following series of steps.

Discussion note -

STEPS IN A THEORETICAL VALUATION OF LIABILITIES AND SURPLUS FOR LONG TERM CONTRACTS

Long term contracts are those for which premiums are more than needed for benefits in the early contract years, i.e., annuities and insurances with a savings element. They give rise to sizeable liabilities and assets to cover them. The valuation of these contracts should treat the valuation of assets and liabilities consistently. It is possible to think of the valuation as a series of steps:

1. Determine market value of assets A.
2. Determine an interest rate by equating A to the present value of future payments of investment income and capital. The present value would provide for the probabilities that options in the payment schedules will be used, and for the probabilities that payments of income and capital will not be made. This is the riskless rate of interest.
3. It is assumed that the net in-payments will exceed the net out-payments, giving rise to reinvestments during the life of the contracts. If the long term rate of reinvestment is taken to be greater than or equal to the riskless rate, the interest rate for liabilities will normally be the riskless rate. But if the long term rate is taken to be less

than the riskless rate, the interest rate for liabilities should be between the riskless rate and the long term rate.

4. Determine liabilities L by a prospective gross premium valuation which makes provision for benefits, gross premiums, expenses, taxes and a reasonable scale of policyholder dividends. The present value calculation would introduce the probabilities of claims arising and also the probabilities that options will be used, especially the options of lapse and the use of nonforfeiture values.
5. Surplus is $S = A - L$.

Comments

1. The probabilities of payment of income and capital will depend on market values. For example, when interest rates are low, calls on bonds and redemptions can be expected sooner.
2. The probabilities of policy options being used will also depend on market values. For example, when interest rates are high, greater use of cash values and policy loans can be expected.
3. Surplus required will be that which is needed as protection when the factors affecting the valuation vary through ranges which are thought to be reasonably possible in the future.

MR. ROBIN B. LECKIE: There are many facets to the claim of uniqueness by the life insurance business. Perhaps the most interesting element of uniqueness is the lack of precision and even understanding of the definition, size and use of surplus.

In most businesses capital and surplus represents the net worth of the business. This is generally the sum of the capital paid in and accumulated undistributed earnings. In the case of a life insurance company, about the most that can be said is that capital and surplus represents the difference between a valuation made of assets and a valuation made of liabilities. Both valuations are, in a sense, the present value of a future income stream, and yet the valuations are generally done independently and using different bases.

Despite that caveat, surplus is a paramount consideration for both stock and mutual companies since it represents, on the one hand, a hedge against insolvency and on the other, the undivided earnings of participating policyholders or of shareholders. Because of its significance to all parties to the insurance process and because of its unique actuarial characteristics, one would expect considerable actuarial literature to have been devoted to the subject. However, as has been noted, the subject has been largely ignored, perhaps because it does not lend itself to actuarial precision.

There are three elements to the balance sheet of any company - assets, liabilities and net worth. Because these must always be in balance, it is not possible to consider surplus without also considering the principles and bases for both the valuation of assets and of liabilities.

In this connection an important point to note is that for a given company, there is more than one approach to the valuation depending on the use to which the valuation is put. And for the same use, there will be different approaches between companies. For example, one approach is that for the statutory statement prepared for regulatory authorities. The prime purpose is a test of solvency. A second statement, a little less conservative, is that based on GAAP which is primarily used for reporting earnings on a uniform and supposedly comparable basis. A third valuation, a less conservative one, could be based on a consistent valuation of both assets and liabilities, that is, a gross premium type valuation. On this continent its purpose might be to assess net worth, possibly for purchase by another company.

I would like to briefly discuss the concepts of these valuations to develop some understanding of the principles, purposes and size of the liabilities so as to assist us in an understanding of the nature and size of surplus. The objective is to consider the various types of liability margins inherent in the valuation process.

First, a word about the valuation of assets. In effect, assets are valued as the present value of an income stream and capital repayment. For bonds this will probably be at the yield rate at purchase, in order to produce the amortized value, whereas for stocks it may be at the anticipated yield at purchase, if valued at cost, or the anticipated current yield, if valued at market. A valuation based on original yield, that is, amortized value for bonds and cost for stocks, is consistent with a going concern valuation where it is expected that assets will be held to maturity and liabilities will ride out their actuarial duration. The use of current yield, that is, market values, is based on the liquidation concept where assets must meet immediate liabilities. For statutory purposes, it is quite reasonable to use a combination of the two approaches.

Because my discussion is primarily concerned with the valuation of liabilities, I will accept for purposes of this discussion a valuation of assets equal to those appearing in the statutory statement. Any deferred acquisition expense asset will be considered a deduction from liabilities, while the Mandatory Securities Valuation Reserve or Investment Reserves will be considered as a form of surplus. The company is then free to revalue all assets on a market value basis and consider the difference from the statement basis, positive or negative, as an element of surplus. Other possible elements of surplus are non-admitted assets, including goodwill and the value of the agency organization.

Now, let us look at the liabilities. The lowest level valuation - the minimum reserve conceivable - is a valuation based on best guess assumptions, that is, the present value of future guaranteed and unguaranteed benefits less the present value of future premiums with the present values based on most probable interest, mortality, withdrawal and expense assumptions. Anticipated income tax is factored into the calculation. Interest would be based on the yield derived from the valuation of the assets and the expected return on the investment of future cash flows, positive and negative. Dividends would be an unguaranteed benefit and would be based on the then current dividend scale, adjusted for any anticipated future dividend changes. The purpose of this approach is to define as the basic liability the amount, which together with future premiums, will be sufficient to exactly meet future obligations, if the best guess assumptions are exactly met.

The next level of liability is determined by introducing some margins for currently anticipated adverse deviations. For example, it is reasonable to assume a progressive reduction in available yields for future investments. The mortality and expense margins of current non-participating premiums could be introduced. No margins would be included for participating business.

The third level of liability is the GAAP reserve, reduced by the deferred acquisition expense asset. The U. S. GAAP reserve will generally relate the provision for adverse deviations to original assumptions, not current assumptions. These assumptions are likely to include more accounting and actuarial conservatism than those of the previous level of valuation. It is probable now that the valuation interest rate will start to depart from the rate used to value assets, and there may not be close consistency between companies in the way interest rates are chosen. There are no prescribed standards for the preparation of comparable GAAP statements by mutual companies in the United States.

At this stage it is worthwhile to repeat that our purpose is merely to develop a conceptual understanding of the liabilities, not to present proposals to accountants or to make comparisons between companies.

The fourth level of liability is determined from the GAAP valuation by substituting cash values wherever the cash value exceeds the calculated reserve. This then allows for each policyholder exercising a potentially adverse option against the company.

The fifth level of liability will be based on the Standard Valuation Law utilizing the Commissioners Reserve Valuation Method and including any required deficiency reserves. Now, of course, the valuation of liabilities bears virtually no relationship to the valuation of assets.

The final level of liability will be the reserves actually held by the company in its statutory statement. This could be the same as the previous level or would be higher if some other form of reserve modification is used or if the net level premium method is adopted. It is also possible the company may have included with its actuarial liabilities various special reserves such as a reserve for the future strengthening of reserves.

It should be apparent that there is no precise and unique determination of the value of liabilities. Some companies may have used a low premium interest rate while others may have used a high rate and this will significantly influence their liabilities. Some companies modify reserves, others do not. Some companies may have large volumes of various forms of annuities that have required significant surplus appropriations to set up statutory reserves. And there is as yet little consistency in the choice of interest assumptions for GAAP reserves.

What is the purpose and nature of the actuarial liabilities and the margins which are structured into those liabilities? How does each of these margins influence our confidence that the company will be able to meet its commitments?

At the basic level there is by definition no margin and the liability is adequate to meet future commitments (or for participating business, to maintain the current dividend scale) approximately 50% of the time. The second level provides a margin for currently determined adverse deviations which should certainly increase confidence to say, 90 to 95 percent. The GAAP level adds a margin for basic accounting and actuarial conservatism. I cannot believe we would want less than 95% confidence, although I am not aware of any such standards having been set either by the actuarial or accounting professions. The fourth level, which covers individual cash values, provides for immediate anti-selection without impairing the expectations of remaining policyholders. The fifth level adds a basic solvency margin which should be raising confidence to close to 100%. Obviously, perfect confidence is not attainable nor is it needed, because there still exists surplus and capital. The sixth level permits the company the additional conservatism of writing off initial expenses even though they are recoverable from future premiums.

You may be interested in the size of these margins. I have done some rough calculations for our own company which is a reasonably large mutual company operating out of Canada with half of its reserves on non-participating policies, most of which are annuities. I have made no attempt to examine the so-called margins at the second and third level, as they are so dependent on present interest rates and the current outlook and thus would vary considerably from time to time and from company to company. However, measuring the subsequent margins as a percentage of what would be close to our GAAP reserves, the margin for the cash value floor is 2%, the margin for the Commissioners' Statutory Reserve is an additional 5% and the margin for the actual net level premium reserves, together with the unallocated actuarial reserves,

is another 7.5%. Thus, on this basis, we have close to a 15% margin over GAAP in our statutory statements.

All of these valuation margins built into the valuation process are to assure future performance under varying degrees of conservatism. They are not intended to cover the risk of asset failure, nor major epidemics or catastrophes, nor the amounts required to finance future expansion. That would be the purpose of designated surplus or of surplus margins in the asset valuation.

I would like to go back to the first level of actuarial valuation, that is, a reserve based on the same interest rate as the assets, together with most probable future expectations. In this valuation the variable which would concern us most is the return on future investments. If we can assume for the moment that no calls exist on the assets, that the life insurance is balanced by a reasonable volume of annuity business and that no policyholders will exercise financial options against the company, then it is possible to structure the assets in such a way as to be immune to future changes in interest rates.

It requires assets of a longer maturity than the apparent term of the liabilities so as to eliminate the reinvestment risk. If immunization is achieved, the first level of liability takes on added significance, since the interest rate is eliminated as a variable. Unfortunately, total immunization is not possible because of the guaranteed cash values and because for life insurance alone, assets with the longest conceivable terms would still not be long enough. And in any case, total immunization places strong constraints on the conduct of an intelligent investment strategy.

Before closing I would like to summarize the accepted concepts of valuation in major countries. In the United States, statutory balance sheet valuation is on a modified going concern basis with reserves sufficient to cover guaranteed cash values, calculation factors based on extremely adverse assumptions and most assets at an amortized value. In addition, stock companies report earnings on a GAAP basis and these earnings will normally be higher than those reported to the supervisory authorities and higher than those from which dividends to shareholders can be paid.

In Canada a new basis of financial reporting is being introduced which equates GAAP and statutory accounting for both stock and mutual companies. The valuation, which is under the control of the company's valuation actuary, will be based on assumptions appropriate to the circumstances of the company as certified to by the valuation actuary. The actuary, however, is permitted to use reserves more conservative than those based on the most appropriate assumptions. In such a case the valuation actuary must calculate the increase in actuarial reserves, for purposes of the income account, on both bases. Valuation in Canada, like the United States, is on a modified going concern basis.

The United Kingdom has moved to the liquidation concept of valuation. Asset values are at market. The interest rate derived from the asset valuation, reduced by a contingency factor, is used in the valuation of the liabilities. Thus, unlike Canada and the United States, a shift in interest yields will impact both sides of the balance sheet in close to the same proportion. It should be noted, however, that guaranteed cash values are almost unheard of in the traditional ordinary life business of United Kingdom companies.

The Committee on Valuation and Related Matters is dealing with a most interesting subject. Hopefully, it, together with the Committee on Dividend Philosophy and with other work now being carried on by actuaries, will lead to a better understanding of the need for liability margins and surplus and when these should be released for distribution in a mutual company.

MR. MAYNARD: Mr. Leckie, would you care to comment on the problems that a company doing an international business might encounter?

MR. LECKIE: There is a currency risk to the extent that assets and liabilities are mismatched. There can be a place of payment risk as there now is in Cuba with assets locked in Cuba and policyholders outside Cuba making claims. There can be a loss if assets are taken over in a country where the assets are greater than the liabilities. There are also regulatory and economic risks.

MR. THOMAS G. KABELE: Recently, my company went through a GAAP purchase accounting. Assets were valued at market. Liabilities were valued at the resulting interest rate for assets minus certain contingency charges. We found that GAAP surplus actually increased slightly. Each one percent increase in interest rate decreased assets by 6.7% and GAAP reserves by 10%. Thus, the level of conservatism embodied in a market oriented approach may not differ significantly from that contained in a very conservative valuation of assets and liabilities.

MR. MAYNARD: I agree that you can get some rather surprising results from market valuations. The main ingredients are probably the length of assets and liabilities.

The next discussant will be Bob Miller.

MR. ROBERT A. MILLER, III: Before talking specifically about surplus requirements for group term life and group health insurance, I want to make a couple of points that apply to all lines of business.

The buyer wants to get his insurance at the lowest possible cost -- however he may define that term.

The buyer of insurance also wants to be as sure as possible that the company will be able to make the promised payment if and when the insured event occurs.

These two buyer wants -- low cost and complete assurance -- put opposing pressures on the insurance company.

The first pressure tends to minimize the capital invested in the business. Premium rate competition limits the earnings that can be derived from the business. Nevertheless, these earnings must produce a rate of return that is competitive in the market for capital. Together these factors produce the pressure to minimize the capital investment.

The second pressure is to maintain enough surplus to convince the buyer that the company has the financial strength to carry out its promises.

These considerations lead to the conclusion that if we want to operate our businesses soundly and be fully effective competitors in both the market for insurance business and the market for capital, we need to be able to measure the risks we are trying to manage.

In the generalized analysis that follows, the risks affecting the insurance business have been sorted into five categories:

1. Chance fluctuations in loss experience.
2. Chance fluctuations in investment experience.
3. Systematic exercise by insureds of choices adversely affecting loss experience or investment experience or both.
4. Natural disaster.
5. Economic disaster.

The first category includes chance fluctuations in the rate of mortality or morbidity, or the rate of incidence of fires, automobile accidents, general liability claims and so on. It also includes fluctuations in the average size of loss, whether they result purely by chance or because of something like an inaccurate prediction of the effect of inflation on health, property or liability claims.

The second category includes chance fluctuations in the frequency and severity of default, delay or reduction in the payment of principal or investment income. It also includes fluctuations in the value of assets and prescribed write downs of impaired assets.

These first two categories of risk are not completely independent of each other. Underwriting policy and results can affect investment experience by affecting cash flow. Investment policy and results, particularly capital gains and losses, can affect underwriting capacity.

While it can be argued that risks assigned to the third category could just as well be assigned to one or the other or both of the first two categories, they have been separated for purposes of this discussion because:

1. they involve deliberate choices by insureds and
2. in many instances they can be managed through suitable drafting of the insurance contract.

Choices available to insureds in the group term life and health insurance businesses can have an important effect on surplus needs.

They include such things as under-reporting of premium waiver disability claims, which do not involve immediate cash benefits to insureds, as compared with long term disability claims which do involve such benefits.

When temporary disability benefit schedules rise above unemployment compensation schedules, temporary disability losses tend to increase more than proportionately and vice versa.

It seems plain that the existence of insurance influences the utilization and price of medical services.

It is almost axiomatic that economic recession causes the rate of incidence of long term disability claims to rise.

In many cases, choices available to insureds affect investment experience, because they affect cash flow.

Natural disasters include things like the flu epidemic of 1918 which killed about 22 million persons around the world and the earthquake of a couple of years ago which killed hundreds of thousands of persons in China. I believe that there is no way to manage nuclear war once it has started and so it is not included as a natural disaster.

Economic disasters include things like the Great Depression of the 1930's. They also include long term or steep inflation, both of which are ravaging countries like Brazil and Colombia. Economic disasters can involve very high or very low interest rates.

Having identified the nature of the risks to be managed by means of accumulated surplus, the next step is to analyze how these risks affect group term life and group health insurance.

By making some assumptions as to the probability distribution of the number of group term life insurance claims in a year, it is possible to determine the amount of surplus needed to reduce the probability of insolvency from this risk in a period of one year to any desired level. The effects of operating income, income from the investment of surplus and inflation have to be taken into account also.

Our calculations show that somewhat more surplus is needed to reduce the chance of insolvency to the same level for a two year period. As the test period is extended to three years, four, five, and so on, the total required surplus increases at a decreasing rate, until finally the total required surplus for n years, say, is less than that required for $(n-1)$ years. When this happens, it is evident that the surplus required to reduce the probability of insolvency to the desired level for $(n-1)$ years will reduce the probability to or below that level for the indefinite future.

The amount of surplus needed to manage the risk of insolvency from chance fluctuations in the number of claims can be sharply reduced by deliberately setting premium rates higher than the level needed to cover expected average claim costs. This form of risk sharing is acceptable to group insurance policyholders because it reduces risk charges and because, to the extent the margins are not needed, they will be returned over periods appropriate to the size and experience of the respective policyholders.

With regard to group health insurance it is not practical to measure chance fluctuations in loss experience in terms of a frequency distribution based on a rate of incidence of claims. Instead we measured fluctuations in loss ratio over a period of several years. This procedure has the advantage of taking into account not only fluctuations in morbidity rates, but also such things as increasing cost per claim -- arising out of inflation, expansion of benefits and greater utilization of medical care.

This kind of analysis enabled us to determine the amount of surplus needed to put the probability of ruin from this risk at the same level as for the corresponding risk for group life insurance.

Even though it is not quite so effective as for group life, a well designed and implemented experience rating policy is a powerful tool for managing the group health loss fluctuation risk and thus reducing the amount of surplus needed for this purpose.

Chance fluctuations in investment experience are not nearly so important a factor in the determination of surplus requirements for group term life and group health insurance as they are in that determination for individual life insurance and group pensions. The magnitude of these fluctuations for bonds and mortgages under normal conditions can be derived from a review of the company's losses from default in the payment of principal or interest or from a review of countrywide experience as described in various financial publications and papers. Sound investment policy and diversification are the best ways to minimize risk in this area.

For common stocks, probably the best measures of risk are those based on long term studies such as that carried out a few years ago by Ibbotson and Sinquefeld at the University of Chicago.

When the volume of investment in common stocks becomes large in proportion to surplus, there is a very substantial downside risk. This was shown by the experience of a great many insurers -- both life and casualty -- in the relatively mild recession of a few years ago. The surplus needed to cover this risk is a substantial fraction of the market value of the common stocks held by the company. The size of the fraction depends upon the company's evaluation of its ability and determination to get out of a falling market with minimum losses.

I have already given examples of some of the kinds of choices insureds may exercise to the disadvantage of the company. Each insurer should try to identify such choices and decide which can and should be managed by contract provisions or pricing. The others will have to be managed through the holding of amounts of surplus which will depend upon the nature of the choices involved.

Insofar as natural disasters are concerned, the possibility of an epidemic seems to pose the greatest threat for group life insurance. Modern medicine at times seems almost miraculous, but -- the flu epidemic of 1918 occurred less than 60 years ago and was second only to the black plague as a killer, the medical profession seemed less than sure how to handle the Philadelphia legionnaires' disease, and the miracle of modern transportation can spread infection with amazing rapidity. The flu epidemic of 1918 doubled Aetna's mortality rate for a brief time and increased it by nearly 20% for a two year period -- that is a lot of extra death claims. A vast epidemic could create huge group health insurance losses in a relatively short time.

More limited natural disasters can produce substantial losses. A severe earthquake striking a major city where an insurer covers a large number of persons -- say 50 -- for very high amounts can produce a substantial loss. However, it is perhaps better to manage this type of risk by reinsurance than by holding surplus.

With regard to economic disasters, some people -- perhaps a majority -- believe there can never be another depression as severe as that of the 1930's. It was severe all right. Aetna Life Insurance Company went into that depression with surplus equal to about 17% of its liabilities. At the end of 1934, surplus was about 6% of liabilities.

It is hard to imagine how economic disaster could affect group term life insurance experience as much as it would be affected by a natural disaster of the magnitude of the flu epidemic. The investment risk is relatively much smaller than for permanent life insurance. Group term life insurance premiums are related directly to amounts of insurance which are fixed in advance. So inflation by itself can't do much to increase loss ratios. It can sharply increase expense ratios but this can be anticipated in the experience rating process.

On the other hand, rampaging inflation could run group health insurance into the ground in a few years. In any case, the economic disaster surplus needed is large in comparison to that required for group term life insurance.

When the risks have been analyzed, the next question is how much surplus does it take to manage them all together. Chance fluctuations in loss experience and in investment experience are largely independent of each other. It is true that the Great Depression brought on a rash of suicides, but the extra deaths hardly made a ripple on the surface of Aetna's mortality experience. Systematic anti-selection can be managed so that it is not a major threat to solvency. If this is done, the residual risk can be treated as a part of the chance fluctuation in loss experience.

In the case of natural and economic disasters, we made the assumption that, if two of these occurrences took place within a period of a couple of years, virtually the entire insurance industry would be in crisis. On the other hand, the industry did pretty well in coping with the flu epidemic and the Great Depression which were about ten years apart. So we decided that for each broad form of business we need an amount of surplus large enough to manage the type of disaster that will affect that line most severely -- that is, natural disaster in the case of group term life insurance and probably economic disaster in the case of group health insurance. Furthermore, we assumed that the severity of the disaster will match the worst in recent history, even though the possibility of repetition may be remote. That is just what we want the possibility of insolvency to be -- remote. The disaster surplus was then added directly to the surplus needed to manage the other risks.

The next step is to determine how surplus needs are affected by interdependence of the lines. In the Aetna, the vast bulk of our group life and group health insurance business is packaged for experience rating purposes. This greatly reduces the volatility of the loss experience for the combined lines. However, this is not true of the investment experience; its volatility is the same for the combined lines as for either line separately. The disaster surpluses can either be reduced slightly because of the differing impact of various kinds of disaster on each line or they can be added directly without reduction to produce a slightly conservative total.

Of course it would be most unusual for a company to write only group life and group health insurance. In the usual case surplus needs for these lines cannot be determined without taking into account the existence of other lines and how their surplus needs may interrelate with those of the group insurance lines. The problem becomes even more interesting -- not to say exciting -- when casualty lines are involved.

MR. MAYNARD: Mr. Miller, you warned us that group liabilities can increase strikingly in periods of change and inflation. How can the actuary anticipate and deal with problems of this kind?

MR. MILLER: The problems are controllable for group term life insurance because there is a fixed amount of insurance, an annually renewable contract, expenses are a small part of the cost of insurance and the coverage is experience rated. In group health, inflation effects claims costs and the premium can get out of phase with the amount of claims. If the inflation rate is fairly constant, you can adjust for it in your pricing. However, with accelerating inflation, there is no way to avoid trouble. In 1968, 1969 and 1970 we lost money in group health.

MR. WILLIAM H. LESLIE: Mr. Miller, do you look at each individual group health coverage separately or do you consider all coverages together?

MR. MILLER: We do look at group long term disability separately. This coverage involves substantial reserves and is peculiarly susceptible to deliberate choices by insureds, so we have some extra surplus requirements for this line. All other lines are experience rated as a package, so we look at them together.

MR. ROBERT F. LINK: Ten days ago, when I was thinking about what I might say here today, I stumbled upon an article by Robert A. Bennett in the Sunday New York Times. It was entitled "Banks - Cash Rich, Capital Poor." The article suggested that the American banking system showed signs of outrunning its capital. Bennett said, "Although banks are awash in funds, that is very different from having adequate capital. There is an important difference between the funds that depositors leave in a bank and the money put up by a bank's owners and long-term creditors." He offered a fine quote from Gabriel Hauge, chairman of Manufacturers Hanover: "Banks showing a superior ability to build and accumulate capital will have a decided advantage. The heart of capital strength remains earning power."

Banks get their capital from investors, retained earnings and long-term lenders. The capital of insurance companies is their surplus. Most of it - virtually all in the case of mutual companies - comes from retained earnings. The source of capital aside, the symptoms described in the article may also characterize the recent performance of the life insurance industry. Surplus ratios have declined over at least the last twenty years, for a representative sample of eleven major life insurance companies. The arithmetic average of the surplus ratios of the eleven companies was 8.4% in 1955, 8.0% in 1960, 7.7% in 1965, 7.1% in 1970 and 5.8% in 1975. Leverage is the reciprocal of the surplus ratio. While the surplus ratio was dropping from 8.4% to 5.8%, the leverage factor was increasing from about 12 to about 17. So it is a good time to be interested in surplus questions.

What is surplus? Here is one definition: Surplus is the amount available in time of crisis. It is the financial reservoir that bears the risks with respect to the entire enterprise. People speak of surplus being locked up in reserves through the use of margins. Whatever you call it, the margin in reserves is entirely different from available surplus. Margins can be recognized in considering whether reserves are adequate. The existence of margins must be recognized in estimating future earning capacity. On the other hand, a margin cannot usually be unlocked to cure an insolvency.

Annual statement surplus is available to cover losses. To a lesser degree, the Mandatory Securities Valuation Reserve (MSVR) is available to cover losses. And if there are margins in reserves that represent a redundancy both from the management point of view and from the point of view of minimum statutory reserve standards, such amounts might be considered available, provided management was confident that the regulatory authorities would permit the necessary destrengthening. This brings us to the concept of strategic surplus, consisting of the sum of annual statement surplus, the MSVR and available destrengthening. In the Equitable, we have made good use of the strategic surplus concept in analyzing our financial position and strategy.

There are many reasons for holding surplus, but I think our main focus today is on one kind of reason, which is to avoid the more serious consequences of unexpected unfavorable experience variances. What are those consequences? The most severe would be a finding that the company's assets are literally insufficient to mature its liabilities. Long before one reaches that point, statutory insolvency would probably intervene. And well before statutory insolvency was reached, a well-managed company experiencing an adverse surplus trend would perceive a surplus crisis and take strong corrective action.

Thus, it appears that there are three strategic objectives, which are:

1. to avoid a surplus crisis;
2. to avoid statutory insolvency; and
3. to avoid a condition where funds are insufficient to mature liabilities.

The third objective will be attained whenever the company is solvent on a statutory basis and reserves at that time are considered sufficient. Therefore, the first two objectives, relating to crisis and statutory insolvency, tend to be controlling. The objective in both cases is to have the probability of the unfavorable event at an acceptably low level.

In considering these matters, my company uses the concept of target surplus. Simply defined, target surplus is the level of strategic surplus which, if in hand, would cause the probabilities to be at acceptable levels. How do we get at this?

We need data on present and projected business mix, a description of the risks attaching to the various kinds of business, and a description of the strategy to be followed when surplus is off target. With this information, we should be able to estimate the probability of insolvency or of crisis within some period such as twenty years, for various target levels of surplus. The following table illustrates the results of such a process for a hypothetical company that writes mainly individual coverages:

PROBABILITIES OF CRISIS AND INSOLVENCY WITHIN TWENTY YEARS
FOR DIFFERENT TARGET LEVELS OF SURPLUS

<u>Target Surplus</u>	<u>Probability of Insolvency</u>	<u>Crisis</u>
2%	16.10%	57.4%
3	8.20	52.4
4	3.58	48.2
5	1.24	43.5
6	.48	39.6
7	.28	30.4
8	.12	21.1
9	.06	13.6
10	.06	8.6

NOTE: A crisis is assumed to occur when, in the absence of crisis action, strategic surplus would fall below the lesser of 3% or one half of the target level.

With this information, you can see the possibility of strategic choice. For example, management might say it wants the probability of insolvency to be no more than 0.25%. The table tells you target surplus should be a little over 7%. Suppose management wants the probability of a crisis to be no more than 20%. Then target surplus should be a little over 8%. In this illustration, crisis controls.

You'll recognize that this is a gross oversimplification of a complex human process. I'll get back to this point in a moment, but first you ought to have some idea of how we get the probabilities and target levels. In *The Equitable*, we have done this by using a Monte Carlo EDP model. We call it the Ruin Problem Simulator, or RPS. It simulates the financial progress of a risk enterprise, using a structure modelled after the ruin problem of risk theory. The risk reserve is strategic surplus. The risk premium is management's planned contribution to strategic surplus. Variances of surplus production are simulated by a stochastic process. The RPS cycles through this process for a twenty-year period, simulating experience variances each year. It does five thousand twenty-year runs and this gives us our probabilities of insolvency and crisis.

The risk premium for each year is calculated in accordance with an assumed management strategy that recognizes what the assumed target surplus is and what management is supposed to do when the target surplus is not in hand. Experience variances are simulated in accordance with two distribution functions. One is for general portfolio common stocks. The other is for all other risks and uses the statutory liability base as a risk base.

A critical part of the model is the assumptions about risk. I will set aside common stocks, interesting though they are, and concentrate on the other risks. We quickly concluded that our main concern was not with anything that had happened in the last twenty or thirty years, but rather with major events for which there is very little experience. We have assumed that we might experience an asset loss of as much as 4% about once in a hundred years. That is the general magnitude of the experience in the Great Depression. We considered all sorts of other catastrophes, and have tentatively concluded that they are all, at least for us, of significantly lesser magnitude.

We intend to create a new model, RPS Mark II, that will be a great deal more flexible. In particular, it will accommodate an input of up to twenty different risks, each with its own base expressing the magnitude of exposure. In this way, we can test different business mixes. Even without the new model, however, we can produce somewhat satisfying estimates of the necessary probabilities. So this part of the problem is perhaps half solved.

If you try to sell your management something like this, you may not find it an easy sell. If you recommend a target level that is higher than your current surplus, you put a monkey on their back. Also, regardless of the level of your present surplus, your permissible growth rate is a direct function of your target level and your earning power. The higher the target level, the lower the growth rate. So you've got to be very convincing. To be convincing, you need two things. First is a way of calculating the probabilities and target levels that will be believable to management. With our model, I think we have had pretty good success here. The second thing you need is a way to help them decide whether their preferred probability for insolvency (for example) should be 0.1%, 0.5%, 2.0% or something else.

How do we establish what the preferred probability is? The best approach we have thought of so far is to look at other well managed insurance companies and try to estimate as well as we are able the probabilities implied by their surplus levels, business mix and apparent strategy. You might or might not want to follow the crowd when you see what you think their probabilities are. However, you should know what they are doing, and then you can decide. One thing you do not want to happen is for your company to become insolvent or go into crisis while other companies weather the storm.

We have already done some work on other insurance companies, using tricks to get at what their probabilities might be. When RPS

Mark II is on line, we will be able to do a much better job of that. We can analyze a representative panel, see what their probabilities are, look at our own situation, and then see where we want to fit in. This will enable us to decide what our probabilities should be.

Once we know that, we can then use Mark II to analyze the surplus needs implied by different business strategies. This will help us to select those strategies that seem to have good characteristics in terms of earning power relative to surplus need.

You will notice that, as it turns out, the main use of the RPS is to make comparisons, between companies or between strategies. A helpful fallout from this mode of use is that there tends to be less quibbling about assumptions. People tend to accept the thesis that the orderings indicated by RPS tests are likely to be insensitive to variations in assumptions, while remaining fully sensitive to different business configurations. The thesis is plausible, and the little data we have on this point tends to corroborate it.

My part of this program was supposed to concentrate on the surplus needs of a company with a heavy element of business with high reserves, such as individual life and group pensions. For your information, our work suggests that the target surplus for experience-rated group pension business might be less than half of the target surplus for individual life. Group pension interest guarantee business needs a somewhat higher surplus than individual life. We do not yet have a good analysis of group life and health.

We have been at this for a couple of years, and as you can see, we have a long way to go. However, we are beginning to get real interest and attention -- even enthusiasm -- from our top management. Our results are beginning to impact strategy, and people are anxious to use the new capabilities that our future work will produce.

MR. JAMES F. REISKYTTL: Our work suggests that the common stock component could require as much surplus as the rest of the assets combined. Mr. Link, what impact did you find in your analysis of this component?

MR. LINK: Our work in this area is not yet complete or conclusive, but it seems to indicate that for every dollar of common stock in the general account, there should be an additional fifty cents in surplus.