DISCUSSION OF THE PRELIMINARY REPORT OF THE COMMITTEE ON VALUATION AND RELATED PROBLEMS

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The Discussion Draft on Valuation, Surplus and Related Problems follows this digest of the concurrent session.

1. Review of immunization theory and the relevency of such theory to the report.
2. The conceptual framework of a balance sheet, including the recognition of contingencies.
3. Comparison of the Committee's report to the proposal of the ACLI Subcommittee.
4. Relevency of the report to the developing Canadian practices.
5. Difficult questions which are still unresolved.

MR. JAMES C. HICKMAN: A reader of the preliminary report will be struck by the fact that some of the traditional issues in valuation do not receive much attention. Issues such as net versus gross premium valuation, modified preliminary term methods, valuation mortality tables and interest assumptions are not explicitly dealt with in the report. The committee elected to commence its work by examining the fundamental principles of valuation. The traditional issues in the valuation of an insurance enterprise appear within this general framework.

The objective of the committee's work is to measure the balance between the assets and liabilities of an insurance enterprise in today's volatile economy. This balance is of interest to management, regulators, stockholders and policyholders. The committee has not been concerned with defining income for an insurance enterprise.

1. Basic Principles

The value of assets and liabilities is the expected present value of future cash flows generated by the ownership of the assets or liabilities. We let:

A = Value of the assets of an insurance enterprise

L = Value of the liabilities of an insurance enterprise

$A(t)$ = Dollar value of potential cash flow (dividends, coupons, redemptions) at time t generated by the ownership of assets

$L(t)$ = Dollar value of potential cash flow (claims plus insurance expenses minus premiums) at time t generated by outstanding insurance policies

$(1+i)$ = Interest accumulation factor

$P_A(t)$ = Probability that the asset cash flow A(t) will occur

$P_L(t)$ = Probability that the liability cash flow L(t) will occur

Then, by our fundamental principle:

$$A = \sum_t (1+i)^{-t} P_A(t) \ A \ (t),$$

and

$$L = \sum_i (1+i)^{-t} P_L(t) \ L(t).$$

The valuation of assets and liabilities involve exactly the same basic ideas. Traditionally actuaries have spent a great deal of time on the determination of L. Now it appears necessary for actuaries to be concerned not only with L but also with A, and the degree of consistency with which the two values are obtained.

2. Division of the Problem.

    The values of A and L, and the derived value of surplus, (S=A-L) may change because the interest rate used in valuing future cash flows change, the probabilities of payment change, or shifts in the natural or legal environment may cause changes in the amounts of potential cash flows. This observation led the committee to divide its work into three projects. It is clear that these projects are interrelated. However, it is equally obvious that some sort of division was needed in order to make a systematic attack on the overall problem.

The division is as follows:

(a) A study of changes in the values of A(t), asset cash flows, caused by asset value depreciation, (physical destruction, obsolescence) and changes in $P_A(t)$, the probabilities of the realization of the asset cash flows. Provision for this type of contingency will be denoted by C_1.

(b) A study of changes in L(t), insurance liability cash flows, and the probabilities of their realization, $P_L(t)$. The shift may be caused by chance variation, the subject of risk theory, or by changes in the natural or legal environments. Provision for this type of contingency will be denoted by C_2.

(c) A study of changes in the value of S=A-L caused by changes in the interest rate by which future expected payments are reduced to a present value. Provision for this type of contingency will be denoted by C_3.

3. Progress.

    Attachments 1 and 2 to the report are the initial specifications for research projects into the determination of C_1 and C_2. These specifications have been developed into two Requests for Proposals (RFP) by the Actuarial Education and Research Fund (AERF). The two RFP's have been approved by the board of AERF. Actuaries who are interested in obtaining a copy of one or both of the RFP's may communicate their

interest to a member of the selection committee, J. A. Mereu, C. L.
Trowbridge and J. C. Hickman. The life insurance subcommittee of the
board of AERF, headed by A. E. Morson, is developing plans to raise
funds to support these two projects.

The committee agrees with the late W. M. Anderson [a] President,
Society of Actuaries 1955-56, who said, "The major risk facing a life
insurance company is a change in the riskless interest rate." In
addition, because formal provision for interest rate risk has not been
an explicit element of insurance valuation, the committee has concen-
trated much of its attention on interest rate risk.

4.   Interest Rate Risk

It is clear that if

$$A(t) \ P_A(t) = L(t) \ P_L(t),$$

for all t, then

$$A-L = \sum_t (1+i)^{-t} \ \left[A(t) \ P_A(t) - L(t) \ P_L(t) \right] = 0,$$

and this will hold no matter what interest rate is used. Changes in
the interest rate will not alter the perfect balance between A and L
in this perfectly matched case. A simple argument using a Taylor
series expansion shows that if

$$\sum_t t \ (1+i)^{-t} \ A(t) \ P_A(t) = \sum_t t(1+i)^{-t} \ L(t) \ P_L(t),$$

changes in the interest rate may affect the values of A and L but the
change in relationship between A and L will be small. These ideas
were brought to the attention of actuaries in two remarkable papers
that appeared in the early 1950's [c,e] . The ideas were summarized
and related to North American practice by Vanderhoof, [f] .

Attachment 3 outlines some committee thoughts on how interest rate
risk might be recognized in an insurance balance sheet.

5.   References

     a.   Anderson, W. M., "The Long View of Life Insurance Investment",
          Proceedings of American Life Convention, 1954.

     b.   Fisher, L. and Weil, R. "Coping with the Risk of Interest Rate
          Fluctuations; Returns to Bondholders from Naive and Optional
          Strategies", Journal of Business, Vol. 49 (1971)

     c.   Haynes, A. T. and Kirton, R. J., "The Structure of a Life
          Office", Transactions, Faculty of Actuaries, Vol. 21 (1953).

     d.   Hickman, J., "Investment Implications of the Actuarial Design
          of Life Insurance Products", Journal of Risk and Insurance,
          Vol. 38 (1971).

     e.   Redington, F., "A Review of the Principles of Life Office
          Valuation", Journal, Institute of Actuaries, Vol. 78 (1952).

f.   Vanderhoof, I., "The Interest Rate Assumption and the Maturity
     Structure of the Assets of a Life Insurance Company", Trans-
     actions, Society of Actuaries, Vol. 24 (1972)

MR. C. L. TROWBRIDGE: Let me start by apologizing for one aspect of
our Committee's preliminary report. The report itself introduces a con-
ceptual balance sheet of an insurance enterprise. In doing so, however,
it leaves to one of the attachments, specifically Attachment 3, the very
important matter of the interest rate or rates at which assets and liabili-
ties are valued, and their interrelationships with the contingency reserve C_3.
Much of what the Committee has to say appears in Attachment 3. For those
of you who expect to see the meat of any well presented report "up-front,"
the Committee's excuse is that this is only a preliminary report, and in
getting it together we were badly pressed for time. I would like to
apologize for certain errors and omissions in Attachment 3. The homework
with respect to references to earlier literature just had not been completed.
The references that Mr. Hickman has just given improve this situation.

Let me now take you through the line of thinking expressed more fully in
the attachment entitled Interest Assumptions in the Balance Sheet of an
Insurance Enterprise and the Associated Contingency Reserve for Interest
Rate Fluctuation.

1.   The assets of an insurance enterprise can be viewed as the present
     value of the income stream arising from investments already owned.
     The only theoretical problem is the determination of the discount
     rate.   The traditional methods of asset valuation are special cases.

2.   The liabilities of an insurance enterprise are the present value of
     a disbursement stream arising from insurance or annuity contracts
     already on the books. Again, the theoretical problem is the determina-
     tion of the valuation interest rate.

3.   Clearly there should be consistency, if not full equity, between the
     valuation rates for assets and liabilities.

4.   Unless the asset and liability streams are exactly matched as to timing,
     the enterprise is on an interest risk. A change in the interest rate,
     in either direction, affects assets and liabilities differently.   If
     assets are short in relation to liabilities, it is an interest rate
     decline that threatens solvency. If assets are longer than liabilities,
     an interest rise is the threat. We search for a contingency reserve C_3
     which will adequately protect the enterprise against interest rate change.

5.   We can, if we choose, hold C_3 implicitly. By this we mean that C_3 is
     within the calculation of A and/or L, rather than within their dif-
     ference D.   Valuation of A and L at a consistent interest rate i will
     do this automatically--if we choose i to be at the top end of its
     potential range when assets are long--at the low end of the range when
     liabilities are long. Where assets are shorter than liabilities, for
     example, we could value both assets and liabilities at 4%, thus pro-
     tecting the enterprise against an interest rate fall to as low as 4%.
     If assets are longer than liabilities, we might value both at 12%.

6.   There are, however, important reasons why the valuation of assets at
     some artificially low rate like 4%, or some such high rate as 12%,

simply will not do. Assets are clearly overstated, or understated, in comparison with the traditional ways of looking at assets values, and in relation to what happens as securities trade. Even for a theoretical balance sheet it is important that we focus on A and L separately, as well as on their difference.

7. Attachment 3 then concentrates on the short-asset, longer liability case which seems to be typical of life insurance companies. It shows that if assets are valued traditionally, and liabilities appropriately modified, the same implicit C_3 is held within L as under the "low interest for both" calculation suggested earlier. The rate of interest for the valuation of L turns out to be $i = wi_o + (1-w)i_1$ where:

i_o is the rate on which asset valuation is based,

i_1 is a "safe" rate below which interest rates are never expected to fall,

w is an index of matching, with a range from 0 to 1.

In the perfectly matched case $w = 1$, $i = i_o$, and assets and liabilities are valued alike. The implicit C_3 is zero.

In the entirely unmatched case (all assets in cash) $w = 0$, $i = i_1$, and liabilities are valued at the safe rate i_1. You will recognize that traditional valuation practices in effect assume that matching is zero-- even in circumstances where the matching is actually pretty good.

The index of matching, already suggested but hardly define, will be worth more work if the theory here developed is to go any further.

8. We may prefer (at least for a theoretical balance sheet) to hold C_3 explicitly as an identified C_3, a part of the difference A-L but outside of L itself. L can then be calculated at the same rate i_o as for assets, and C_3 becomes the difference between the L at i_o and the L at $i = wi_o + (1-w) i_1$.

9. Finally, it is to be noted that the degree of matching and the interest rate are not independent. It is likely that an interest rate decline will shorten assets, as options to call are exercised. It is likely than an interest rate rise will shorten liabilities, through the process that has come to be known as disintermediation. The degree of matching--w--must be estimated conservatively, since matching is lessened by the very interest rate against which one needs to protect. We will hear more about these problems of interdependence from Sam Turner later on.

MR. DONALD D. CODY: Attachment 4 by Dick Robertson provides a description of the basic differences between the evolving approaches of the SOA and the ACLI. My intent here is to suggest the possible impact of the SOA theoretical findings on the ACLI approach as so far known to me. To do this, I want to highlight some of the implications of the treatment of the interest rate risk in Attachment 3 of our Committee report.

Attachment 3 is a brilliantly simplified demonstration of levels of the C_3 contingency reserve needed for product portfolios with varying matching of asset and liability cash flows in a range of investment yield scenarios.

C_3 is the contingency reserve needed against the future risk of change in investment yield environment. Theoretically, it should be derived as that amount which is unlikely to be dissipated in future balance sheets at a specified probability level. Thus, it is a ruin theory problem involving the distribution of possible future investment yield environments.

Attachment 3, however, utilizes a deterministic approach. First, the surplus, S, is derived for a range of investment yield scenarios for the illustrated asset, A, and liability, L, cash flows for several product lines. The liability cash flows are:

   (a) One, fully matched to asset cash flows (e.g. immediate life annuities)

   (b) Another, shorter than asset cash flows (e.g. a guaranteed interest contract with on-going cash value guarantees)

   (c) A third, longer than asset cash flows (e.g. individual life insurance contracts)

The following table shows the results:

Interest Rate (Used for A and L)	Illustrative Surplus (S=A-L) (% Assets)		
	A and L Fully Matched	L Shorter Than A	L Longer Than A
4%	20%	30.5%	1.3% *
5	20	27	8.4
6	20	23.5	14.6
7	20	20	20
8	20	16.4	24.8
9	20	12.8	29.1
12	20	1.8*	39.3

* To be used as scenarios to determine C_3.

The paper then suggests that the scenario suitable today for determination of C_3 might be 12% interest for the short liability case and 4% for the long liability case. Since neither 12% nor 4% are satisfactory for asset valuation in a real world balance sheet, the paper assumes valuation at 7%, the postulated yield on assets at book. At 7% interest, surplus, S, is 20% of assets in the demonstration. However, for the 12% and 4% yields chosen for C_3 determination, surplus, S, is respectively 1.8% and 1.3% of assets. C_3 is the excess of 20% over these figures and thus us 18.2% for the short liability case and 18.7% for the long liability case. The C_3 needed in the short liability case in a 12% interest scenario are no doubt too low since liabilities are likely to shorten sharply further due to disintermediation.

When an investment year method is applicable on a particular product, the interest rate for asset valuation might be 9% today, leading to S's of 12.8% and 29.1% and C_3's of 11% and 27.8% respectively in short and long liability cases.

One further comment needs to be made: A, the present value of asset cash flow, is identical to asset valuation in traditional balance sheets. However, L, the present value of liability cash flow, is a gross premium valuation, reflecting gross premiums, claims, insurance expenses, premium taxes, federal income taxes, cash values, policy loans, and dividends, different from net premium valuation.

While our Committee work is very preliminary and Attachment 3 is only a learning demonstration, there appears to be a number of messages bearing on the emerging ACLI subcommittee findings. The ACLI valuation interest rate is:

$$3\% + F\ (R - 3\%)$$

where

R is current new money rate based on 3-year average Moody's seasoned Aa utility bond yields, not be greater than average 1-year yields.

F is a factor varying from .5 to 1.0 by product to reflect possible trends in future yields and the degree of matching of asset and liability cash flows.

Federal income taxes have been ignored in this formula. Group and individual products are to be combined in categories of insurances, annuities, and guaranteed interest contracts.

The SOA Committee work suggests to me that the following findings may emerge as the ACLI subcommittee proceeds in its testing:

1. Companies with Phase 1 FIT or with a material Phase 1 component may find the ACLI formula improper unless marginal FIT rates are added.

2. Closely related to (1), qualified and non-qualified products may require different interest rates.

A rule appearing to be emerging in the SOA Commitee work in my view is that annual statement reserves should perhaps be the equivalent of the sum of (a) a gross premium valuation reserve using the asset valuation interest, (b) a contingency reserve against risk from changing interest rates recognizing the differences and dynamics of shortcomings in matching on different products and (c) the contingency reserves C_1 for asset losses and C_2 for excess claims. The interest rate and mortality rate used in statement net premium reserves would be chosen to accomplish this. The ACLI formula, so far developed, may prove to have these problems:

1. Group annuities and individual annuities have very different liability cash flows and it may be improper to use the same F-function in both lines.

2. IPG group annuities (with 100% pass-through) and immediate annuities may prove to be the only types of contracts warranting an F equal to unity.

3. Individual guaranteed interest contracts, especially those with on-going interest and cash value guarantees, would appear to have short liabilities and may prove to require F-functions well below unity.

MR. JOHN C. MAYNARD: I would like to touch upon the valuation problem as
seen by the valuation committee and also comment on how Canadian Actuaries
are looking at this problem. You may be questioning why we have reverted
to first principles of valuation. Insurance has been around for a long
time and Actuarial Societies have been operating for 130 years. Valuation,
being a traditional test of strength and solvency in an insurance operation,
is a prime problem of the actuary. I believe there are two reasons for a
fresh look.

1. Conditions today are constantly changing, particularly
     variation in interest rates and expenses.

2. We are in the midst of a product revolution. Insuring
     organizations have made great changes in the kinds of
     contracts offered. The traditional methods of valuation
     which are rather mechanical have been tested in a time when
     variation was not as common. We feel that these methods
     should be revisited.

The following chart demonstrates the attack of the Society's committee.
This is our concept of a balance sheet.

        Assets   Liabilities
                                              C_1
                                              C_2
                                              C_3
                                              Surplus

This concept recognizes the contingencies of asset variation (C_1) and
pricing inadequacy (C_2) which have been around for a long time. The item
receiving the most attention today is C_3, the quantity needed to protect
the enterprise from variations in interest rates. We have to remember the
obvious fact that any valuation in the form of a balance sheet is made with
one set of figures and therefore one set of assumptions for the calculation
of assets and liabilities. If the balance sheet is to be useful, it should
envision a variation in conditions. This is the purpose of C_3.

This draws attention to the relationship between assets and liabilities and
the effect of a swing in the interest rate on this relationship. In think-
ing of this relationship, one should visualize the effect on liabilities
which contain guaranteed cash values. Guaranteed cash values put a kind of
floor under liabilities when interest rates are on the way up.

The Canadian Institute is presently very active in the matter of valuation.
This body has been active due to a change in the regulatory environment.
The accounting profession has exerted pressure for more realistic income
statements. In the United Kingdom, new valuation rules were developed a
few years ago, which did take into account changing conditions. This has
led the Canadian authorities to try to bring these things together by giv-
ing the actuary more responsibility. This was done by naming him Valuation
Actuary in the Canadian Insurance Act. The Valuation Actuary must make
appropriate assumptions for valuing liabilities. These assumptions include
issue expenses, future expenses, dividends, taxes, and an interest rate which
is consistent with asset valuation. These are basic points which are much
easier to write down than to provide guidelines for dealing with them. Man-
aging these assumptions has been thrust upon the Valuation Actuary in no

uncertain terms. He is required to attach a certificate to his company's
annual statement each year. This certificate specifies how the valuation
was performed and provides justification.

Another feature of the scene in Canada is the relationship between the
actuary and the auditor. By the law, the auditor is not allowed to qualify
his certification in that he had to rely upon liability valuation by the
actuary. Of course, this raises the question of independence. To cope
with this, the Canadian Institute is interpreting its Guides to Conduct in
light of the valuation of liabilities. Further, the Institute is developing
recommendations that the actuary would say he had followed. Thus, the
actuary is under peer review by attesting to have followed his professional
guidelines. This is intended to provide public assurance.

The Valuation Actuary is left to face the calculation of liabilities. The
Society of Actuaries valuation report emphasizes the interrelationship of
asset and liability valuation and the important contingency reserves. The
Canadian Institute has not yet dealt with these contingency reserves, they
are unresolved problems. I believe the Society committee's basic principles
work will be very helpful to the Canadians in tackling their unresolved
problems.

MR. SAMUEL H. TURNER: The thrust of the Preliminary Report of this Committee
is one of risk management, not risk avoidance. We freely admit the interest
risk cannot be avoided in any perfect sense through immunization. We are
strongly convinced, however, that the better immunized company is financially
sounder than the less immunized company. While the obvious implication of
this statement relates to solvency, I believe we are equally convinced that
recognition of immunization will also result in increased awareness of
interest risks, and therefore in a sounder managed company.

Some areas have already been identified where further development is neces-
sary. The purpose of my comments is to identify and highlight certain
problems and issues for your consideration.

1. The traditional view of interest rates as being gross yield rates on
    assets held, net of investment expenses, may be inappropriate and un-
    justifiable.

    There are two specific issues to be addressed:

        a. Should interest rates used in the valuation of actuarial
            liabilities be equivalent "riskless" rates?

            Assume a block of assets was purchased to yield 11% at the same
            time yield rates on a riskless investment with the same maturity
            was 8%. It is clear that the assets purchased are with risk,
            and the market assessment of risk premium is on the order of 3%.

            Notwithstanding the fact that this specific issue has not been
            fully considered by our Committee as of this date, I am of the
            opinion that at least the majority of the Committee would hold
            that assets should be valued at the higher yield rate of 11%,
            and liabilities should be valued, in effect, at the riskless
            rate of 8%.

There would undoubtedly be some disagreement within our committee as to presentation; specifically, as to whether the contingency reserve should be held implicitly within the liability valuation, as would be the case with liabilities valued at 8%, or explicitly outside of the liability determination as a separate contingency reserve, and if the latter, whether it is part of C_3 or C_1.

The conceptual position is essentially clear. The practical issues to be addressed would include the following:

i) What is a "riskless" rate and how can it be determined?

ii) Where should the resulting contingency reserve be shown/included for purposes of balance sheet presentation?

b. Should interest rates used in the valuation of actuarial liabilities be pre-tax rates, or equivalent after-tax yield rates?

Page 3 of the Preliminary Report states that the totality of assets is equal to the present value of the expected stream of future dollars generated by current investments, net of all related costs and expenses. Bob Posnak suggested in Ernst & Ernst's book on GAAP that life insurance company tax on taxable investment income might be viewed as more in the nature of a "gross receipts tax," than an "income tax." As such, the incidence of tax would more closely track investment income than gain from operations. The survey conducted a couple of years ago by the Academy's Committee on Financial Reporting Principles indicated that something like 40% of the actuaries responding viewed GAAP interest assumptions as being net-of-tax. These statements, supported by traditional valuation practices followed in U. K. (where life insurance tax is essentially based on investment income), clearly indicate that net-of-tax interest rates should be used and that recognition within the profession as to the propriety of using net-of-tax rates has increased dramatically over recent years.

The conceptual position is clear -- that interest rates used in the valuation of actuarial liabilities should be net of applicable tax effects. The practical issues to be addressed include the following:

i) How should net-of-tax interest rates be determined in order to realistically and conservatively reflect expected future tax effects?

ii) How should tax differentials by lines within a company (e.g., qualified vs. nonqualified business), and by company (e.g., different tax situations), be recognized?

2. Matching is not just a matter of the incidence of total expected assets and liability flows.

While several issues could be noted, perhaps the most interesting issue is whether matching, or specifically the provision for a C_3 type of contingency reserve, should be considered for each line of business, or simply for the aggregation of all lines. My perception is that at least

four of the five members of the committee believe that C_3 should be determined by line. I sense the commonality of this belief to be a derivative of the thrust of our proposal -- that the essence of the matter discussed is risk management, not risk avoidance.

I would be willing to admit that the overriding interest of the "public" is in solvency of the whole, not segments of the whole. However, because it is unreasonable to assume that all assets back all actuarial liabilities in the sense that all actuarial liabilities should be valued at a common interest rate reflective of all assets held -- because the risk in one line may be a fall in interest rates while in another a rise in interest rates -- because the relative mix of aggregate asset and liability flows by line of business is most likely dynamic, not static -- because knowledge is better than ignorance -- because responsible management does not happen by accident but through informed action, I therefore conclude that the effective management of the interest risk of an insurance enterprise can only be achieved with knowledge of the interest risk by line of business.

If the concern of regulators is not just solvency of the insurance enter-prise as of a date, but solvency of the enterprise one year or five years hence, then I submit that their interests are also by line of business.

3. Asset and liability flows are not certain and are not independent.

    Disintermediation -- the shortening of liabilities -- during periods of rising interest rates is a very significant contingency to be evaluated in assessing the degree to which asset and liability flows appear to be otherwise matched. Disintermediation can occur either (1) explicitly, through increased utilization of policy loans and through cash surrenders, or (2) implicitly, through shifts in product mix away from individual permanent life insurance plans to individual and group term and/or to annuity products.

    For several years we have experienced interest rates considerably in excess of policy loan interest rates. While some up-market companies have experienced significant alterations in their liability cash flows through increased policy loan utilization, and while "replacement" con-tinues to be a feared, but unpopular occurrence, mass disintermediation has simply not occurred in the U. S.

    Nevertheless, there are several products -- such as high cash value whole life insurance, and especially SPDAs -- that contribute to unpre-dictability of cash flows. I will hasten to add that the fundamental problem does not lie solely with voluntary actions of actuaries and companies in product design, but also in insurance statutes that univer-sally require specified guaranteed cash values and policy loan rates, regardless of the volatility and nature of the existent economic environ-ment. One might allege that the nature of state insurance statutes and regulations in the U. S. contributes to the risk of insolvency, and to the unpredictability of future cash flows, within the life insurance industry.

    It is clear that there exists ties between asset and liability flows and prevailing interest rates, which may be accentuated by a particular company's circumstances -- the nature of assets held, the company's market and products. How might these interdependencies be recognized within the conceptual framework presented?

4. The actuarial profession has historically not been inclined to sponsor
    an extension of responsibility and accountability beyond that imposed
    upon it by others.

    I believe we would have little disagreement in stating, with respect
    to rendering an opinion as to the adequacy of reserves, that the critical
    issue is whether _assets_ on hand, together with expected future premium
    and investment revenues, are adequate to provide for expected future
    benefits, expenses and taxes. If this is true, then what responsibility
    does and/or should the actuary have in rendering a professional opinion
    as to the adequacy of reserves to consider the assets backing those
    reserves?

    At some risk of being stoned by my peers, I have raised several issues
    relevent to the general matter being addressed. If these issues stir
    you to consider the matters addressed and express your views, here or
    later, then my purpose will have been achieved.

MR. CHARLES GREELEY: I am chairman of the ACLI Actuarial Committee referred
to by the panelists, and I was also a member of the Society's Nonforfeiture
Committee a few years ago. While the Society's Committee was doing funda-
mental research in the nonforfeiture area, the ACLI was at the same time
concerned with related practical details and with implementation of the
most urgent matters. Both the Society and the ACLI discussed nonforfeiture
principles or legislation with an NAIC Task Force appointed to study this
subject. Thus, we had three groups simultaneously working in the nonfor-
feiture area -- with quite successful results, in my opinion.

The situation today in the valuation area is very similar. The Society's
Committee is doing research and essential work which will probably take
three or four more years to complete. In the meantime the ACLI is compelled
to examine the areas where practical solutions are urgently needed. The
NAIC Task Force also recognizes that it takes several years to enact legis-
lation and that a way must be found quickly to eliminate the periodic need
for repeating the legislative process.

It is thus helpful that the Society's interim report was made at this time.
Any specific advice by the Society's Committee on the matters currently
being considered by the ACLI would also be very valuable in developing
legislation in the right direction. A first legislative step could be
taken soon, and further steps can be taken later when the Society finishes
its work.

MR. TROWBRIDGE: This valuation committee in many ways is the offshoot of
the Unruh committee. Actually, the Unruh committee had the same job as
this committee, but it concentrated on the nonforfeiture side and never
got to valuation.

This committee is deliberately theoretical. We are developing a theoretical
framework on which the NAIC, ACLI and the corresponding Canadian bodies can
build. We are not trying to think practically, we seek a theoretical frame-
work for practical men to build upon.

The reason this preliminary report has been released is simply that we are
in a hurry. We know that it must be available to be of any help in the
practical situation. The movement within the United States and Canada is

substantial. It will however be some time before the AERF can respond to the two pieces of research that we have farmed out.

There are interesting relationships between the work of this Committee and what is going on in the industry. The formula that I presented for the valuation interest rate

$$w i_o + (1-w) \; i_1$$

is of the same form as the ACLI formula that Mr. Cody displayed.

$$3\% + F \; (R-3\%)$$

They both value liabilities on a weighted average between a safe interest rate and a rate associated with market conditions on which assets are valued. The valuation committee suggests the weighting be based upon how immunized you are, whereas the ACLI avoids the determination of how immunized a particular company may be. The ACLI does propose variation by product to recognize the degree of immunization possible.

MR. TURNER: It is important to not isolate just the interest assumption. This report speaks of expected cash flows which imply withdrawal, mortality, and all other costs. This is not 58 CSO with no withdrawal rates.

MR. MAYNARD: We have just got started with the basic approach and much more needs to be done. I hope that within the coming year timing and usefulness will be more apparent.

MR. ROBERT F. LINK: I gather that your committee feels that no disaster will take place if the current direction of the ACLI's work leads to some form of legislation along those lines.

MR. CODY: Yes and maybe no. We have some agreement on the form, but the determination of the F function is critical. Some of the ACLI reasoning, as far as it has been published, seems incomplete.

MR. HICKMAN: The direct answer is no, we wouldn't view that as a disaster. The use of a weighted average on the liability side is incomplete, but it is an improvement. However, until the valuation recognizes of the asset side, there is a degree of incompleteness.

MR. TURNER: There is a way to circumvent the legislative process and the long associated delays. I believe that Canadian companies and the Canadian Institute have control of their situation. In the United States, particularly stock companies, a means to circumvent delay is through GAAP. The actuarial profession already has guidelines with regard to rendering an opinion as to the adequacy of statutory reserves. A GAAP reserve for a stock company is always greater than or equal to a gross premium valuation reserve. A GAAP reserve includes dividends, withdrawal and realistic interest rates. It would be easy to superimpose on that, from a professional viewpoint, some consideration for matching of asset and liability flows. This GAAP reserve would then be a minimum for statutory purposes. This would address the solvency issue quickly and could be done unilaterally within the actuarial profession.

MR. JOHN K. BOOTH: I would like to go back to Mr. Cody's comments. It is
quite true that the ACLI's work is incomplete. We are still studying the F
factors and it will be some time before we have a final recommendation.
Also, the tax question of distinguishing interest rates for qualified and
non-qualified business is under study. This came up in connection with the
1976 NAIC amendments to the law. Every time the question comes up, it
becomes quite complex. With all of the different company situations, no one
feels that it would be appropriate to freeze this kind of differential into
the law.

Within the council, we are restrained by political realities. I look with
envy at the Canadians with the flexibility built into their new law. In the
U.S. we are constrained with the preservation of state regulation and simul-
taneously seeking uniformity in that state regulation. This leads to the
rigid system we have had since Elizur Wright. The work of the Council is
not theoretical, but more an improvision upon the existing system to make it
more responsive to changing interest rates.

MR. CODY: When I made my comments, I knew what you said was true. It makes
one wonder if the knowledge that is emerging should be used by actuaries in
determining and approving a valuation. The statutes could have a minimum
requirement, but they could also have a reference requiring the actuary to
determine if the valuation should be greater than the minimum. When you
think about all of the variatons amongst companies, it becomes clear that
the validity of a cut and dried statute is rapidly disappearing.

MR. BOOTH: The actuarial certification in the NAIC Annual Statement requires
the actuary to certify that all legal liabilities are met. The certifica-
tion also requires that the statement actuarial items make reasonable, good
and sufficient provision for all other liabilities.

MR. TURNER: I prefer to see more flexible guidelines implemented by the
Academy on what is required in order to render that certification. Using
statutes requires the ten years to make a change.

MR. IRWIN T. VANDERHOOF: I am concerned about the direction the ACLI
appears to be going as opposed to the Society. This Society committee is
working in terms of specific company characteristics. A company with an
asset portfolio of long bonds is different from a company with short mort-
gages. That difference is very important when you are dealing in an 8-9
percent interest rate environment. Interest rates could at the will of
our government move up to 14 percent or down to 4 percent relatively rapidly.
The impact on different companies could be immense because of differences
in the asset portfolio. Those differences in asset portfolio are not con-
sidered in saying every company should use this interest rate for this kind
of business. This is the nature (perhaps necessary) of the ACLI approach.
I hope this group continues to agitate in favor of specific company
characteristics.

MR. HICKMAN: Irwin has just summarized the difference between the ACLI's
work and this committee. You have to look at both sides of the balance
sheet, the assets and the liabilities. Changes in interest rates will
affect companies differently depending upon their risk management policy
on the asset side. That information should be important to management,
regulators, and others.

MR. JULIUS VOGEL: Is there some connection between the interest rate used
to value assets and liabilities? If you use a formula that says:

$$3\% + \tfrac{1}{2} \ (R - 3\%)$$

is reasonable for life insurance liabilities then what is used for assets?
Would it be appropriate to continue at amortized cost or do you use the
same rate?

MR. TROWBRIDGE: The only reason this committee has arrived at a weighted
interest rate on the liability side is to keep the asset valuation traditional.
I stated earlier that the straightforward way to provide for interest rates
falling to as low as say 4 percent is to value both assets and liabilities
at that rate. But holding assets at that low rate will not do. You can
obtain the same result by holding assets traditionally (amortized cost) and
using an interpolated rate for the liability.

MR. VOGEL: Mr. Turner has alluded to something that has baffled me over
the years. In the Canadian valuation process, he mentioned that you must
take the present value of all liabilities, including dividends, into account.
It bothers me to throw dividends in as a liability to same extent as a
guaranteed benefit. The whole concept of a mutual company is to pay divi-
dents if and only if the experience warrants.

MR. TURNER: This issue is not at all new with respect to U.S. practices.
It was discussed at some length with the development of GAAP Audit Guide
with regard to stock companies issuing participating business. One of the
concerns is will the dividend scale impair the future solvency of the
company. This is directed at small companies which copy a competitors
dividend scale and reduce premiums. A gross premium valuation using those
dividends and other reasonable assumptions can result in reserves greater
than the statutory reserve. The presumption that these reserves will be
lower than the current ones is not always true.

MR. MAYNARD: In looking forward and making a valuation of liabilities, the
traditional way is to make a gross premium valuation. I would not bring
the dividends in as a positive outflow. When the time comes, and if con-
ditions are assumed, you will be able to pay the dividends.

MR. TROWBRIDGE: Discussion Draft

VALUATION, SURPLUS AND RELATED PROBLEMS

The Committee on Valuation and Related Problems (Special) presents to the
membership of the Society of Actuaries this Discussion Draft. Although the
Discussion Draft is in some sense a preliminary report of this special
committee, and is sometimes so referred to within the draft, it is better
viewed as a Committee written paper designed to promote discussion among
Society members.

This Discussion Draft, including its several attachments, was formally pre-
sented and discussed at Concurrent Session N of the Society meeting of which
this volume is the Record. The Committee encourages interested actuaries to
continue these important discussions.

                        COMMITTEE ON VALUATION AND RELATED PROBLEMS

                                D. D. Cody
                                J. C. Hickman
                                J. C. Maynard
                                R. S. Robertson
                                S. H. Turner

                                D. J. Grady, FCAS
                                   liaison with the Casualty
                                   Actuarial Society

                                C. L. Trowbridge
                                Chairman

The Committee on Valuation and Related Problems is a special purpose com-
mittee of the Society of Actuaries, appointed early in 1977 by then
President Robert Jackson. The Yearbook makes the following statement as to
purpose:

>   "The purpose of this Committee is (1) to study in depth the
>   underlying actuarial principles and practical problems in
>   connection with the valuation of assets and liabilities, the
>   determination of adequate surplus levels, and other related
>   solvency questions, and (2) to develop a report on its findings."

During the two years of the Committee's existence, it has evolved its own
interpretation or elaboration of its charge. The Committee hopes to develop
a theoretical or conceptual framework for the balance sheet of an insurance
enterprise. The emphasis is to be on tests of solvency--i.e., the ability
of the enterprise to meet its obligations under adverse circumstances. It
is hoped that the approach can be of sufficient generality that all lines of
insurance, all kinds of insurance organizations, and the environments of
both the United States and Canada, are taken into account. A liaison with
the Casualty Actuarial Society has been established to assure that this
field of endeavor is represented.

On the other hand, the Committee has no intention of drafting legislation
or regulation for the quantification of assets, liabilities, or contingency
reserves. It must leave these matters to the insurance industry and to its
regulators. The contribution of the Committee, which represents the
actuarial profession but not the insurance industry, must take the form of
a theoretical framework on which pragmatically oriented regulations may
eventually be built.

It has come to be realized that such a theoretical framework is missing, or
at least that there are missing elements and important inconsistencies. It
follows that the practical world of solvency regulation cannot build upon
a solid base of consistent theory unless and until such theory is developed.
Any real progress toward such a theoretical or conceptual framework will be
a contribution to effective regulation.

Since its establishment, the Committee has had several meetings and has made
some progress. Although much remains to be done, it seems appropriate that
the present thinking of the Committee be exposed to the Society membership.
Discussion arising from the exposure of these ideas may further the effort.

As an independent matter, valuation problems are under intense study, both
in the United States and in Canada, by actuaries in the practical world.
If the Committee's work is to be helpful to the industry and to the regu-
lators, it must make its appearance before the practical effort has gone
too far. These developments give some urgency to the Committee's efforts,
and are largely responsible for the emergence of a preliminary report at
this time.

Conceptual Framework

Stripped of much of its detailed complexity, the balance sheet of an insur-
ance enterprise is a statement of assets (A), of liabilities (L), and of
the difference between them (D). The ratio of D to A (or that of D to L)
becomes a crude measure of the current financial position of the enterprise.

There are, however, certain hazards which may impair the financial health
of the insurance enterprise. The balance sheet must in some way make
provision for the possibility of several kinds of adverse developments.
Assume there are several contingencies c_i for which some provision is
appropriate, and for each it is possible to quantify an appropriate con-
tingency reserve C_i.

With respect to each of the various C_i's, there may be a choice as to how
it is reflected in the balance sheet. Provision for any contingency can
appear on the balance sheet as:

      (1)   a subtraction of C_i from the assets A.
      (2)   an addition of C_i to the liabilities L.
      (3)   an allocation or apportionment C_i of the difference D.

The interpretation of the difference D heavily depends upon the choices
made. If all of the C_i's are treated as in (3) above, D takes on the nature
of an aggregate contingency reserve. To the extent that the C_i's are
treated as in (1) or (2), the size of D shrinks, as does its role as a
contingency reserve. In the extreme, if all provision for adversity is made

within the valuation of assets or liabilities, D loses its contingency
reserve role. Under these circumstances, the word by which $D = A - L$ is
often designated--surplus--may be justified.

In the conceptual framework for the balance sheet of an insurance enter-
prise, the choices made with respect to the handling of the various C_i's
may not be too important. Clarity on this point is nonetheless extremely
important if fuzzy thinking is to be avoided. Multiple provisions for the
same contingency may be as erroneous in one direction as inadequate provision
is in the other.

Other issues that need attention are the (1) inconsistent handling of basic
assumptions in calculating assets and liabilities, (2) choices as to whether
certain assets are better viewed as offsets to liability--or certain lia-
bilities as offsets to assets, (3) the interdependence of the various C_i's
as determined for the enterprise as a whole; and the interdependence of
particular C_i's as determined for various lines and/or blocks of business.

The Committee's thinking as to assets, liabilities, and the various con-
tingency reserves, all from a theoretical or conceptual viewpoint, is set
out below.

Assets
_____

The assets of an insurance enterprise are typically (1) cash, or cash
equivalents, and (2) bonds, mortgages, stocks, real estate, or other form
of investment.

For purposes of this discussion, those assets which arise from application
of the principles of accrual accounting (e.g., interest earned but not yet
paid, premiums due but unpaid) can be viewed as the equivalent of cash.
Asset items that can be viewed as offsets to liabilities (e.g., deferred
premiums) are so treated. In particular, policy loans against the cash
values of life insurance policies can be offset against corresponding
liability--and such offset is contemplated here.

If one accepts this simplified view of the asset side of the balance sheet
of an insurance enterprise, he finds that the totality of all assets is the
present value of the expected stream of current or future dollars generated
by the current investments. This stream takes the form of interest, divi-
dend, and rental income, plus repayments and maturities; and should be net
of all related costs and expenses.

A very simple representation of the asset side is the graph of expected
asset flow as a function of time.

Expected
Asset Flow
A_t

0   5   10   15   20

Time (in years)
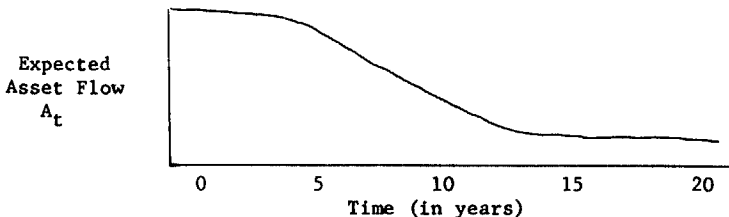
Viewed in this light, there is only one theoretical problem in the deter-
mination of the dollar value of A. This is the determination of the interest
rate (or rates) at which the present value of the asset stream is calculated.
For every pattern of future interest rates, a value of A can be calculated
by the expression $\int \dfrac{A_t}{\pi\,(1+i_t)}$.

However, it is essential to realize that in the real world the expected
asset flow varies significantly with the pattern of future interest rates.
In general, an assumption of low interest rates for the future leads
logically to an earlier asset flow, whereas an assumption of high rates
suggests that the asset flow will be delayed. Practical problems abound,
but the theoretical problem comes down to the determination of i.

For the moment, we leave the matter of asset valuation, including the
question of the selection of an interest rate for asset valuation purposes.
A later section will deal with this problem specifically.

Liabilities

The valuation of liabilities has many of the same characteristics. Here we
value the expected stream of net cash flow from (not to) the insurance enter-
prise that arises from insurance or annuity contracts in force at the time
of valuation. Positive elements to this outflow are all expected disburse-
ments, including benefit payments, withdrawal values, expenses, and divi-
dends; negative elements are expected future premiums. In keeping with the
treatment of policy loans as an offset to liabilities, the making of a policy
loan is a plus to outflow, the repayment of a loan or the payment of policy
loan interest is a minus.

Valuing the resulting net cash flow from business already in force (generally
negative to the insurance enterprise once the enterprise has reached some
level of maturity) has the same theoretical problem as for assets--i.e.,
the choice of an appropriate interest rate. Again there are substantial
practical problems--but no theoretical problems of particular moment.

A graph of the expected liability net cash flow will not likely have the
same shape as that for assets. For companies emphasizing long-term business,
the L_t graph can be expected to have a long tail. Simply for purposes of
illustration, we can visualize the L_t graph as something like the following:

Expected
Liability Flow
L_t

5   10   15   20

Years
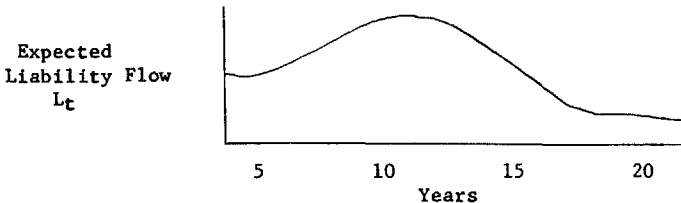
As with the determination of A, L can be calculated for any pattern of
future interest rates. The proper expression is $\int \dfrac{L_t}{\pi\,(1+i_t)}$. Again we
realize that the pattern of future interest rates assumed will materially
affect expected liability flow. Opposite to the situation with expected
asset flow, expected liability flow is likely to be earlier with high future
rates and later with lower future rates.

Contingency Reserves

The Committee views the contingencies (c_i) for which some provision (C_i) should be made as essentially three. c_1 is the possibility of asset depreciation or destruction; c_2 is the possibility of underpricing (or under-reserving) of the insurance risk; c_3 is the possibility of change in the rate of interest. All have a potential impact on the solvency of the insurance enterprise; and many of the best recognized reasons why solvency might become impaired can be treated as special cases of one or another of the three identified above. The three contingency reserves will hereafter be considered separately.

C_1--Contingency Reserve for Asset Depreciation

The possibility that some capital loss may occur with respect to invested assets is well recognized throughout the business world. Reserves for bad debts in the banking industry, mandatory security valuation reserves in the NAIC life statement, are examples of such recognition. Loss can occur through default on indebtedness, decrease in value of common stocks or real estate, or physical destruction of the security behind a mortgage.

C_1 is intended as the specific provision for all such asset related losses--but with one notable exception. Changes in market value of fixed income securities due solely to changes in the prevailing interest rates are considered to be provided for under C_3--and hence not a factor in C_1.

Problems with C_1 are not so much a question of theory or of concept-- but rather those of quantification. The quantification of C_1 would seem to be best expressed as a percentage p_1 of the asset value, where p_1 is a function of the asset mix. The Committee has not yet grappled with the quantification of C_1. It has asked for the help of the Actuarial Education and Research Fund in arriving at a sensible level for C_1. Attachment 1 is the specification that this Committee has furnished the AERF in asking for this help.

Although C_1 can be viewed as a write-down in assets, or as an addition to liabilities, the Committee suggests that clear thinking is enhanced if C_1 is considered to be outside of both A and L. C_1 therefore becomes a part of D--and forms, together with other C's similarly treated, the base below which D should not fall.

C_2--Contingency Reserve for Pricing Inadequacy

The possibility that the insurance enterprise may be subject to loss through pricing inadequacy, or other expression of the so-called insurance risk, is also well recognized. The not-more-than-3-1 premium/ surplus rule familiar to casualty actuaries is the best example. Any factor which causes premium levels to be inadequate, temporarily or permanently, is to be considered as a part of C_2. Claim fluctuations are one element, but more important are likely to be the practical reasons why premium rates are sometimes insufficient--competition, regulation, guarantees, inflation, or simply lack of knowledge as to risk characteristics.

C_2 is intended as a specific provision for all such pricing losses. Problems of C_2 are again mostly those of quantification. C_2 is presumably best expressed as a percentage p_2 of premium (or other measure of the insurance risk where premium is inappropriate), where p_2 is a function of the premium mix. Again the Committee has not grappled with the quantification of C_2. Again it has asked for the help of the AERF. Attachment 2 is the specification.

The Committee views C_2 as a part of D, although the alternative of holding C_2 among the liabilities remains a possibility.

C_3--Contingency Reserve for Interest Rate Change

C_3 has somewhat different characteristics than C_1 or C_2. Theoretical and conceptual aspects may be more difficult, and quantification may be only a part of the problem.

C_3 is by definition the provision for the potential loss to the enterprise resulting from swings in interest rates. No insurance enterprise is immunized from the effects of interest rate shifts--since an interest rate change will, at least theoretically, affect assets and liabilities differently. Depending upon the direction of the change in i, and on the relative "length" of assets as opposed to liabilities, the difference $D = A - L$ may be affected in one direction or the other. Generally speaking, if assets are shorter than liabilities, it is the interest rate decline against which C_3 must be held; but if assets are longer than liabilities, C_3 becomes a hedge against interest rate increase.

Obviously C_3 is closely related to the choice of an interest rate (or rates) for the valuation of assets and liabilities. The Committee feels that assets and liabilities can be so valued that C_3 is held outside of D; but that a specific C_3 held within D may, at least for theoretical purposes, be the better choice.

Quantification of C_3 will be addressed, together with the resolution of the problem of interest assumptions for assets and liabilities, in the third attachment to this report.

Summary

The conceptual framework suggested by the Committee for the establishment of the balance sheet of an insurance enterprise can be visualized as:

Assets	Liabilities and Contingency Reserves	
Investments	Liabilities (Reserves)	
Cash	Difference:	C_1
		C_2
		C_3
		Surplus

D, the difference between assets and liabilities, can be displayed in four pieces, three of which are contingency reserves. The last (which would include invested capital) is here labelled surplus, though it can also be viewed as a contingency reserve against hazards not included within C_1, C_2, or C_3.

Interest Assumptions

The Committee has devoted considerable attention to the setting of the interest rate in the valuation of both assets and liabilities. It has previously been noted that the valuation interest rate is the most important theoretical problem with respect to both A and L--and that C_3 is closely associated with these same interest rates.

Attachment 3 is a Committee prepared paper entitled "Interest Assumptions in the Balance Sheet of an Insurance Enterprise and the Associated Contingency Reserve for Interest Rate Fluctuation." It represents the current, but not necessarily final, thinking of the Committee as to this important matter. One of the main purposes of this preliminary report is to expose these ideas to the Society membership--for discussion, criticism, and comment.

Work in Progress

The careful reader of the Conceptual Framework will have noted several points where further development is necessary. The framework itself may or may not withstand the scrutiny of Society members--but the Committee itself recognizes that the framework is incomplete until certain issues are faced.

1. It has previously been noted that quantification of C_1 and C_2 are pieces of unfinished business referred by the Committee to the Actuarial Education and Research Fund. Attachments 1 and 2 show some detail.

2. Attachment 3 may be a good statement of the Committee's current thinking as to interest assumptions and C_3; but it has not been previously exposed to the scrutiny of Society membership, and has only recently been discussed at a Society meeting.

3. The problem of whether the C's are additive, or instead that something more or less than their sum is appropriate to serve all contingency reserve purposes, has not yet been attacked.

4. It has become apparent to the Committee that actuaries representing the insurance industry and the insurance regulators, in both the U. S. and Canada, are struggling with the determination of a satisfactory interest rate for the valuation of liabilities.

    Attachment 4 is a Committee outline as to how current developments in the U. S, seem to be similar to, or different from, the concepts of Attachment 3.

    Attachment 5 is a similar outline as to recent developments in Canada.

Attachments--1,2,3,4,5

Attachment 1

Contingency Reserve C_1

Possible Research Project -- Proposed by Committee on Valuation and Related
                             Problems to Actuarial Education and Research
                             Fund

General Problem--to determine the amount of surplus reasonably necessary to
                 protect the solvency of an insurance enterprise against
                 asset depreciation.

   Surplus--the excess of assets over liabilities. It is to be assumed
            that both assets and liabilities are valued on a consistent
            best estimate basis that makes adequate provision for the
            possibility of interest rate changes; but that all provision
            for other contingencies is in surplus. MSVR, if it exists,
            is not regarded as among the liabilities.

   Reasonably Necessary--necessary to give the public, the regulators,
            and the company management assurance that the probability
            of future insolvency due to asset depreciation is satis-
            factorily low.

   Insurance Enterprise--any company organized as an insurance company
            that has invested assets arising from the insurance operation.
            Companies emphasizing pure insurance (YRT) coverages build up
            few assets--and are at one end of the continuum. Companies
            that emphasize annuity or deposit type coverages have little
            insurance in force--and are at the opposite end. Insurance
            enterprises throughout the continuum are included.

   Asset Depreciation--any factor which may cause the value of invested
            assets to decline, but excepting market value declines due
            to interest rate changes. Risk of default (as to interest'or
            principal) on debt, and risk of earning power decline on
            equity, are the main hazards against which this surplus is
            to be held. Asset depreciation is to be distinguished from
            other ways in which surplus can be eroded--especially from
            operating losses due to price inadequacy in the insurance
            operations.

Sub-Problems

   1. What is the best base for an asset depreciation surplus objective?
       The surplus/assets ratio seems natural. Is there any real alter-
       native?

   2. Policy loans are traditionally considered to be an asset, but it
       may make more sense for surplus analysis purposes to consider
       policy loans as an offset against liabilities. Perhaps there are
       other assets that should be excluded from the base when surplus
       ratios are computed (separate accounts, due and deferred premiums,
       etc.).

3. Risk of asset depreciation can arise from several different charac-
   teristics of a particular investment. Cash and government backed
   bonds are considered to be at one end of the spectrum, other bonds
   and most mortgages somewhere in the middle, common stocks and real
   estate holdings toward the risky end. It follows that the surplus/
   asset ratios we seek should vary by the investment mix. How can
   surplus objectives be quantified for any particular class of
   investment, given the current state of knowledge as to risk of
   default on debt investment or the downside market value risk on
   equity investment?

Attachment 2

Contingency Reserve C_2

Possible Research Project -- Proposed by Committee on Valuation and Related
                           Problems to Actuarial Education and Research
                           Fund

General Problem--to determine the amount of surplus reasonably necessary to
            protect the solvency of an insurance enterprise against
            pricing inadequacy.

   Surplus--the excess of assets over liabilities. It is to be assumed
            that both assets and liabilities are valued on a best estimate
            basis; that all provision for contingencies is therefore in
            surplus.

   Reasonably Necessary--necessary to give the public, the regulators,
            and the company management assurance that the probability of
            future insolvency due to pricing inadequacy is satisfactorily
            low.

   Insurance Enterprise--any organization insuring risks in return for
            the payment of a premium. Life, disability, health, property,
            liability, casualty risks are all included. Group insurance
            is contemplated, as well as individually marketed insurance
            and various forms of reinsurance.

   Pricing Inadequacy--any factor which may cause the premium charged to
            be inadequate to pay claims and expenses. Pricing inadequacy
            is to be distinguished, however, from the risk of asset
            depreciation--which is intended to be the focus of another
            research project.

Sub-Problems

   1. What is the best base for a pricing-inadequacy surplus objective?
       The surplus/premium ratio seems natural. Is there any real
       alternative?

   2. Pricing inadequacy can arise from several different characteristics
       of a particular risk:

       a. Statistical (chance) fluctuations (often dampened by reinsur-
           ance).

       b. Lack of knowledge as to risk characteristics (especially on
           unseasoned coverages).

       c. Limitations on ability to adjust rates (rate guarantees or
           rate regulation).

       d. Difficulty in adjustment to inflation (both claims and expenses).

Various insurance coverages have these different characteristics
in varying degree. It follows that the surplus/premium ratios we
seek should vary by coverage characteristics--the higher the
probability of premium inadequacy, the higher the ratio should be.
How can surplus objectives be quantified for any particular cover-
age, given the current state of knowledge as to risk character-
istics, and the environment in which the risk is assumed?

Attachment 3

Interest Assumptions in the Balance Sheet of an Insurance Enterprise and the
Associated Contingency Reserve for Interest Rate Fluctuation

Introduction

The liability side of the balance sheet of an insurance enterprise has long
been considered the particular domain of the actuary. Because most of the
liabilities of a life insurance company (and at least some of those of a
property/liability company) involve payments that will not become payable
until some time in the future, the principle of "discount for interest" is
vital. The rate of interest on which the calculation is based is the single
most important assumption in the actuarial calculation of certain kinds of
reserves; and it is never unimportant except as to payments due almost
immediately.

The asset side of the balance sheet of an insurance enterprise is similar,
in that the valuation of most kinds of bonds and mortgages involves present
value principles. Even where market values apply, the valuation is essen-
tially one of discounting for interest. Again one finds that the results
are extremely sensitive to the interest rate assumed. Actuaries give less
attention to the asset side of the balance sheet, however; and historically
have tended to ignore an inconsistency between the rates of interest at
which assets and liabilities are valued.

The purpose of this paper is to explore any inconsistencies that there may
be, to analyze whether such inconsistencies are important, and to suggest
ways in which they might be resolved. In the process, we must take a look
at the characteristics of the cash flows making up both assets and liabili-
ties, recognize the principle of "immunization" developed by Redington and
others, and analyze what might be considered the interest risk--i.e., the
risk to the enterprise that interest rates may change.

Valuation of Assets

Assets of the fixed income type--i.e., those represented by an instrument of
indebtedness--are typically carried in North American insurance practice at
a "book" value, equal to the amount of the indebtedness, plus or minus an
adjustment to amortize any premium or discount at which the security was
acquired. It is easy to demonstrate that this book value is the present
value of the anticipated stream of interest and principal payments, where
the interest rate used in the calculation is the "yield" at which the secu-
rity was acquired.

There is a competing view of asset valuation, one that substitutes market
value for book value. Market value is not the usual method for bonds or
mortgages in good standing, though it is prescribed for (1) debt investment
in trouble, and for (2) common stock. Market valuation of bonds and mort-
gages can be viewed as equivalent to book value, with the important excep-
tion that the interest rate used in the discounting process is determined
as of date of valuation rather than date of acquisition. If the yield at
which the securities could be bought or sold has risen since date of acqui-
sition, market value will normally be less than book; but market value will
exceed book if yields have fallen. Market value as a basis for asset valua-

tion appeals to some, especially those who fear that cash flow problems will require that assets be liquidated before their maturity.

It is key to this entire paper that the rate of interest at which securities can be bought or sold varies over time. It may be helpful to think of this rate as being the sum of three relatively distinct elements:

1. The market rate for a riskless investment in a non-inflationary setting.

2. A rate reflecting the market's assessment of the possibility of default.

3. A rate reflecting the market's inflation expectations.

The first element will vary with supply and demand, and with other market conditions, but should otherwise be relatively stable over time. The second element is peculiar to the particular security, and will vary appreciably over time only if the security gets in difficulty, or otherwise has its "rating" materially changed. The third element has been the most volatile over recent years--and probably accounts for most of the dramatic increase in interest rates since World War II.

If one accepts this view of interest rate movements, the risk of interest rate change is closely associated with the change in inflation expectations. We shall see that any interest rate move can profoundly affect the solvency of an insurance enterprise--and interest rate changes due to inflation are no exception. This is especially true in the United States where, unlike Canada and the United Kingdom, guaranteed cash values are mandatory.

Valuation of Liabilities

It is standard practice to value liabilities "conservatively"--i.e., to discount at a rate of interest low enough that the probability of the enterprise actually earning at least that rate is very high. For very short-term liabilities, many insurers use no interest discount at all.

Until recently 3½% was about the maximum interest rate permitted under state regulation, though higher rates are now permitted for certain kinds of liabilities. The tendency for the maximum valuation interest rate to rise is clearly due to the general rise in long-term interest rates, which were below 3% in 1947 but are at or above the 9% level in the inflationary environment of today.

It is important to note that the connection between the interest rates employed in the valuation of assets and those used for the valuation of liabilities is now tenuous at best. Theory would seem to indicate that one should be derivable from the other, if they aren't actually identical. The absence of a solid tie between the interest rate employed in the valuation of assets and the interest rate employed in the valuation of liabilities is the problem to which this paper is particularly addressed.

Underlying Assumptions

There is a basic premise behind the developments to follow which must be clearly stated if confusion is to be avoided. No coherent theory of asset

and liability valuation can be developed until one faces this important
question--which of the many contingencies that may adversely affect an in-
surer are to be provided for by surplus (i.e., the difference between assets
and liabilities); which are to be provided for by some degree of conservatism
within the calculation of assets, liabilities, or both?

We are not concerned in this paper with contingencies of an insurance nature;
but in establishing a rationale for the setting of the interest assumption
we must be concerned with all asset related contingencies. One of these is
the risk that assets will lose value because the borrower defaults, the asset
is physically destroyed, or the stock market falls. Another is the risk in
which we are here particularly interested--that interest rates will change.

In everything that follows, it is assumed that the possibility of "asset
depreciation" will be one of the risks against which a surplus is held.
Essentially this means that no conservatism will creep into either asset or
liability valuation to recognize the asset depreciation risk. Instead the
"surplus"--defined here as the excess of assets over liabilities--must per-
form, among its other roles, as a contingency reserve against asset depre-
ciation.

As to the possibility that interest rates will change, this paper will
ultimately take the same general position. Assets and liabilities are to
be so defined that provision for interest rate change is outside of either,
and hence within the "surplus"--the excess of assets over liabilities. The
explicit recognition of the interest rate risk, a contingency reserve desig-
nated C_3 and thought of as a part of surplus, will be the direction in which
this paper is headed.

Before the theory of an explicit C_3 can be developed, however, it seems
essential to look at the valuation of assets and liabilities as if the pro-
vision for the interest risk were within, rather than outside of, the cal-
culation of A and L. If a way can be found to determine A and L such that
an appropriate implicit C_3 is held outside of surplus, then an explicit C_3
can be moved to surplus later. The immediately following sections of this
paper take the first step by tackling the question of an implicit C_3 held
within assets or liabilities--leaving to a later section the second step of
moving C_3 into the surplus section of the balance sheet.

A Set of Simplified Models

In order to illustrate the matters discussed in this paper, models of asset
and liability flows will be needed. These models will emphasize simplicity,
and are not intended to be particularly realistic. Moreover, they will in-
corporate certain simplifying assumptions. In particular, it will be assumed
at this stage that both asset and liability flows are fixed, whereas in the
real world both depend upon choices that borrowers and policyowners make.
The discussion of these complexities is thereby delayed until the theory
for the simpler case can be developed. It is also assumed that the insurance
enterprise is made up of a single line of business, thus avoiding any ques-
tion of separate balance sheets for several lines with differing cash flow
characteristics.

Asset Models

A1. Suppose the asset side of the balance sheet, at time zero, can
     be represented by:

          14 units due at time 3
          10 units due at time 8
           5 units due at time 13
           1 unit due at time 18

     In total there are 30 units due the enterprise, spread over
     nearly 20 years of time. These 30 units can be thought of
     as interest and/or principal payments on fixed income secu-
     rities. Neither the borrower nor the lender has any option
     to change the timing of any payment due.

     The present value of the net asset cash flow is:

     $$A_1 = 14(1+i)^{-3} + 10(1+i)^{-8} + 5(1+i)^{-13} + 1(1+i)^{-18}$$

     where i is the valuation rate of interest. The yield at which
     these securities were acquired is assumed to be 7%--so the book
     value of A_1 is 19.62 units. The 7% yield rate includes any
     extra that the market charged to reflect the risk of default.

A2. A second asset model is represented by 19.62 units, all in
     cash or the equivalent. The value A2 is not, therefore, a
     function of the interest rate. (The constant 19.62 was
     deliberately chosen to be identical to the book value of A1.)

Liability Models

L1. Suppose the expected net cash flow on the liability side of
     the balance sheet is represented by:

          11.2 units due at time 3
           8.0 units due at time 8
           4.0 units due at time 13
            .8 units due at time 18

     Neither the insurer nor the contractholder has any right to
     change the amount or timing of a payment due.

     Although no liability in the life company balance sheet is
     likely to have exactly this pattern, a block of income
     paying life annuities could well have the general timing
     characteristics.

L2. Suppose the liability side of the balance sheet is represented
     by:

          16.8 units due at time 1

     This pattern is not atypical of the liabilities arising from
     group life and health insurance, or other insurance of a YRT
     nature. Here liabilities are of a much shorter duration than
     that assumed for A1, but a year longer than A2.

L3. A "long" liability pattern is perhaps representative of indi-
vidual ordinary life insurance, where the net outpayment is
held down during the early years by inflowing premium payments.
Here the specific pattern chosen is:

            3 units due at time 3
            8 units due at time 8
            9 units due at time 13
            9 units due at time 18
            6 units due at time 23
            4 units due at time 28
            3 units due at time 33

The details of each of the three liability patterns were deli-
berately chosen so that their present values, at 7%, were all
equal.

The table below shows specific present values, of both the model asset and
liability flows, at various interest rates.

Interest rate i	Value of Assets--in Units		Value of Liability--in Units		
	A1	A2	L1	L2	L3
12%	15.28	19.62	12.22	15.00	9.28
9	17.67	"	14.14	15.41	12.53
8	18.61	"	14.89	15.55	13.99
7	19.62	"	15.70	15.70	15.70
6	20.72	"	16.58	15.85	17.70
5	21.93	"	17.54	16.00	20.09
4	23.25	"	18.60	16.15	22.95
3	24.70	"	19.76	16.31	26.40
.					
.					
0	30.00	"	24.00	16.80	42.00

It is now the intention to use these models to analyze four different asset-
liability combinations.

First, the A1-L1 pair will be chosen to represent what we will
here call the "Matched" case.

Second, the A2-L1 pair will be examined as the completely
"Unmatched" case.

Third, the A1-L2 combination is illustrative of the "Short
Liability" case (which may be typical of some property/liability
companies).

Finally, the A1-L3 pair will help us look at the "Longer Liability"
situation (which seems to be the usual one among North American
life companies).

Analysis of the Matched Case--A1 and L1

The simplest situation from the point of view of a theoretically sound
balance sheet is clearly the situation where assets and liabilities are

matched. Liability pattern Ll is exactly equal at all points to 80% of Al,
so it is exactly matched as to incidence with the assumed investment (asset)
flow Al. The two taken together are representative of the matched (or
immunized) situation discussed by Redington.

Under the ideal conditions of perfect immunization, the insurer is not actu-
ally on any interest risk. When assets and liabilities are matched, it seems
clear that theory calls for a single valuation interest rate to be applied
alike to assets and liabilities. Then if interest rates move, upward or
downward, assets, liabilities, and surplus move proportionately, and the
surplus/asset ratio is unaffected.

For purposes of illustration, assume that the assets were acquired at a 7%
yield, and that present market values are based on 8%. Also assume that 4%
is a rate of long-term interest return that we feel confident will be ex-
ceeded. Then we see at least these three possibilities:

	Assets and Liabilities Valued at 8%	7%	4%
Asset Al	18.61	19.62	23.25
Liability Ll	14.89	15.70	18.60
Surplus S = Al - Ll	3.72	3.92	4.65
Surplus Ratio S/Al	20%	20%	20%

The 8% column represents asset valuation at market, and liabilities valued
at 8%. The 7% column represents asset valuation at book, and liabilities
valued at 7%. The 4% column represents a view of the balance sheet taking
into account the possibility that interest rates will drop quickly to 4%.

There seems to be no theoretical justification (for this matched case) for
valuing liabilities at some low rate (such as 4%) while valuing assets at
book. The results of such a practice are illustrated below:

Assets (at 7%)	19.62
Liabilities (at 4%)	18.60
Surplus	1.02
S/A	5.2%

Surplus ratios have clearly been understated by holding most of the true
surplus in the overconservatism in assets or liabilities. Since there is
no interest risk as long as assets and liabilities are matched, there is no
reason to include a margin of conservatism for this purpose.

Analysis of the Unmatched Case--A2-Ll

If liabilities are represented by Ll, but assets are (as in A2) all in cash,
then the traditional display:

Assets	19.62
Liabilities (at 4%)	18.60
Surplus	1.02
S/A	5.2%

would seem to be entirely appropriate, if it is the intention to hold,
within the valuation of assets and liabilities provision for a possible

reduction in interest rate to as low as 4%. The essential difference be-
tween this case (5.2% surplus) and the matched case A1-L1 (20% surplus) is
that in the latter the 19.62 has been invested at 7%, and the realization
of the needed interest to carry the liability does not depend upon the
future of interest rates. In the matched case the interest risk has been
immunized, and the larger surplus reflects a credit for such immunization.
In the unmatched case, no such credit is justified.

Analysis of the Shorter Liability Case

The reasoning is somewhat different where the liabilities are shorter than
the assets, as illustrated by Liability Pattern L2, combined with the Asset
Pattern A1. Although short liabilities are not typical of the individual
life or annuity lines of life companies, they may be typical of group life
and group health; and of many of the property/liability lines.

In this case, assets may have to be liquidated before their maturity to meet
the maturing liabilities. This fact strongly suggests that assets be valued
not higher than market. The discount rate for liability valuation is less
important, because the liabilities are short--but the rationale for valuing
liabilities on the same basis as assets is as sound as before.

In the specific example, if assets and liabilities are both valued at 8%
(assumed to be a market interest rate), we find as follows:

Asset A1	18.61
Liability L2	15.55
Surplus	3.06
S/A	16.5%

This is, perhaps, the "best estimate" result, if we expect current interest
rates to continue.

A 7% (book) valuation of assets, combined with a 7% valuation of liabilities,
produces:

Asset A1	19.62
Liability L2	15.70
Surplus	3.92
S/A	20%

Here the asset appears to be overvalued, and the surplus overstated.

If valuation techniques are to provide for adverse swings in the interest
rate, conservatism requires that we provide for the possibility that inter-
est rates might possibly go as high as, say, 9%--or even 12%.

	At 9%	At 12%
Asset	17.67	15.28
Liability	15.41	15.00
Surplus	2.26	.28
S/A	12.8%	1.8%

Finally, a 7% (book) valuation of assets, combined with no interest discount
as to the liabilities, is perhaps representative of current North American
practice where liabilities are almost immediate.

Asset	19.62
Liability	16.80
Surplus	2.82
S/A	14.4%

The practical result may be deemed to be fairly satisfactory, but the theory
is weak. Assets and liabilities are both somewhat overstated--but the re-
sulting surplus may be under or overstated. In any event, the asset and
liability valuations do not include provision for the possibility of inter-
est rate increases beyond about 8½%.

Analysis of the Longer Liability Situation--L3 and Asset Pattern Al

The situation illustrated by Liability Pattern 3, where the liabilities are
clearly longer than the assets, is the usual one for a typical life insur-
ance company. In such a case, the surplus is most sensitive to the choice
of interest assumptions as to assets and liabilities, and inconsistencies
are most important.

Below are illustrated the balance sheets for Liability Pattern L3 and Asset
Pattern Al under straightforward assumptions as to a uniform rate for valu-
ing assets and liabilities.

Valuation Interest Rate

	9%	8%	7%	6%	5%	4%
Assets	17.67	18.61	19.62	20.72	21.93	23.25
Liability	12.53	13.99	15.70	17.70	20.09	22.95
Surplus	5.14	4.62	3.92	3.02	1.84	.30
S/A	29.1%	24.8%	20.0%	14.6%	8.4%	1.3%

The results are striking. Surplus, and especially the surplus/asset ratio,
is a sharply increasing function of the interest rate assumed. This is true
even though both assets and liabilities decrease as the interest rate climbs.

Note that the 20% surplus which would result from book value of assets and
a 7% assumption for liabilities, increases to 24.8% if the 8% "market" rate
is employed, or falls to 1.3% if one uses the "safe" 4%.

We have as a first step adopted the view that the valuation of assets and
liabilities should be on a basis that includes adequate provision for the
possibility of interest rate moves. In the case before us, it is the inter-
est rate fall that one must be concerned with. If one feels confident that
interest rates will not (in the long run) be less than some "safe" rate such
as 4%, the valuation of both assets and liabilities at such rate protects
against a fall in interest to as low as 4%. Surplus appears to be very
small--only 1.3% of assets--but the risk of interest changes seems to be
well covered outside of the indicated surplus.

It is interesting to note how far from the theory set forth above present
practice lies. In the example before us, the book value (7%) of the asset

is $19.62, the 4% liability is $22.95. There is an apparent deficit of 17%
of assets. This disturbing result comes about from the inconsistency between
the interest basis for valuation of the two sides of the balance sheet.

Summary of Three Cases

We have seen that theory of an implicit C_3 calls for a single interest rate
to be used for valuation of assets and liabilities--but that the best setting
of the single interest rate depends upon the relative length of assets and
liabilities.

Assuming that the surplus is not expected to absorb the financial effect of
interest swings (but is expected to make provision for default under fixed
income investment) then the best valuation rate would appear to be:

> For the short liability case--at the high end of reasonable
> expectations--today one might value both assets and liabilities
> at about 10% or higher.

> For the long liability case--at the low end of reasonable
> expectations--today one might view both assets and liabilities
> at about 4%.

> For the matched case--anywhere within the range of reasonable
> expectations, so long as assets and liabilities are valued
> consistently.

The above appears to be a reasonable theoretical base for the calculation
of assets and liabilities so as to include, outside of surplus, an adequate
margin for interest swings.

The first step in the analysis has been taken. We are now ready to look at
the consequences of this theory--then move toward the explicit C_3 we seek.

Difficulties with the Analysis to Date

The foregoing theoretical solution to the problem of the setting of a dis-
count rate for the valuation of assets and liabilities, and in doing so
holding a contingency reserve for interest rate swings within the asset-
liability calculation (and hence outside of surplus), may or may not make
good sense to others interested in the same problem. However that may be,
the theoretical solution so far proposed must be carried further if it is
to prove at all practical.

There are obvious difficulties, particularly with respect to the asset side
of the balance sheet. Valuation of bonds and mortgages on an interest rate
as low as 4% seems to be an obvious overstatement of assets--as indeed it
is looking at assets alone. Similarly, the valuation of assets at some high
rate such as 12% seems inconsistent with the always present possibility of
converting those assets to cash. In a practical world, it may be necessary
to stick with the traditional "book" valuation of assets; or to change to
its only viable alternative, the valuation of assets at market.

The holding of C_3 implicitly, within A and/or L and outside of S, is another
weakness. A clearly identified and quantified C_3 seems preferable for a
theoretical analysis, even if an implicit C_3 proves to be the better prac-
tical solution.

The following section offers a tentative solution to the difficulties just stated.

An Explicit C_3

Suppose for the moment that these principles were adopted:

1. Assets would be held on one of the two practical alternatives to asset valuation--book or market. There would be less break with tradition if book were the choice, but the theory would hold together just as well if market were chosen.

2. Liabilities are valued at the same interest rate as that implicit in the valuation of assets.

3. An explicit C_3 is computed such that the resulting $A-L-C_3$ is the same percentage of A that A-L was to A under the implicit C_3 valuation theory developed earlier.

The balance sheets for the four model combinations that we have examined previously would appear as follows--with assets at book.

	A1-L1	A2-L1	A1-L2	A1-L3
Assets (at 7%)	19.62	19.62	19.62	19.62
Liability (at 7%)	15.70	15.70	15.70	15.70
C_3	None	2.90	3.57	3.67
$A-L-C_3$	3.92	1.02	.35	.25
$\dfrac{A-L-C_3}{A}$	20%	5.2%	1.8%	1.3%

If assets at market were the choice, the display would be changed to:

Assets (at 8%)	18.61	19.62	18.61	18.61
Liability (at 8%)	14.89	14.89	15.55	13.99
C_3	None	3.71	2.72	4.38
$A-L-C_3$	3.82	1.02	.34	.24
$\dfrac{A-L-C_3}{A}$	20%	5.2%	1.8%	1.3%

Note that C_3 is zero in the matched case, positive in all the others. Note also that the valuation interest rate for assets and for liabilities is always consistent. C_3 is derived, however, from the worst case hypothesis; that interest rates will fall (to 4% in the example above) in the long liability--shorter asset case, and that interest rates will rise (to 12%) in the reverse situation. The size of C_3 is a function of the degree of mismatch, and the level of protection desired.

It is interesting and important to note another relationship that holds if liabilities are at least as long as assets. The sum of L and C_3 can be viewed as equivalent to the valuation of L at an interest rate somewhere between (1) the rate inherent in the valuation of assets, and (2) the lower safe rate beyond which it is assumed that interest rates will not fall.

Moreover, the weighting of the first is 100% in the perfectly matched case A1-L1, 0% in the absolutely mismatched case A2-L1, and a function of the degree of matching whenever immunization is present but incomplete. Note the arithmetic demonstration below:

	A1-L1	A2-L1	A1-L3
Matching	100%	0%	Partial
	Assets valued at book (7%)		
$L + C_3$	15.70	18.60	19.37
Equivalent interest rate	7%	4%	5.3%
	Assets valued at market (8%)		
$L + C_3$	14.89	18.60	18.37
Equivalent interest rate	8%	4%	5.7%

In each case, the A1-L3 immunization turns out to be just under 50%.

Recognition of Non-Independence

In the development of the theory heretofore presented, and especially in the examples chosen, it has been tacitly assumed that asset and liability flows are independent of the changing rate of interest. Under the tight conditions imposed on both the asset and the liability models (that borrowers and policyowners have no choices as to timing or amount of payments to be made or received) this assumption of independence may be plausible; but in the real world this independence does not exist. It is time to drop this limitation on the theory here developed, and to search for an extension to the more general case.

There is clearly a tie between the asset flow and the prevailing interest rate through any repayment options the borrower may have been granted. If interest rates fall, there will be a tendency for borrowers to repay, thereby shortening the asset flow in comparison with what it may have been had interest rates remained constant. If interest rates rise, we would expect a lengthening of assets, as borrowers who might otherwise repay early are discouraged from doing so.

Similarly there is a tie between the liability flow and prevailing interest rates. When interest rates (especially short-term rates) are high, the individual life insurance policyowner (and the holder of pension or annuity contracts) will tend to choose dollars now over dollars later--using any cash withdrawal or policy loan rights more often, or delaying premium payments, and thereby shortening the liability flow. This "disintermediation", essentially the withdrawal in tight money times of policyholder funds viewed as "on deposit" with the insurer, can be very severe where certain kinds of savings or annuity vehicles (especially those permitting a cashout at book value) are offered. If interest rates fall, disintermediation will be slowed, and liabilities can be expected to lengthen. Companies primarily in the group insurance business, or those writing property-liability insurance, offer fewer choices to policyowners, and may find that their liability flows are relatively independent of the interest rate.

The question remains as to how these interdependences can best be recognized, consistent with the principles previously expressed. To study this question, it will be helpful to look at three contrasting situations separately.

As to the situation where liabilities are longer than assets

As interest rates fall, assets can be expected to shorten,
liabilities, if anything, to lengthen. Since assets are already
too short, matching is reduced if interest rates fall. Conversely,
matching should improve if interest rates rise.

In this situation, it is the _fall_ in the interest rate that is
the risk that one worries about, and it is also the _fall_ that
decreases the degree of immunization through matching.

It would seem, therefore, in the application of the theory that
asset and liability patterns (which must in the real world be
estimates at best) be calculated as if interest rates had fallen
to the 4% level. This means a conservative, or large, C_3--in
keeping with the idea that matching will be less if the worst
happens--in this case that interest rates fall.

As to the situation where assets are longer than liabilities

In this situation, the concern, from a solvency viewpoint, is that
interest rates may rise. Should this occur, liabilities may
shorten and assets lengthen, again reducing the degree of matching
based on the worst case assumption--i.e,, that interest rates will
be high.

It might be noted, however, that the interdependence of asset and
liability flows and the interest rate may well be less of a prob-
lem than in the case first discussed. The high interest rate will
not lengthen the assets as much as a low rate would shorten them.
If liabilities are short due to emphasis on pure insurance coverages
of a short-term nature, disintermediation in tight money times
will have little tendency to make liabilities even shorter. For
both of these reasons, it may be satisfactory to ignore the lack
of independence matter in the typical enterprise whose liabilities
are short.

As to the situation where assets and liabilities are closely matched

In this situation, no hedge is needed against a change in interest
rate unless the change itself results in a mismatch that would not
otherwise exist. A lowering interest rate is likely to push the
matched situation toward the short asset situation--which is the
very situation where lower interest rates are a threat. A rise
in interest rate may push the matched situation in the other
direction, again causing an increase in interest risk. Life
companies emphasizing policies or contracts particularly subject
to disintermediation may find that what they considered to be a
closely matched situation on a rising interest rate rapidly
exhibits short liability characteristics.

Caution is thereby called for in even what we consider the matched
situation because a drift in the interest rate in either direction
lessens the matching and worsens the situation.

The best immunized situation with respect to the possibility of
lower interest earnings may well be one where the assets are
slightly longer than liabilities. The best immunized situation
with respect to tight money and higher interest may be one where
the assets are a little short.

Relationship to Immunization Concepts

A British actuary, Redington[1], was perhaps the first to point out the possi-
bility of immunizing the balance sheet of an insurance enterprise against
interest rate variation. The technique he suggests is the deliberate
matching of asset and liability flows. Immunization concepts were brought
to the attention of North American actuaries by Vanderhoof[2], who furnishes
additional bibliography on this intriguing subject.

North American actuaries have tended to dismiss immunization theory on the
grounds that the North American practice of granting guaranteed withdrawal
values in individual life and annuity products makes practical application
of his concept impossible.

This paper accepts the North American view that immunization in any perfect
sense is impossible, and that therefore the interest risk cannot be avoided.
Guaranteed withdrawal values are one of the practical difficulties, but
there are others (notably the lack of perfect call protection in bond and
mortgage markets).

On the other hand, this paper accepts the view that some immunization is
better than none; and that the better immunized company is in a sounder
financial situation than the less immunized, all other things being equal.
North American valuation practice does not recognize these differences,
however, and provides no incentive to management to strive for a higher
level of immunization. The technique suggested in this paper, by requiring
a C_3 inversely related to the degree of immunization actually found, provides
this incentive and at the same time makes it clear just what interest risk
is being provided for. Non-recognition of immunization may have been accep-
table in periods of prolonged economic stability, but is less acceptable in
periods of economic volatility such as has been experienced in North America
since the 1950's.

At the same time, this theory makes clear the absence of any provision for
asset depreciation, or for the interest risk, in the way assets and liabili-
ties are determined, pointing to a need for higher surplus than under the
valuation tradition of today. Life company actuaries have sometimes felt
that the valuation traditions have been so conservative that no need for
surplus exists. Adoption of this theory should help dispel this misguided
notion.

[1]   Redington, F. M., "A Review of the Principles of Life Office Valuation"
                JIA LXXXVIII (1952).

[2]   Vanderhoof, I. T., "The Interest Rate Assumption and Maturity Structure
                of the Assets of a Life Insurance Company"
                TSA XXIV (1972)

Summary

The line of thinking indicated in this paper leads to an initial conclusion
that a valuation of assets and liabilities at the same interest rate will
provide, outside of surplus, for the interest risk to which an insurance
enterprise may be subject. The interest rate chosen should be on the low
side of reasonable expectations if the asset pattern is shorter than liabil-
ities, on the high side if the reverse is true. Conceptually, the interest
rate chosen is that rate at which the excess of the present value of net cash
flows from assets over net flows from liabilities is minimized.

One can produce essentially the same result without abandoning the tradi-
tional book valuation of bonds and mortgages by adjusting the traditional
liability valuation, and by holding an explicit C_3 to reflect the degree of
immunization.

Finally, it is suggested that the degree of immunization be conservatively
estimated because matching varies with changes in the interest rate, and in
the direction that matching tends to disappear when it is needed the most.

Attachment 4

Analysis of ACLI Subcommittee Proposal

A proposal for recommended NAIC model legislation on liability valuation has been prepared by the American Council of Life Insurance Subcommittee on Actuarial Aspects of Valuation Problems (ACLI Subcommittee). The ACLI Actuarial Committee, to which the Subcommittee reports, has asked for certain changes in the proposal, so that this proposal does not yet represent an approved industry position, and will be changed. Nevertheless, it is useful to examine the proposal in light of the principles developed by the Society of Actuaries Committee on Valuation and Related Problems (Society Committee). Such examination will identify the differences in perspective between the industry and the actuarial profession on the matter and can help evaluate the strength and weaknesses of the ACLI Subcommittee proposal.

The ACLI Subcommittee proposes retaining the existing structure whereby the minimum reserve for an insurance policy or annuity would be based on a specified mortality and interest basis. The basis would depend on the type of insurance (e.g., life insurance vs. annuity, single premium vs. annual premium). As with the present structure, the minimum reserve standard would apply for all policies issued in a calendar year and would not be changed during the life of the policies, although different standards would apply to issues of different years. Unlike existing standards, the interest assumption for the minimum reserves would automatically be adjusted from time to time as market interest rates change. The minimum reserve applicable to a given contract would assume an interest rate which would be a weighted average of an interest rate representative of new money interest rates and 3%, the latter representing a conservative estimate of long-term historical interest rates. The weightings would vary by class of insurance, emphasizing the new money rate for single premium annuities and with a relatively greater emphasis on the historical rate for annual premium life insurance and annuities.

The ACLI Subcommittee proposal and the Society Committee approach compare as follows:

Theory vs. practice. The ACLI Subcommittee placed heavy emphasis on the practical aspects of valuation and, in particular, the desire to be consistent with existing practices and to minimize the room for subjective judgments. Within this practical framework, the effort was made to develop standards that were as consistent as possible with theoretical considerations.

Explicit vs. implicit provision for interest rate change.

The Society Committee derives an explicit contingency reserve (C_3) for the possibility of interest rate change. In this form the theory calls for valuation of liabilities at the same rate as for assets, and a contingency reserve outside of the reserve liability.

The Society Committee also develops the theory of an implicit C_3 held within the reserve liability. Here again assets and liabilities are valued at the one rate of interest, but this interest rate is at the low end of reasonable expectations when assets are shorter than liabilities.

The Society Committee develops still a third approach, again involving an implicit C_3, where assets are valued traditionally, and reserves are computed on a weighted average interest rate somewhere between the rate earned on assets and a safe rate below which interest rates are never expected to fall.

The ACLI Subcommittee proposals are similar to the third mentioned Society Committee approach. An implicit C_3 is contemplated, and reserves are held on a weighted interest rate.

Aggregate vs. policy interest rates. The Society Committee contemplates use of an aggregate rate for all policies in an insurer's portfolio, the same rate being applicable to all policies. The ACLI Subcommittee proposes continuation of the existing requirements where different rates may apply to different policies depending on the type of insurance and the year of issue of the policies.

Recognition of asset and liability maturities. The Society Committee recommends that the weighted interest rate be closer to current interest rates when asset-liability matching is good, closer to the lower safe rate when matching is poor. The ACLI Subcommittee permits use of a higher interest rate for plans of insurance with shorter duration liabilities (and presumably better matching) than plans with longer duration liabilities.

Changes in interest rates with time. The ACLI Subcommittee proposes fixing the interest rate applicable to a specific generation of policies at the time of issue regardless of changing conditions subsequent to that time. However, the interest rate applicable to new issues will change as market interest rates change. The Society Committee contemplates adjusting the aggregate valuation rate from time to time to recognize changes in the distribution of assets, distribution of liabilities, and market interest rates.

Variation among companies. The ACLI Subcommittee rules would apply equally to all companies. The Society Committee recommends that the interest rate vary among companies to recognize the differences in interest earnings and degree of matching.

Objectivity. The ACLI Committee rules are completely objective with no room for judgment. The actuary would, of course, apply judgment when preparing his actuarial opinion on the reserves. The Society Committee contemplates that the actuary would use his professional judgment to determine the interest assumption based on the circumstances of the company and the investment environment.

Attachment 5

Valuation in Canada

The procedures and responsibilities for the valuation of insurance liabili-
ties changed significantly in 1978 for companies under the jurisdiction of
the Canadian government.

Highlights of the changes are as follows:

1. The Company's Board is required to appoint a valuation actuary.

2. The valuation actuary is required to choose appropriate assumptions and
    valuation methods, and make the valuation of liabilities in accordance
    with them. The choice of assumptions is subject to the approval of the
    Superintendent of Insurance.

3. For Ordinary insurance the statement liability must not be less than a
    minimum which is a modified net premium reserve on the actuary's
    assumptions and subject to

    a. an initial expense allowance which does not exceed actual issue
        expenses and 150% of the net premium. The allowance is spread
        over the premium paying period in the form of an addition to the
        net premium.

    b. a test is applied to determine whether future loadings exceed
        future administrative expenses and taxes and the requisite part
        of future dividends. If it does not do this, the renewal net
        premium must be reduced in the valuation.

4. If the reserve in the annual report differs from the minimum reserve
    and the net level reserve, the two latter reserves must be shown in the
    report.

5. The valuation actuary is required to give his certificate for the valu-
    ation of liabilities and to prepare a valuation report on the procedures
    used. The report is required to explain how the actuarial reserves meet
    the minimum, what scale of policyholder dividends has been provided for,
    and how the valuation interest rate is related to the rate of interest
    on assets.

The Committee on Financial Reporting of the Canadian Institute of Actuaries
has prepared two documents: the opinion to the guides to conduct, "Actu-
arial Principles and Practices for the Valuation Actuary", and "Recommenda-
tions for Insurance Company Financial Reporting". The opinion gives an
interpretation of the guides as they apply to the valuation actuary and
requires him to follow the Recommendations. The Recommendations give an
outline of good actuarial practice, under several headings: documentation,
approximations, treatment of data, assumptions, methods, and reports.

There are several issues which have not been resolved and which either have
not been referred to in the Recommendations, or are referred to only in a
preliminary way. These issues include: provision for adverse deviations,
criteria for valuation methods, definition of contingency reserves, the
matching of assets and liabilities, definition of minimum capital and surplus.

All of these matters are under active review and discussion in committees
and at meetings of the Canadian Institute.

In summary, legislation and regulations in Canada require an actuary to be
appointed to make an up-to-date valuation of liabilities featuring realistic
assumptions and provision for future expense and dividends. The Society's
Committee on Valuation and Related Problems is developing a theoretical
structure for the balance sheet of an insurance enterprise by examining the
definitions, relationships, and quantification of assets, liabilities, con-
tingency reserves, and surplus. This Society effort is in a new direction.
It should complement the work being done in the Canadian Institute and may
lead to solutions of some of its unresolved problems.