

**RESERVE PRINCIPLES FOR INDIVIDUAL HEALTH INSURANCE**

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INTRODUCTION

This paper presents the findings of the Society of Actuaries' Committee on Individual Accident and Health Valuation Principles. This committee was appointed by the Society at the request of the (C) Committee Technical Task Force of the National Association of Insurance Commissioners (NAIC) (currently the Life, Health and Accident Standing Technical Actuarial Task Force). While examining proposed new tables for policy reserves for medical expense insurance, the (C) Committee Technical Task Force decided that new input was desirable regarding statutory reserve standards for both policy reserves and claim reserves.

Because there was a question as to the propriety of a Society of Actuaries' committee recommending specific statutory valuation rules and tables, we limited our study to "principles" as opposed to "practices."

Our initial findings were set forth in a draft report that was exposed to the Society membership in January 1982. Many comments were received from Society members. During a panel discussion at the autumn 1982 Society of Actuaries' meeting, additional comments were made. Based on the comments, some changes were incorporated. The revised report was submitted to the Society of Actuaries' Board of Governors which recommended that the report be submitted as a paper rather than be published as an expression of opinion of a Society committee. Essentially, there were two reasons for the decision: the report was not completely responsive to the original NAIC request that we study statutory valuation standards, and as our committee was small, it was therefore unclear as to whether or not our report represented a consensus of Society members.

This paper represents only the views of its authors and is not an official report of the committee. We hope that it stimulates further consideration of valuation principles, progression toward a consensus on such principles, and appropriate follow-up by actuarial organizations and the NAIC toward establishing those principles. While the principles expressed herein were developed in the context of individual health insurance, they are general in nature and would seem to extend to other types of insurance—including life insurance. For that reason, our findings should be of interest to a broader

range of actuaries than just health actuaries. This interest should be especially keen since our findings suggest that the use of narrowly defined promulgated tables, which fail to recognize some of the factors impacting on future costs and which are applied over a broad range of companies, markets, and underwriting practices, is subject to question.

Because of the differences in subject matter, this paper is divided into two main sections covering policy reserves and claim reserves. It is prefaced by some remarks on the accounting principles applicable to reserve principles.

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#### ACCOUNTING PRINCIPLES

All aspects of business transactions or cycles usually are not completed simultaneously. For example, in manufacturing, there can be a considerable time lag between the purchase of materials, the delivery of goods sold, and the collection for sales. In such a case, there is no one theoretically correct time when profit (or loss) should be recognized via accounting statements. If purchase orders are received before materials are bought, a legitimate viewpoint might call for profit to be booked at the time of the purchase orders. Anyone selling a business might include this profit in the "value" of the company. Yet another viewpoint might call for deferring the booking of profit until the time of delivery or collection. Even transactions related to expected future sales could be booked in the present. Conversely, anticipated transactions related to past sales might go unrecorded if they were legally avoidable.

This problem regarding the timing of booking profit or loss (and its impact on surplus) is also applicable to insurance transactions. If an annual premium is collected, should the profit (or projected profit) stemming from the premium period be booked immediately; be booked on a prorated basis; be deferred until the insurance period terminates (or even until all claims and expenses are identified); or should a loss be booked initially and then recovered over the premium period?

Under current NAIC accounting for annual premium collections, profits can be immediately realized under life insurance while losses are often booked under health insurance (ignoring profits or losses stemming from other statutory accounting practices). Under life insurance, annual premium collections generate offsetting commission and premium tax expenses and a net premium increment to the life reserve. No liability for administrative expenses that will be incurred over the premium payment period is recognized

(except for collection costs in excess of the loading). This can produce a profit greater than that which is ultimately realized. Under health insurance, the use of a gross unearned premium reserve, without an offset that recognizes commissions, premium taxes, and other expenses already incurred on such premiums, produces a book loss. These differences in treatment derive from the fact that health insurance was originally viewed as a casualty coverage and was accounted for based on statutory principles and practices applicable to such insurance.

The timing of insurance profits is more complicated than for most other business endeavors because of the long-term nature of renewable contracts; the variations in the level of expenses, claims, and investment income (and sometimes premiums) over the contract period; and the long-term nature of claim obligations under many contracts. The accounting approach could vary all the way from booking lifetime profits at the time of issue (e.g., to determine the value of the in-force business for sale purposes) to deferring profits until each contract is concluded and its profit a certainty. An example of an intermediate approach would be to spread the book profits over the life of the policy (e.g., based on a "release from risk" method). The timing of profits under NAIC accounting seems to stem from the approach of conservatively valuing assets and liabilities rather than from any formal viewpoint regarding the timing of profit. Conservatism in statutory accounting stems partially from the limited recognition of the recoverability of excess initial expenses. This differs from generally accepted accounting principles where greater recognition is given to that recoverability.

In discussing policy and claim reserves, it is important to note that these two types of reserves are used to split liabilities into future versus past categories, respectively. It is not absolutely essential to adopt these two separate categories for accounting purposes or maintain the current definitions of future versus past if a split is used. One could set up accounts to represent the present value of each of the various categories of future receipts (e.g., premiums and investment income) and the present value of categories of the future disbursements (e.g., claims and renewal expenses). These would be adjustments to the current cash position. Under such a system, future claim payments would not have to be split into policy versus claim reserve categories.

The splitting of revenues and expenditures into past versus future categories allows one to differentiate between the impact of past versus future events on financial results (as limited or affected by other statutory accounting practices). Of course, one must define "past" and "future" when fol-

lowing this procedure. Theoretically, this kind of split should use a consistent treatment, i.e. match revenues with expenditures. This in turn requires an examination of rating principles. In this paper, the term *rating principles* encompasses the principles and practices that determine which of the various items of the lifetime revenue stream are meant to cover the various items of the lifetime expenditure stream. This involves both specific and general revenue-expenditure matching. An example of specific matching would be the determination of which revenues are meant to cover a specific claim payment. An example of general matching would be the determination of the extent that past revenues are intended to cover future claims. Under policies where the insurer retains the right to change premiums, it follows that the term *rating principles* also encompasses the principles and practices used to establish renewal premium levels to the extent that they affect the ongoing revenue-expenditure matching. It should be noted that rating principles are not spelled out in health insurance contracts. Therefore, one must turn to historic actuarial practice, internal company rules and intent, and regulatory limitations to determine them.

One could split claims and premiums into past versus future categories several ways. One method would involve splitting future claim payments into claim reserves (past) versus policy reserves (future) based on contractual language regarding claims. For example, future claim payments which are independent of premium payments beyond the accounting date could be allocated to past. Then, one would theoretically account for premiums on a consistent basis based on applicable rating principles. In other words, those premiums intended to cover the defined past claims would be booked as earned (whether collected or not) while collected premiums meant to cover future claims would be unearned. An alternative approach would be to split premiums on a pro rata basis to past (earned) and future (unearned or policy reserve) categories and then account for claims consistently based on rating principles (i.e., future claim payments would be allocated to claim reserves versus policy reserves based on whether the defined past or future premiums were meant to cover them). Currently, neither track is being followed completely since there is not a complete matching based on rating principles. Of course, in practice, one can adopt accounting rules on a nonmatching basis to fulfill some purpose (such as practicality or conservatism).

In order to proceed with our study, we assumed that premiums and claims would continue to be allocated into past versus future categories. Policy reserves would encompass future revenues and expenditures while claim reserves would encompass past claims. We have not presumed, however,

how past and future should be defined. Our only presumption is that they should theoretically be defined consistently for both revenues and expenditures based on rating principles. As stated, in practice, this consistency might not be maintained. Inconsistency should have no impact on surplus measurement as it only shifts items from one category to the other (e.g., future claim payments from policy reserves to claim reserves). These shifts can cause confusion, however, since they create theoretical inconsistencies or conflicts between the premium and claim components of policy reserves.

While recognizing that NAIC accounting requires conservative measurement of surplus, we made no effort to study the appropriate level of conservatism for their purposes. The NAIC attempts to attain conservatism by:

1. Using conservative morbidity and interest assumptions in policy reserve calculations.
2. Ignoring terminations other than death in policy reserve calculations.
3. Allowing only partial recognition of renewal-premium-expense loading margins over renewal expenses under policies requiring policy reserves and disallowing any recognition under other policies.
4. Supporting conservatism in claim reserves.

## POLICY RESERVES

### *Definition*

Policy reserves are a natural outgrowth of the interplay of rating principles and the insurance cost environment under renewing policies. For renewable policies subject to changing claim costs due to aging, inflation, and so on, insurers sometimes adopt rating plans whereby premiums do not change in exact unison with the cost changes. Under such rating plans, early premiums are often calculated to at least partially fund higher future claim costs. Simultaneously, initial premiums may be insufficient to cover initial expenses with insurers relying on future premium margins to recover the shortages. In addition, initial premium levels may anticipate increasing future expenses related to the cost of administering increasing claims, inflation, or both.

The developing cash position under such plans must be adjusted by recognizing certain "liabilities" to the extent that the insurer's future revenues will need to be supplemented by current assets in order to meet future costs. Such liabilities are referred to as policy reserves. Under statutory accounting, these reserves should provide an adequate level of dedicated assets to meet a reasonable range of anticipated future levels of experience through the

adoption of conservative reserve tables and calculations. It is the function of surplus to cover costs in excess of those conservatively anticipated.

Policy reserves might best be defined as the present value of the shortfall of future *earned* revenues in meeting future *incurred* expenditures relative to in-force policies. Future earned revenues or incurred expenditures are those which are conceptually allocated to insurance periods subsequent to the valuation date, based on rating principles.

Since this definition would result in booking the present value of lifetime profits when a policy is issued, an alternate definition which provides a more conservative measure of solvency and the orderly booking of profit would treat future profits the same as future expenditures in the shortfall calculation. Future profits could be calculated on many bases, including the use of conservatism in the experience assumptions.

Since some of the future earned revenues or incurred expenditures may have already been collected or paid, further accounting entries (e.g., unearned premiums) are necessary which fall outside of our definition of policy reserves. To the degree that these accounting entries are classed as policy reserves (as is currently the case), the definition of policy reserves becomes more complex since adjustments stemming from rating plans would be combined with adjustments for prepaid revenues or expenditures.

### *Traditional Approach*

The initial development of the concept of policy reserves took place under level-premium life insurance. This is because the use of level premiums in life insurance and the resulting reserves were firmly established before the broad development of individual health insurance. Under life insurance, companies adopted premium rates which remained constant over the premium-paying period in spite of the fact that mortality costs increased with age. Since mortality costs in later policy years would exceed the mortality portion of the adopted level premiums, insurers were required to set up policy reserves in recognition of this future shortage. Policy reserves also cover nonforfeiture liabilities accrued under life insurance. Aside from nonforfeiture values, the applicable principle was that the reserves represented the amount by which future revenues would be insufficient to meet future costs.

As stated, a conservative approach has been taken in establishing the minimum amount of policy reserves for statutory accounting purposes, and this conservatism was assumed to be gained by the combined effect of:

1. Using conservative morbidity and interest assumptions in policy reserve calculations.

2. Ignoring terminations other than death in policy reserve calculations.
3. Disallowing recognition of some or all future expense margins.

This traditional approach adopted in life insurance was later extended to individual health insurance. Such reserves have played an important role in the continuing solvency of the life insurance industry (as indicated by a report contained in the NAIC *Proceedings*, II (1969), 564).

### *Shortcomings of the Traditional Reserve Table Development for Individual Health Insurance*

The extension of life insurance reserving principles to individual health insurance has produced shortcomings. (Perhaps this is because those reserve standards were designed for level-premium life insurance products which had less volatile experience that was also more consistent between companies.) One such shortcoming is that the degree of conservatism, if any, is unknown, since there has been no examination or testing of realistic or nonconservative reserves against the adopted minimum standards. The minimum standards have been developed solely from aggregate morbidity experience (with loadings to provide for statistical fluctuations) and statutorily prescribed mortality and interest bases. There has been no examination or testing of many of the other environmental factors impacting on future income and costs and, therefore, on the level of funds which are necessary to ensure company solvency. The ignored environmental factors include but are not necessarily limited to (1) policy-duration differences in morbidity, (2) secular trends, (3) effects of different underwriting standards, (4) inflation in claims and expense, (5) persistency, (6) regulation, (7) expanding governmental insurance programs, and (8) gross premium levels. While expenses have not been ignored under traditional standards, their recognition has been only on an indirect basis (using modifications to net level reserves). This indirect method may not be the most appropriate, since it may fail to impart the desired level of conservatism. This is particularly true in view of past and anticipated future inflation in expenses. The fact that the traditional approach has failed to deal with inflation in either claims or expenses may be because it was developed prior to any material level of inflation.

A second shortcoming of the traditional approach is the difficulty it has given actuaries attempting to determine the impact on reserves of different renewal and rate-revision provisions contained in policies. This difficulty stems from the conflict between the concept that conservatism should increase as guarantees increase and the lack of a clear-cut tool to bring about different levels of conservatism under the traditional approach.

Not being able to deal with morbidity cost differences among insurers and with changes in such costs after issue is another especially important shortcoming. Since principles have not been established for determining the degree of conservatism that should be maintained in policy reserves, actuaries have used their own judgment about the level of conservatism and the offset of nonconservative morbidity with environmental factors not reflected in the statutory reserve process (e.g., renewal expense margins).

Finally, the traditional approach does not deal adequately with the impact that rate revisions on in-force policies have on the level of reserves that should be maintained.

### *The Need to Review Statutory Reserve Principles and Practices for Health Insurance*

It was timely that the NAIC asked for an examination of policy reserve principles because of the many environmental changes that have taken place since the traditional approach to policy reserves was established. The significance of many types of secular trends is now recognized. These secular trends stem not only from inflation but from underlying changes taking place in our social structures and health care delivery systems. We also have greater knowledge under some benefits about select and ultimate morbidity patterns, so we can give them greater recognition in establishing minimum reserves. In addition, premium increases under some benefit packages have become a way of life and should be dealt with more realistically in reserve determination. Government regulation of premium rates has increased each year and has an impact on the premium rates that will be charged and, therefore, on the adequacy of such premiums in providing for future claims and expenses. Lastly, the development of computer technology enables actuaries to apply more sophisticated methods to and extend their examination and testing of proposed tables.

### *Additional Comments on Policy Reserve Principles Related to Health Insurance*

Traditional tabular reserves have not adequately dealt with inflation and adverse morbidity trends under policies which retain the right to adjust premiums. Because of the number of approaches that could be taken in dealing with such trends throughout the life of ongoing policies, it is readily apparent that rating principles and reserve principles are highly related. In other words, the system used to determine the stream of premiums in such an environment is critical in determining appropriate reserves. To the degree that regulators impact on this stream, their actions are also critical.



It is also important under health policies to distinguish between statutory policy reserves and the funds that should be recognized in the rate-determination process. The purpose of statutory reserves is to conservatively measure solvency while funds used in rate determination should take into account equity for both insurers and their policyholders. These different objectives do not necessarily coincide.

Since it is not always feasible to set initial premiums which will cover all future costs under an inflationary environment, the role of policy reserves under some coverages in measuring solvency is diminished. Here, the majority of the funds that will be needed to meet future claims and expenses under in-force policies will have to come from future premiums. Therefore, the rating principles that are applied and the approval by regulators of continuing, necessary rate increases are extremely important in both the establishment of the necessary level of policy reserves and the ultimate solvency of the individual health insurance industry.

#### *Statutory Reserve Principles for Noncancellable Policies*

For policies which provide for neither rate increases nor cancellation, it is especially important that reserves should be related to the amount of funds which will reasonably assure solvency taking into account all aspects of the risk environment. This means that stringent standards should be adopted for determining minimum reserves and their margins. Those standards should ensure that such margins actually exist yet avoid margins which are excessive to the point that they reduce competition and increase prices to the detriment of the public and the insurance industry. Any proposed minimum reserve standards would be tested against a reasonable range of environmental scenarios in order to ensure that the promulgated standards produce reserves that cover a reasonable range of anticipated experience.

In many cases, the traditional approach to the development of statutory minimum reserves for individual health insurance has resulted in inadequate reserves under current environmental conditions. This is because of unrecognized factors and other reasons such as outdated morbidity tables. Our committee made a cursory study of this situation through the calculation of solvency funds which incorporate various assumptions regarding environmental factors. A summary of the results of these calculations follows (details of the calculations are shown in the appendix):

COMPARISON OF POLICY RESERVES WHICH RECOGNIZE  
DIFFERENT ENVIRONMENTAL FACTORS

(All Reserves based on Male Issue Age 45, 5 Percent Interest,  
1974 \$1,000 Miscellaneous Hospital Benefit Claim Costs  
with or without Adjustment\*)

TERMINAL LEVEL PREMIUM RESERVE PER POLICY REMAINING IN FORCE

Policy Year	Unadjusted Claim Costs with Mortality Terminations Only	Realistic Persistency Replacing Mortality	Claim Costs Adjusted for Select and Ultimate Morbidity	Claim Costs Adjusted for 10%/Year Inflation	Recognition of Expenses**	Expenses Adjusted for 10%/Year Inflation**	Premiums Loaded 5%**
1	\$ 15.47	\$ 8.74	\$ 21.32	\$ 88.23	\$ -32.29	\$ -30.29	\$ -62.30
5	68.49	61.13	138.33	700.95	530.47	567.15	514.65
10	109.70	105.66	215.29	1,386.53	1,296.65	1,343.57	1,296.01
15	102.34	107.19	207.19	1,635.55	1,594.53	1,675.98	1,644.67
19	31.11	35.23	66.88	618.06	617.53	646.07	638.04
Valuation Premium	\$ 68.60	\$ 62.11	\$ 58.28	\$ 123.61	\$ 191.45	\$ 198.76	\$ 208.70

\* Lapses or deaths assumed to occur at the beginning of each year and interest is applied to premiums, claims and expense on a mid-year basis.

\*\* Prospective Gross Premium Reserves

The purpose of these calculations is to show the impact of various environmental factors on the level of necessary premiums and reserves and, thus, the importance of their recognition in adopting minimum reserve standards. This was accomplished by producing a series of reserve tables wherein each table incorporates a new or revised environmental factor from those contained in the previous one. These tables were calculated on a net-level, terminal basis for males issue age forty-five with coverage terminating at age sixty-five.

Actually, the reserve tables in the appendix are the prospective asset shares based on the underlying assumptions. Since expense factors are not brought into account until table 5, the reserves for the first four tables are on a net basis. Since expenses are incorporated in the last three tables, these reserves represent a prospective gross premium valuation.

While all of the calculations are based on a one thousand dollar miscellaneous hospital benefit, examples based on disability or other coverages would have been equally valid. Table 1 uses the claim costs from the 1974 Miscellaneous Hospital Table. These claim costs are combined with 1958 CSO mortality and 5 percent interest. The additional tables are as follows:

Table 2— This table replaces the 1958 CSO mortality table with a persistency table. The persistency table is thought to be representative

of the general level of persistency under this type of coverage.

- Table 3— This table adds the assumption that claim costs vary by policy duration. It was assumed that first-year claim costs are 70 percent of the 1974 Table and that this cost increases gradually to 131 percent in the twentieth policy year.
- Table 4— This table adds inflation as an additional environmental factor. Claim costs are assumed to increase by 10 percent per year starting with the second policy year. This table illustrates the impact of secular trends which can also occur under disability insurance.
- Table 5— This table incorporates expenses as percentages both of premiums and claims as well as per-policy expenses. These expenses were assumed to be considerably higher in the first policy year than thereafter.
- Table 6— This table expands to reflect inflation in expenses. Again, 10 percent inflation was assumed starting with the second policy year. This inflation assumption only affects expenses per policy and not those which are assumed to be a percentage of premiums or claims.
- Table 7— All of the previous tables assume that the premium used in the reserve calculation is that produced by the underlying cost assumptions. In normal situations, companies will include risk or profit margins in their gross premiums. In order to include this environmental assumption, this table is based on the assumption that gross premium calculations include an added 5 percent risk charge to the costs used in the previous table. Obviously, this assumption reduces the amount of funds needed to ensure solvency. Conversely, solvency funds would increase dramatically if the initial gross premium was insufficient to cover lifetime costs.

These calculations demonstrate that many environmental factors, previously excluded from reserve calculations, can have a significant influence on the amount needed to ensure solvency. As stated, solvency reserves are also impacted by the level of gross premiums.

Under noncancellable policies, anyone developing a minimum reserve standard should examine the solvency funds that would be necessary under a reasonable range of anticipated environments taking into account every important environmental factor. In other words, reserve standard testing would not ignore persistency, inflation, durational cost variations, and so on, nor would it ignore the actual gross premiums being charged. In addition,

standards regarding conservatism for statutory accounting purposes would have to be defined and taken into account. This process would require using a computer since a large number of assumption variations would be studied. Knowledge about the range of the solvency funds needed under various circumstances would be used to determine the minimum standards. This is under the presumption that it would be appropriate to adopt a minimum standard which was independent of variations in environmental factors by company. Such a monolithic standard may not be appropriate in some situations if gross premiums, persistency, or other environmental factors vary significantly by company.

An obvious advantage of making this computer analysis is that each insurer and regulator would automatically gain considerable insight about the appropriateness of any adopted standard as related to a given environment. This would help them determine whether or not adopted minimum standards are appropriate for a given insurer and policy form and, therefore, whether or not there can be certification as to the adequacy of reserves. A useful by-product of such an analysis is that the adequacy of premiums can be tested.

#### *Statutory Reserve Principles for Policies which Allow Premium Adjustments and Nonrenewal*

Many individual accident and health policies are subject to environmental factors which can have a severely detrimental impact on future claims and expenses. These factors include inflation and changing utilization patterns. The initial premium rates for such policies usually do not incorporate loadings to completely cover such future cost increases, and therefore, companies must rely on premium adjustments and nonrenewal to cope with them. In such an environment, reserve principles must cope with changing premiums as well as all the environmental factors discussed regarding reserves for non-cancellable policies.

Under policies subject to these cost increases, there will be a stream of future claims and expenses which must be met with a stream of future premiums, interest, and asset dissipation. Therefore, it is readily apparent that the rating principles that apply in determining the premium stream must be known before the related reserves or solvency funds can be determined. In other words, rating principles and reserving principles are interrelated, not independent. For example, if premiums were to be adjusted each year to cover that year's costs, then there would be no need for policy reserves to measure solvency except as might be needed for future rate inadequacies. (Such rate inadequacies might stem from a company's inattentiveness in

applying for rate increases; lack of incorporating sufficient trends in its rate calculations; or the inability to gain regulatory approval for adequate rates.) Statutory principles of conservatism would then be used in determining the role of reserves versus surplus.

At the other extreme, if a company was not going to change premiums or cancel, no matter what future costs arose, then one would apply the reserve principles applicable to noncancellable policies. In between these two extremes, there are many methods of determining the stream of premiums to meet claims and expenses. Each possibility would create different statutory reserves based on the applicable rating principles.

Currently, the principles and practices used to determine premium changes may vary by company as well as by policy form within a company. In addition, companies cannot adopt rating principles and practices completely independently because regulators are placing limitations on those principles and practices. Even in the regulatory arena there is a lack of uniformity because rating rules vary by state, by actuary within a state, and possibly by type of coverage. Rating principles and practices range from ignoring past experience in the rate determination process to using tabular reserves or actual past experience in determining the amount of current assets which will be used (in addition to future premiums and interest) to meet future claims and expenses. Current systems for calculating rate adjustments on in-force policies also vary as to length of the projections incorporated in the calculations. Such calculations can be based on a very short-term projection all the way to a lifetime projection.

Since it is impractical to illustrate reserve principles under every possible rating principle and practice, we are limiting our discussion to two situations. An understanding of these two cases should aid considerably in understanding the principles applicable to other situations.

#### *Adjusted-Loss-Ratio Approach*

One approach to rate-revision determination, which uses tabular reserves, has been based on the examination of adjusted loss ratios. In this instance, the historical annual-loss-ratio trend is examined wherein tabular active life reserve changes are added to incurred claims before dividing by earned premiums. These adjusted loss ratios, including projections, are then related to the anticipated lifetime loss ratio in determining whether or not a rate adjustment is needed. In this situation, the assets, represented by the active life reserves being used, are automatically sufficient to ensure solvency since future premiums are adjusted to provide funds to cover claims not provided

for by such assets. Exceptions would arise if claim cost projections fell short or if the expense portion of the premium (i.e., the complement of the anticipated loss ratio) was less than actual expenses.

In essence, the tabular reserves being maintained under this approach can be viewed as serving two functions. First, they measure the equity of current policyholders in accumulated assets to help meet future costs (and the level of the responsibility of insurers to accumulate assets for this purpose). Second, they ensure proper measurement of company solvency.

Obviously, consideration should be given to maintaining reasonable policyholder equity when establishing minimum standards which are to be used in this manner in the rerating process. This means that diligence should be applied in maintaining modern tables, especially under benefits subject to inflation. It also means that the impact on equity of modifications to net level reserves should be taken into account. Future inflation should not be included in such tabular standards beyond that incorporated in the original premium assumptions. Continuing inflation beyond that contained in the minimum standard would be funded by premium increases.

The following example provides insight as to how the adjusted-loss-ratio approach works and how out-of-date reserve tables and inflation impact on this approach. This example depicts a \$500 deductible; \$10,000 maximum; 80 percent coinsurance major medical policy, where net level policy reserves are based on 1978 claim costs; 1958 CSO mortality; and 3 percent interest (obtained from *Individual Health Insurance*, Vol. II (1979), by Nelson & Warren, Inc.). The example involves a male, issue age forty-five, with coverage extending to age sixty-five with the initial level gross premium calculated to produce a 60 percent loss ratio (on a noninterest-adjusted basis) using 1981 claim costs and persistency. The 1981 claim costs reflect 10 percent annual inflation from the 1978 claim costs. To discover the effect of not using modern reserve tables, actual experience was first depicted as assumed in the gross premium calculations. To discover the effect of using an inflation-free reserve table and initial gross premium in an inflationary environment, additional calculations were included depicting continuation of inflation at the 10 percent level.

In these examples, using an out-of-date reserve table, even without continuing inflation, can produce adjusted loss ratios which indicate the need for a rate increase at later policy durations as great as 35 percent. Further, under a continuing inflationary environment, there is a need for rate increases at a higher level than inflation. This happens because the aging funds that are used are at the 1978 cost level, and rate increases beyond inflation are

EXAMPLE FOR MALES, ISSUE AGE 45, TERM TO 65  
 \$500 DEDUCTIBLE, \$10,000 MAXIMUM,  
 80 PERCENT COINSURANCE MAJOR MEDICAL INSURANCE  
 60 PERCENT ANTICIPATED LOSS RATIO  
 ORIGINAL LEVEL GROSS PREMIUM \$579.92

POLICY YEAR	PERSISTENCY FACTOR	1981 CLAIM COSTS	CHANGE IN POLICY RESERVES*	ANTICIPATED LOSS RATIO		
				Without Policy Reserve Adjustment	With Policy Reserve Adjustment	Indicated Premium Adjustment Factor**
1	1.00	\$223.61	\$143.90	.39	.64	1.07
2	.70	232.55	80.48	.40	.54	.90
3	.75	242.56	44.36	.42	.50	.83
4	.80	255.82	28.39	.44	.49	.82
5	.85	273.84	27.32	.47	.52	.87
6	.88	296.04	20.65	.51	.55	.92
7	.90	321.84	10.29	.55	.57	.95
8	.92	350.67	3.26	.60	.61	1.02
9	.92	381.94	-24.01	.66	.62	1.03
10	.92	414.98	-51.55	.72	.63	1.05
11	.92	448.97	-78.70	.77	.63	1.05
12	.92	483.13	-104.81	.83	.65	1.08
13	.92	516.61	-129.29	.89	.67	1.12
14	.92	549.25	-152.06	.95	.69	1.15
15	.92	581.54	-173.65	1.00	.70	1.17
16	.92	613.72	-194.34	1.06	.72	1.20
17	.92	646.09	-214.55	1.11	.74	1.23
18	.92	678.92	-234.66	1.17	.77	1.28
19	.92	711.85	-251.55	1.23	.80	1.33
20	.92	744.64	-274.50	1.28	.81	1.35

\* Per policy in force during the year using net level terminal reserves based on 1978 claim costs, 1958 CSO mortality, 3 percent interest. The change in reserves includes the effect of lapses which are assumed to take place at the beginning of each policy year.

\*\* Adjusted loss ratio  $\div$  anticipated loss ratio of 60 percent.

necessary to cover the impact of continuing inflation on 1981 aging costs. The ultimate premium under the inflationary environment is 12.30 times as great as the original premium while the twentieth year claim cost is 20.37 times as great as the initial claim cost. Thus, the adoption of a level gross premium versus a step-rated premium reduces the premium increase over the twenty years from 1,937 percent to 1,130 percent and reduces the final premium by 39.6 percent.

FIGURES WITH CLAIM COSTS ADJUSTED FOR 10 PERCENT INFLATION

Policy Year	Inflation Factor	Loss Ratio with Policy Reserve Adjustment	Indicated Premium Adjustment Factor
1.....	1.0000	0.64	1.07
2.....	1.1000	0.58	0.96
3.....	1.2100	0.59	0.98
4.....	1.3310	0.63	1.06
5.....	1.4641	0.74	1.23
6.....	1.6105	0.87	1.45
7.....	1.7716	1.00	1.67
8.....	1.9487	1.18	1.97
9.....	2.1436	1.37	2.28
10.....	2.3579	1.60	2.67
11.....	2.5937	1.87	3.12
12.....	2.8531	2.19	3.65
13.....	3.1384	2.58	4.30
14.....	3.4523	3.01	5.02
15.....	3.7975	3.50	5.83
16.....	4.1772	4.08	6.80
17.....	4.5950	4.74	7.90
18.....	5.0545	5.52	9.20
19.....	5.5599	6.40	10.67
20.....	6.1159	7.38	12.30

*The NAIC Approach*

The NAIC recently adopted another approach to determining rate adjustments on in-force policies. Here, premium-increase calculations recognize the accumulated value of prior premiums and claims. This recognition occurs because the actuarial present value of the sum of the past and future claims divided by the actuarial present value of the sum of past and future premiums must meet minimum loss ratio standards.



For example, assume the following:

Present value of past claims	\$1,000,000
Estimated present value of future claims	<u>1,000,000</u>
Total	\$2,000,000
Present value of past premiums	\$2,000,000
Estimated present value of future premiums at current rate level	1,000,000
Applicable loss ratio	60%

Under this example, the allowed rate increase percentage,  $K$ , is determined by:

$$\frac{\text{Present value of lifetime claims}}{\text{Present value of lifetime premiums as adjusted by rate increase } K} = \text{Applicable loss ratio}$$

Therefore,

$$\frac{\$2,000,000}{\$2,000,000 + (1 + K)\$1,000,000} = .60$$

$$K = 33 \text{ percent}$$

An examination of this formula discloses that the present value of net, future premium deficiencies (assuming that the applicable loss ratio portion of premiums is available for claims) equals:

$$\text{Present value of future claims} - \text{present value of future or adjusted premiums} \times \text{Applicable loss ratio} \quad (1)$$

or in this instance,

$$\begin{aligned} & \$1,000,000 - (1 + 33\%)\$1,000,000 \times .60 \\ & = \$200,000 \end{aligned}$$

This is seen to be equal to the present value of past margins as determined by:

$$\text{Present value of past premiums} \times \text{Applicable loss ratio} - \text{Present value of past claims} \quad (2)$$

or in this instance,

$$\begin{aligned} & \$2,000,000 \times .60 - \$1,000,000 \\ & = \$200,000 \end{aligned}$$

Thus, the present value of future losses, which must be funded from past experience (the policy reserve), is equal to the present value of funds actually accumulated. Of course, this is an oversimplification because it has been assumed that the present value of the past and future expenses and risk charges are exactly equal to the complement of the desired loss ratio times the present value of past and future gross premiums, respectively. This may not be the case, especially where initial expenses are proportionately higher than renewal expenses.

The following is a more realistic situation which includes expenses (risk charges are ignored for simplicity):

Let

- $EP_t$  = Actual past or expected future earned premiums on a pro rata basis including the impact, if any, of implemented rate increases;
- $IC_t$  = Actual past or expected future incurred claims;
- $FE_t$  = Expected future fixed expenses independent of premiums;
- $VE_t$  = Expected future variable expense as percentage of premiums;

where

$t$  = calendar year

and further, let

$i$  = the initial calendar year of the policy form

and

$c$  = the current calendar year.

Then, the expected present value of the shortage of future gross premiums in meeting future claims and expenses (i.e., the nonconservative policy reserve or solvency fund) is:

$$\sum_{c+1}^{\infty} v^{t-c-1/2} \{ IC_t + FE_t - (1 - VE_t) \times EP_t \}. \tag{3}$$

To the extent that the present value of expected future expenses, i.e.,

$\sum_{c+1}^{\infty} v^{t-c-1/2} (FE_t + VE_t \times EP_t)$ , is not equal to the allowed expenses,

i.e.,  $\sum_{c+1}^{\infty} v^{t-c-1/2} EP_t (1 - \text{Applicable loss ratio})$ , implicit in formula (1), then

nonconservative policy reserves would differ from formula (1).

In other words, to the extent that the loss ratio used in the NAIC formula allows for greater than estimated future expenses (in order to reflect amortization of excess initial expenses), policy reserves based on formula (1) will be conservative by an amount equal to:

$$\sum_{c+1}^{\infty} v^{t-c-1/2} \{ (1 - \text{Applicable loss ratio} - VE_t) EP_t - FE_t \}.$$

To the extent that this margin (if any) is ignored in setting statutory reserves, financial statements would show conservative financial results and possibly losses. It is obvious that early statutory losses would result in most cases if reserves were based on formulas (1) or (2) because initial expenses usually exceed average renewal expenses.

Recognizing future expense margins (or unamortized past expenses) in determining statutory liabilities is similar, in principle, to allowing preliminary term or modified net level reserves under the tabular reserve system currently in use. One practical (but not fully analyzed) method of using this principle with the NAIC approach is to ignore early morbidity margins in calculating reserve liabilities under formula (2). For example, if the first year morbidity margins were ignored, solvency reserves would be based on:

$$\sum_{t+1}^c (1+i)^{c-t+1/2} \{ EP'_t (\text{Applicable loss ratio}) - IC'_t \} \quad (4)$$

where  $EP'$  and  $IC'$  eliminate the first policy year experience. The shortcoming of this approach is that the appropriateness of such an arbitrary system cannot be ascertained without analysis, and the reserve amount would be inappropriate near the termination of the form where the first-year morbidity margins eliminated in this manner may be extremely large compared to the remaining premiums, claims, and expenses.

Another approach would be to recognize lower renewal expenses (as an offset to high initial expenses) in formula (1). In other words, modify formula (1) to:

$$\sum_{c+1}^{\infty} v^{t-c-1/2} \{ IC_t - EP_t (\text{Applicable loss ratio} + \Delta) \} \quad (5)$$

where  $\Delta$  represents a conservative estimate of the difference between life-time-expense ratios and renewal-expense ratios.

Because formulas (2) and (4) do not fully release reserves until every policy issued under a given form has been terminated, it is evident that a

modification of these formulas should be allowed when it is reasonably certain that future premium increases will not be needed and retrospectively determined policy reserves are excessive. We therefore suggest that insurers be allowed to switch to a prospective gross premium valuation (as in formula (5)), in such circumstances, as long as the actuarial reserve certification makes adequate disclosure of the extent to which such a system is in use.

### *Findings Regarding Policy Reserves*

Based on our deliberations, we have found the following:

1. Policy reserves are a natural outgrowth of rating principles applicable to renewable policies which call for an income stream which does not match the timing or amount of the expenditure stream.
2. Reserve standards should recognize, implicitly or explicitly, all factors impacting on revenues and costs.
3. Under the current statutory concept, reserves should be the conservative amounts which, together with future revenues, are needed to meet anticipated future costs. It is the function of surplus to cover costs in excess of those conservatively anticipated.
4. There is a distinct difference between establishing conservative statutory reserves and reserves under generally accepted accounting principles which are based on the "release from risk" concept.
5. Since statutory reserves are intended to contain conservatism, standards and principles regarding such conservatism must be established before appropriate reserve tables or standards can be adopted.
6. One goal of statutory reserves is to conservatively measure liabilities and corollary solvency. Therefore, such reserves do not necessarily reflect policyholder equity in insurer assets for determining premium rate revisions.

### CLAIM RESERVES

#### *Definition*

As previously stated, claim reserves\* stem from the traditional NAIC accounting approach of splitting revenues and expenditures into past versus future categories (e.g., future revenues and expenditures are represented by policy reserves and unearned premiums while past claims are represented by claim reserves). In other words, claim reserves represent the present value

\*In this dissertation, the term "claim reserves" is usually used to represent both claim reserves and liabilities as contained in the statutory accounting statement for life insurers. The difference between reserves and liabilities will be discussed later.

of future claim payments assigned to past transactions. Theoretically, the past and future should be defined consistently for both premiums and claims as determined by rating principles. To the extent that policy provisions define (or are used to determine) past versus future premiums and claims, those provisions come into play in determining the allocation of future claim payments to policy versus claim reserves.

Where an insurance contract is not renewable and the insurance period has run out, it is obvious that future claim payments must be covered by claim reserves since no future premiums exist. Where the insurance period has not run out (unearned premiums exist) or where renewal premiums are possible, it is sometimes not as clear-cut whether certain future claim payments are meant to be met by past or future earned premiums.

For at least two reasons, future claim payments, related to past occurrences that the insurer cannot avoid by contract termination, have been historically relegated to claim reserves. First, there may be no assurance that future premium revenue will be earned. Thus, the conservative approach is to charge such claim payments against past revenues. Second, it has been historically assumed that past revenues were intended to provide for such claims. There are exceptions, of course. For example, under social insurance programs and uninsured pension programs, future claim payments related to past coverage are often assumed to be funded by future revenues.

Greatest confusion may exist where contractual liabilities do not relate solely to date of occurrence but also are dependent on the date of delivery of medical care and the continued in-force status of the policy. An example would be a "calendar year," major medical policy which covers medical care costs for accidents or sicknesses occurring while the policy is in force if that medical care is received while the policy is in force. On examining the claim payments relative to hospitalization continuing after December 31 which commenced before December 31 (for determining claim reserves as of December 31), one must determine whether premium revenues earned before or after December 31 are intended to fund such claims. Contract provisions are not necessarily indicative and one must look to unstated rating principles. Where a viable continuing block of policies will remain in force, it could be an acceptable rating practice to cover such continuing claim payments via future earned premiums. On the other hand, insurance regulators could adopt conservative standards which preclude the recognition of such rating practices when calculating claim reserves.

Similarly, a future medical treatment (or period of disability) may be a near certainty but has not yet commenced as of the valuation date. An

example would be an insured who has completed a period of treatment or disability related to a condition likely or certain to reoccur. Further, it may be highly likely that the insured will maintain the coverage in force by timely premium payments which are considerably less than the impending claim payments. Again, the underlying question is whether the applicable rating principles call for these future claim payments to be funded by past or future premiums. It seems appropriate to recognize a viable rating plan using future premiums for this purpose unless statutory principles of conservatism prohibit the plan's recognition. The need for conservatism relates to the level of viability or workability of the applicable rating principles.

One must also look to rating principles in determining if claims during the grace period are to be provided for in claim reserves or policy reserves. It is possible that a viable rating plan would collect sufficient premiums from continuing policyholders (as supplemented by grace-period premium charges against grace-period claims) to cover grace-period claims.

### *Contract Provisions*

Historically, contract provisions for determining the responsibility of the insurer to make claim payments often have been used as the only important criteria for determining the claim payments to be covered by claim reserves. In other words, rating principles have not been examined. This is probably because most policies do not require continued in-force status to maintain claim entitlement, and the rating principles for such policies have been tacitly assumed to flow from their claim provisions.

Where such assumed rating principles are proper because of contract language, accepted practice, or conservatism, it is appropriate to look to contract provisions regarding claims. The controlling provisions include those dealing with the date of occurrence or manifestation, the period of coverage, and the termination of liability.

*Date of occurrence.* Policy contract obligations may be delineated by definitions of or requirements for (1) the date the event, which gave rise to a disabling condition, occurs (that is, an occurrence of an accident or the commencement of an illness), (2) the date the disabling condition is first manifested, (3) the date any other policy provision is met (for example, under medical expense insurance, the date any deductible is satisfied or, under disability income insurance, the date any elimination period is satisfied), and (4) the date an expense obligation inures to the insured (for example, under medical expense insurance, the date on which a medical service is received). Among various insurance contracts, these requirements can

differ internally by benefit as well as between types of plans (for example, disability income insurance versus medical expense insurance).

Early policies required that the occurrence of an accident or commencement of an illness must fall within an insurance period in order for coverage to apply. For accident insurance, the necessity for this requirement is obvious. For sickness insurance, however, such a requirement as a condition for insurance coverage has been set aside by court decisions and state statutes and regulations. For the purpose of determining prior origin, the time when the sickness would be first recognized by a prudent citizen is construed as the time of occurrence.

The nature of occurrence or manifestation required by a policy sometimes depends on the type of insurance coverage being provided. For example, for disability income insurance, an insured person's inability to perform gainfully in his occupation or an occupation for which he is reasonably suited by education or training, or in any gainful occupation, or in any combination of these may be required to occur during a period of insurance coverage. In addition, some disability income policies require that the manifestation of an "accident" disability must occur within a specified period of time from the date of the accident, otherwise the disability is considered a "sickness" disability. (Court decisions in some states may have set aside this requirement.)

For "principal" or "capital" payment for loss of limb or life under accident insurance, most policies require that the loss occur within a specified period of time from the date of the accident causing loss, where the date of the accident must fall within the period of insurance coverage. Such policies usually do not require that the loss fall within the period of insurance coverage.

*Period of coverage.* Within the terms and requirements of a policy contract, insurance coverage is provided during an insurance period for which premiums are paid and accepted. Also, a policy contract may defer the commencement of insurance coverage for some insurance contingencies into the insurance period (for example, under medical expense insurance, the coverage of tonsillitis which may lead to a tonsillectomy may be deferred for thirty days after issue) or may extend the insurance coverage beyond the insurance period for which premiums have been paid (for example, under medical expense insurance, deferred maternity coverage). And finally, a number of states have statutes which require that the period of insurance coverage extend beyond the period for which premiums are paid (i.e., the grace period).

*Termination of coverage.* Various types of provisions exist which terminate claim liability under a covered accident or sickness. These provisions deal with continuing disability, continuing premium payments, and other requirements. For example, most disability income insurance policies do not require that the policy be kept in force (that is, that additional periods of insurance coverage be purchased) for the claim payments to be made for a disabling condition which first manifests itself during a period of insurance coverage. However, such policies usually contain a waiver of premium benefit which maintains the policy in force during a period of disability.)

Under medical expense insurance, the "per disability" policy contracts do not generally require that a policy be maintained in force for insurance payments to continue to be made on account of a disabling condition which first manifests itself during a period of insurance coverage. However, under major-medical-expense insurance, there exists a strong and growing trend to require that the policy must be in force at the time of treatment in order for the related expense to be covered. This trend is especially evident under individual major medical policies containing the increasingly popular "per-calendar-year" deductible provision.

Under policies that do not require maintenance of in-force status in order to continue coverage of a condition occurring during a period of coverage, there is often a recurrent provision that defines continuing disability for coverage purposes. For example, such a provision may state that after a lack of treatment, expense, or disability for six months, any subsequent treatment etc., will be considered to stem from a new accident or sickness.

*Claim liabilities versus reserves.* Current statutory practice for life insurance companies calls for differentiating between reserves and liabilities. Both these items represent future claim payments which are allocated to past earned premiums.

The amount of future claim payments which are not contingent on continuing treatment, expense, or disability are represented by claim liabilities. Such payments are said to be accrued. Those payments contingent on continuing treatment, expense, or disability are represented by claim reserves. Such payments are said to be unaccrued. For example, for a life insurer producing its statutory financial statement as of December 31, future claim payments related to periods of disability or medical expense prior to January 1 would be represented by claim liabilities while such claim payments related to periods of disability or medical expense after December 31 would be represented by claim reserves.



*Interest discounts.* As with policy reserves, claim reserves represent present values of future claim payments. Because of the time value of money, the solvency of insurers which have long-term financial obligations is appropriately measured taking into account investment income on funds held to meet future expenditures. Based on the statutory practice of conservatism in measuring solvency, the interest rate, if any, used for this purpose should be appropriately conservative taking into account the actual invested funds of the insurer and the yield and safety of such investments.

*Conservatism.* Beyond the use of conservative interest discount rates, the conservative approach to the measurement of solvency may call for incorporating additional safety margins in claim reserves. In other words, reserves greater than those called for by "best estimates" are used. These margins should vary directly with the level of uncertainty involved and fall within guidelines adopted by the regulators to fit their purpose.

*Claim administration expense reserves.* Accounting principles usually call for the establishment of reserves for claim administration expenses related to future claim payments covered by claim reserves. Again, such reserves stem from rating principles. If past premium income is meant to be used to meet such expenses, then claim expense reserves should be maintained. Those future expenses to be covered by future premium income would not be reserved (unless the rating principle involved is not viable or regulatory conservatism calls for its disregard). In most instances, the rating principles and their viability would be consistent regarding both the related future claim payments and the claim administration expense.

*Methodology in calculating claim reserves.* In determining claim reserves, the particular methodology to be used for a given line of insurance coverage should recognize and be sensitive to the forces affecting that line of coverage and should result in a reserve with a high probability of being realistic. Such forces to be recognized should include those internal to the administration of claim payments (such as changes in procedures and systems; fluctuations in the volume of business; fluctuations in the size and quality of staff; and evolution of sufficient and necessary statistical information), as well as those external to the administration of claim payments (such as changes in rates of inflation and unemployment; changes in secular trends of using medical services and facilities; changes in medical technology; and changes in public expectations and ethics).

In the calculation of a claim reserve by a particular methodology, efficiency, economy, administrative handling, availability of information, as-

signment of dates, and materiality are important considerations. While it is one thing to justify a particular methodology within the framework of the preceding practical considerations (even though the methodology may not be in complete accord with or reflect the legal obligations and rating principles of a policy contract), it is quite another thing to argue that the methodology does in fact technically represent an insurer's obligations. The selection of appropriate methodology is governed by acceptable actuarial practices, whereas the determination of the substance or elements of a claim reserve is governed by actuarial principles. The degree to which the consequences of conforming to a particular practice produces values different from the values resulting from conforming to proper principles is the degree to which the practice produces inaccurate reserves.

*Findings regarding claim reserves.* Based on our deliberation, we have found the following:

1. Claim reserves, in principle, stem from rating principles. That is, claim reserves represent future claim payments which are meant to be met by past premiums (and their investment income).
2. In most cases, rating principles are not contractually stated but in practice are consistent with contractual provisions which determine claim obligations. In other words, past premium income is usually to be used to meet those future claims which are independent of coverage termination as of the accounting date.
3. Possible exceptions to the previous generality involve claims beginning during the grace period; claims stemming from continuing medical expense under calendar year, major medical policies; and claims related to insureds who are highly likely (or certain) to become claimants in the future. Here, the adopted rating practice may be less certain and vary by policy or insurer. In addition, regulators may wish to address these situations taking into account their goals regarding the conservative measurement of solvency.
4. To the degree that future claim payments will be deferred, reasonably conservative interest-discount factors could be applied.
5. While practical considerations may be taken into account in calculating claim reserves, insurers should determine that the resulting reserve values are appropriate in relationship to those stemming from underlying theory. This includes recognition of reserve differences by type of coverage, secular trends, inflation, changes in distribution of business, changes in administrative procedures, and the impact of new sales on the relative level of claim reserves.

6. Reserves should contain margins in keeping with regulatory principles of conservatism.
7. Additional reserves should appropriately recognize claim administrative expenses as called for by rating principles and as modified by statutory principles of conservatism.
8. It is necessary to examine the bases for both the policy reserves and the claim reserves in determining that appropriate or consistent principles have been applied to a specific block of business.

#### CONCLUSIONS

Concluding from our study and findings, we believe clarification of statutory accounting principles regarding policy and claim reserves is needed. Historically, some of these reserves have been developed without explicit guidelines resulting in confusion and conflict. Delineated principles would act as a guide to the development of future reserve tables and standards. These principles should deal clearly with the relationship between rating principles and reserves and provide the reasons for deviating from rating principles if such deviation is deemed appropriate.

Further, rationalized guidelines are needed regarding the degree of recognition of all future costs and the factors affecting them. This would include the degree of recognition of the impact of inflation on future claims and expenses.

Also, standards and principles of conservatism to be used in establishing statutory minimum reserves as well as in the calculation of adequate reserves for actuarial certification purposes need to be established.

Finally, because the underlying rating principles, experience, and gross premiums affecting policy and claim reserves may vary significantly by insurer as well as policy form, standards for monitoring and testing the reasonableness of reserves need to be adopted.

APPENDIX

TABLE I

MALE, ISSUE AGE 45, TERMINATION AGE 65

Claim Costs: 1974 \$1.000 Miscellaneous Hospital Table Unadjusted  
 Interest: 5%  
 Persistency: 1958 CSO  
 Expenses: None  
 Profits: None

Policy Year	Persistency Rates	Gross Premium Per Policy	Claim Costs Per Policy	Expenses			Policy Reserve
				Percentage of Premium	Percentage of Claims	Per Policy	
1	100.000	\$68.60	\$ 53.56	0	0	0	\$ 15.47
2	99.465	68.60	55.20	0	0	0	30.06
3	99.417	68.60	56.84	0	0	0	43.80
4	99.364	68.60	58.50	0	0	0	56.63
5	99.305	68.60	60.19	0	0	0	68.49
6	99.240	68.60	61.91	0	0	0	79.33
7	99.168	68.60	63.70	0	0	0	89.01
8	99.089	68.60	65.60	0	0	0	97.40
9	99.004	68.60	67.57	0	0	0	104.35
10	98.911	68.60	69.65	0	0	0	109.70
11	98.810	68.60	71.89	0	0	0	113.20
12	98.700	68.60	74.31	0	0	0	114.57
13	98.579	68.60	76.91	0	0	0	113.52
14	98.446	68.60	79.79	0	0	0	109.61
15	98.300	68.60	82.99	0	0	0	102.34
16	98.141	68.60	86.27	0	0	0	91.38
17	97.966	68.60	89.83	0	0	0	76.19
18	97.776	68.60	93.50	0	0	0	56.30
19	97.569	68.60	97.37	0	0	0	31.11
20	97.343	68.60	101.35	0	0	0	0

TABLE 2  
 MALE, ISSUE AGE 45, TERMINATION AGE 65

Claim Costs: 1974 \$1,000 Miscellaneous Hospital Table Unadjusted  
 Interest: 5%  
 Persistency: Assumed (to reflect lapses and deaths)  
 Expenses: None  
 Profits: None

Policy Year	Persistency Rates	Gross Premium Per Policy	Claim Costs Per Policy	Expenses			Policy Reserve
				Percentage of Premium	Percentage of Claims	Per Policy	
1	100.000	\$62.11	\$ 53.56	0	0	0	\$ 8.74
2	70.000	62.11	55.20	0	0	0	20.19
3	75.000	62.11	56.84	0	0	0	33.67
4	80.000	62.11	58.50	0	0	0	47.89
5	85.000	62.11	60.19	0	0	0	61.13
6	88.000	62.11	61.91	0	0	0	73.14
7	90.000	62.11	63.70	0	0	0	83.70
8	92.000	62.11	65.60	0	0	0	91.95
9	92.000	62.11	67.57	0	0	0	99.35
10	92.000	62.11	69.65	0	0	0	105.66
11	92.000	62.11	71.89	0	0	0	110.57
12	92.000	62.11	74.31	0	0	0	113.69
13	92.000	62.11	76.91	0	0	0	114.59
14	92.000	62.11	79.79	0	0	0	112.67
15	92.000	62.11	82.99	0	0	0	107.19
16	92.000	62.11	86.27	0	0	0	97.58
17	92.000	62.11	89.83	0	0	0	82.97
18	92.000	62.11	93.50	0	0	0	62.53
19	92.000	62.11	97.37	0	0	0	35.23
20	92.000	62.11	101.35	0	0	0	0

TABLE 3  
 MALE, ISSUE AGE 45, TERMINATION AGE 65

Claim Costs: 1974 \$1,000 Miscellaneous Hospital Table Adjusted to Reflect  
 Underwriting Selection  
 Interest: 5%  
 Persistency: Assumed (to reflect lapses and deaths)  
 Expenses: None  
 Profits: None

Policy Year	Persistency Rates	Gross Premium Per Policy	Claim Costs Per Policy	Expenses			Policy Reserve
				Percentage of Premium	Percentage of Claims	Per Policy	
1	100.000	\$58.28	\$ 37.49	0	0	0	\$ 21.32
2	70.000	58.28	41.95	0	0	0	48.71
3	75.000	58.28	46.61	0	0	0	80.16
4	80.000	58.28	52.07	0	0	0	111.57
5	85.000	58.28	57.78	0	0	0	138.33
6	88.000	58.28	61.91	0	0	0	161.34
7	90.000	58.28	65.61	0	0	0	180.72
8	92.000	58.28	70.19	0	0	0	194.05
9	92.000	58.28	73.65	0	0	0	205.72
10	92.000	58.28	77.31	0	0	0	215.29
11	92.000	58.28	81.24	0	0	0	222.18
12	92.000	58.28	85.46	0	0	0	225.72
13	92.000	58.28	89.98	0	0	0	225.14
14	92.000	58.28	94.95	0	0	0	219.37
15	92.000	58.28	100.42	0	0	0	207.19
16	92.000	58.28	106.11	0	0	0	187.46
17	92.000	58.28	112.29	0	0	0	158.60
18	92.000	58.28	118.75	0	0	0	119.05
19	92.000	58.28	125.61	0	0	0	66.88
20	92.000	58.28	132.77	0	0	0	0

TABLE 4  
 MALE, ISSUE AGE 45, TERMINATION AGE 65

Claim Costs: 1974 \$1,000 Miscellaneous Hospital Table Adjusted to Reflect  
 Underwriting Selection and Inflation  
 Interest: 5%  
 Persistency: Assumed (to reflect lapses and deaths)  
 Expenses: None  
 Profits: None

Policy Year	Persistency Rates	Gross Premium Per Policy	Claim Costs Per Policy	Expenses			Policy Reserve
				Percentage of Premium	Percentage of Claims	Per Policy	
1	100.000	\$123.61	\$ 37.49	0	0	0	88.23
2	70.000	123.61	46.15	0	0	0	211.72
3	75.000	123.61	56.40	0	0	0	365.28
4	80.000	123.61	69.31	0	0	0	535.07
5	85.000	123.61	84.60	0	0	0	700.95
6	88.000	123.61	99.71	0	0	0	860.85
7	90.000	123.61	116.23	0	0	0	1,011.89
8	92.000	123.61	136.78	0	0	0	1,141.38
9	92.000	123.61	157.88	0	0	0	1,267.55
10	92.000	123.61	182.29	0	0	0	1,386.53
11	92.000	123.61	210.72	0	0	0	1,493.19
12	92.000	123.61	243.83	0	0	0	1,581.00
13	92.000	123.61	282.40	0	0	0	1,641.70
14	92.000	123.61	327.79	0	0	0	1,664.45
15	92.000	123.61	381.34	0	0	0	1,635.55
16	92.000	123.61	443.25	0	0	0	1,539.12
17	92.000	123.61	515.97	0	0	0	1,354.56
18	92.000	123.61	600.22	0	0	0	1,057.59
19	92.000	123.61	698.38	0	0	0	618.06
20	92.000	123.61	812.01	0	0	0	0

TABLE 5

MALE, ISSUE AGE 45, TERMINATION AGE 65

Claim Costs: 1974 \$1,000 Miscellaneous Hospital Table Adjusted to Reflect Underwriting Selection and Inflation  
 Interest: 5%  
 Persistency: Assumed (to reflect lapses and deaths)  
 Expenses: As Indicated (no reflection of inflation)  
 Profits: None

Policy Year	Persistency Rates	Gross Premium Per Policy	Claim Costs Per Policy	Expenses			Policy Reserve
				Percentage of Premium	Percentage of Claims	Per Policy	
1	100.000	\$191.45	\$ 37.49	75	5	\$40.00	\$ - 32.29
2	70.000	191.45	46.15	10	5	7.50	70.80
3	75.000	191.45	56.40	10	5	7.50	207.31
4	80.000	191.45	69.31	10	5	7.50	366.40
5	85.000	191.45	84.60	10	5	7.50	530.47
6	88.000	191.45	99.71	10	5	7.50	694.54
7	90.000	191.45	116.23	10	5	7.50	854.12
8	92.000	191.45	136.78	10	5	7.50	996.52
9	92.000	191.45	157.88	10	5	7.50	1,136.34
10	92.000	191.45	182.29	10	5	7.50	1,269.65
11	92.000	191.45	210.72	10	5	7.50	1,391.22
12	92.000	191.45	243.83	10	5	7.50	1,494.34
13	92.000	191.45	282.40	10	5	7.50	1,570.53
14	92.000	191.45	327.79	10	5	7.50	1,608.65
15	92.000	191.45	381.34	10	5	7.50	1,594.53
16	92.000	191.45	443.25	10	5	7.50	1,511.82
17	92.000	191.45	515.97	10	5	7.50	1,339.17
18	92.000	191.45	600.22	10	5	7.50	1,051.49
19	92.000	191.45	698.38	10	5	7.50	617.53
20	92.000	191.45	812.01	10	5	7.50	0



TABLE 6  
 MALE, ISSUE AGE 45, TERMINATION AGE 65

Claim Costs: 1974 \$1,000 Miscellaneous Hospital Table Adjusted to Reflect Underwriting Selection and Inflation  
 Interest: 5%  
 Persistency: Assumed (to reflect lapses and deaths)  
 Expenses: As Indicated (reflecting inflation)  
 Profits: None

Policy Year	Persistency Rates	Gross Premium Per Policy	Claim Costs Per Policy	Expenses			Policy Reserve
				Percentage of Premium	Percentage of Claims	Per Policy	
1	100.000	\$198.76	\$ 37.49	75	5	\$40.00	\$ - 30.39
2	70.000	198.76	46.15	10	5	8.25	79.61
3	75.000	198.76	56.40	10	5	9.08	224.78
4	80.000	198.76	69.31	10	5	9.98	393.52
5	85.000	198.76	84.60	10	5	10.98	567.15
6	88.000	198.76	99.71	10	5	12.08	740.36
7	90.000	198.76	116.23	10	5	13.29	908.38
8	92.000	198.76	136.78	10	5	14.62	1,057.90
9	92.000	198.76	157.88	10	5	16.08	1,204.35
10	92.000	198.76	182.29	10	5	17.68	1,343.57
11	92.000	198.76	210.72	10	5	19.45	1,470.08
12	92.000	198.76	243.83	10	5	21.40	1,576.84
13	92.000	198.76	282.40	10	5	23.54	1,655.00
14	92.000	198.76	327.79	10	5	25.89	1,692.95
15	92.000	198.76	381.84	10	5	28.48	1,675.98
16	92.000	198.76	443.25	10	5	31.33	1,587.10
17	92.000	198.76	515.97	10	5	34.46	1,404.21
18	92.000	198.76	600.22	10	5	37.91	1,101.29
19	92.000	198.76	698.38	10	5	41.70	646.07
20	92.000	198.76	812.01	10	5	45.87	0

TABLE 7

MALE, ISSUE AGE 45, TERMINATION AGE 65

Claim Costs: 1974 \$1,000 Miscellaneous Hospital Table Adjusted to Reflect Underwriting Selection and Inflation
Interest: 5%
Persistency: Assumed (to reflect lapses and deaths)
Expenses: As Indicated (reflecting inflation)
Profits: 5% of Unloaded Premium

Policy Year	Persistency Rates	Gross Premium Per Policy	Claim Costs Per Policy	Expenses			Policy Reserve
				Percentage of Premium	Percentage of Claims	Per Policy	
1	100.000	\$208.70	\$ 37.49	75	5	\$40.00	\$ - 62.30
2	70.000	208.70	46.15	10	5	8.25	40.91
3	75.000	208.70	56.40	10	5	9.08	179.76
4	80.000	208.70	69.31	10	5	9.98	343.60
5	85.000	208.70	84.60	10	5	10.98	514.65
6	88.000	208.70	99.71	10	5	12.08	686.88
7	90.000	208.70	116.23	10	5	13.29	855.15
8	92.000	208.70	136.78	10	5	14.62	1,006.32
9	92.000	208.70	157.88	10	5	16.08	1,154.64
10	92.000	208.70	182.29	10	5	17.68	1,296.01
11	92.000	208.70	210.72	10	5	19.45	1,424.96
12	92.000	208.70	243.83	10	5	21.40	1,534.51
13	92.000	208.70	282.40	10	5	23.54	1,615.85
14	92.000	208.70	327.79	10	5	25.89	1,657.43
15	92.000	208.70	381.34	10	5	28.48	1,644.62
16	92.000	208.70	443.25	10	5	31.33	1,560.47
17	92.000	208.70	515.97	10	5	34.46	1,382.98
18	92.000	208.70	600.22	10	5	37.91	1,086.23
19	92.000	208.70	698.38	10	5	41.70	638.04
20	92.000	208.70	812.01	10	5	45.87	0

## DISCUSSION OF PRECEDING PAPER

E. PAUL BARNHART:

While this paper has illustrative and practical value, it could have had greater value in developing reserve principles for individual health insurance, which it tells us are wholly dependent upon rating principles, had it not limited the definition of *rating principles*: "the term *rating principles* encompasses the principles and practices that determine which of the various items of the lifetime revenue stream are meant to cover the various items of the lifetime expenditure stream."

This is only one narrow consideration among the many that ought to make up any examination of a very broad subject. Should not rating principles also encompass contingency margins, risk classification, allocation of expenses, methods of selecting interest assumptions, assumptions and time periods for projection of trends, and so on, not to mention the traditional triad of adequacy, equity, and reasonableness? While the definition chosen obviously has a relationship to cash-flow considerations, the paper focuses on recognition of profit, with virtually no direct attention to cash-flow considerations and little to the recognition of liability. The "bottom line" seems to have become the "top line."

It is possible to develop viable actuarial rating principles that take no specific account of matching at all: on the one hand is the income stream, actual and/or projected; on the other hand, the expenditure stream, actual and/or projected. The reserve principles then arise from analyzing the comparative retrospective or prospective values of each aggregate stream at any given point in time. If gross premiums and gross expenditures constitute the income and expenditure streams, this is essentially a gross premium valuation. No particular revenue item need be matched with any expenditure item at all.

The paper presents no systematic or organized development of specific principles or even broad sets of principles. While there is considerable and useful illustration, the authors' basic concept of rating principles remains vague. There is little guidance as to just how one actually goes about the process of matching particular revenue items with particular expenditure items, beyond division into "past" and "future." Is the proposed matching of items necessary at all?

The paper does not address the question of soundness of rating or reserving principles. Are there no unsound rating or reserving principles to be avoided?

The closest the paper comes to conceding that there might be something lacking in a selected set of rating principles is during discussion of the comparatively minor topic of claim administrative expense reserves: "Those future expenses to be covered by future premium income would not be reserved (unless the rating principle involved is not viable . . .)." Nowhere else is there any mention of viability, soundness, or any similar cautionary term.

Repeatedly the authors advise that we must look to rating principles to make an appropriate determination of claim reserves; that is, to determine the unpaid claim liability that exists at any valuation date. For example, the authors state that "one must determine whether premium revenues earned before or after December 31 are intended to fund such claims." Concerning the first of several findings regarding claim reserves, the authors state that "claim reserves, in principle, stem from rating principles. That is, claim reserves represent future claim payments which are meant to be met by past premiums (and their investment income)."

I fundamentally disagree. Claim reserves do one thing: they measure existing incurred but unpaid claim liability. Such liability, as of any point in time, has absolutely nothing to do with rating principles. It arises wholly and solely from the insured's existing benefit obligations, and it will be nothing else but what those obligations ultimately determine it to be. It may be one thing for an insurer to depend on next year's premiums to fund this year's unpaid liability, but to go further and assert that this in turn means the insurer can actually defer recognition of that liability into next year is something else. The seeds of insolvency germinate vigorously in that kind of soil!

Rather than say any more about the treatment given in the paper to claim reserves, I refer readers to the *Record*, Vol. 8, No. 4, pages 1568-72, where I discussed this matter at some length.

MARK E. LITOW:

This paper addresses issues which have been controversial in the accident and health field. While my opinions essentially support the principles espoused by the authors, I believe clarification is needed on several topics.

*Soundness of Rating Principles:* Soundness as a concept associated with rating principles is not discussed specifically in the paper. Rather, the use of sound rating principles is implied throughout. Certainly no actuary would contemplate otherwise. In this context, rating principles should mean only sound rating principles; that is, principles applied so as to produce a reasonable and prudent matching of revenues and disbursements. In the process, gross premiums are produced that meet contract obligations as well as expenses, commissions, and profit goals.

*Relationship of Reserves to Rating Principles:* The intertwining of both claim and active life reserves and rating principles is frequently noted in the paper. However, some actuaries do not believe that rating principles play a role in establishing such reserves. In response to this argument, I have the following comments:

1. *Claim Reserve*—This item is calculated based on a set of incurral dating rules, which needs to be defined initially in developing claim costs as well as final contractual provisions. Where incurral dating rules are not defined in regard to claim costs, improper matching of claims and premiums is likely to result. The argument that claim reserves and rating principles have no relationship has little merit, since the incurral dating rules will clearly impact incurred claims and the matching of disbursements to revenues.
2. *Active Life Reserve*—This item is calculated based on a comparison of net premiums and claim costs over the life of a policy, or some term period, and recognition of unearned premiums. Since the premiums and/or claim basis used in generating these components emanate from the initial development of rating principles, the argument that the policy and unearned premium reserves do not have a relationship with rating principles is unsound.

*Incurral Dating, Termination Assumption versus Going Concern Concept:* Either of these concepts can be built into the incurral dating method and also be consistent with rating principles. A definition for each is as follows:

1. *Termination Assumption*—Espouses the idea that all policies are terminated as of the valuation date with the claim reserve established via this principle. This may mean that contingencies occurring after the valuation date, or unaccrued liabilities, are ignored, depending on contract wording.
2. *Going Concern Concept*—Reflects the possibility of contingencies occurring after the valuation date that are related to events before the valuation date. As such, unaccrued liabilities would be recognized more often in these situations.

On this topic the actuarial profession needs to address the following questions:

1. Is a termination assumption reasonable for establishing reserves and testing for the solvency or going-concern capability of a company?
2. Are funding programs that approach pay-as-you-go consistent with the philosophy of statutory reserving?

*Policy Reserves Rating Principles:* As stated in the paper, policy reserves have often served as one of the major sources of conservatism for insurance companies. In addition, they are generally artificial in nature, which coincides well with the conservative tendencies here. Therefore, I see no reason to change either practice as long as these characteristics are properly reflected in the rating principles employed over the life of the policy.

*Rating Principles and Regulations:* The application of rating principles and their flexibility in the development of reserves do not preclude the

possibility of regulation. To the contrary, regulation would still be necessary to monitor proper and consistent use of rating principles in conformity with various guidelines and rules established by state insurance departments. As such, use of rating principles would not be unregulatable.

My thanks to the authors for this timely and excellent paper.

(AUTHORS' REVIEW OF DISCUSSION)

SPENCER KOPPEL, FRANCIS T. O'GRADY, GARY N. SEE,  
AND ROBERT B. SHAPLAND:

We thank the discussants for taking time to address the subject of individual health insurance contract and claim reserves. Their discussion is valuable since it provides further insight into this subject which we hope will lead to some consensus.

Mr. Barnhart's observations indicate that we did not make the scope and purpose of our paper clear. We basically intended to limit ourselves to a theoretical discussion. This meant looking at theoretical rating and accounting principles used in establishing bookkeeping entries that move one from cash accounting to accrual accounting.

The reason we included little discussion of practical considerations is because we felt that the theoretical foundation of reserves should be studied before moving on to practical statutory valuation standards. This is the reason we did not attempt to discuss the soundness of various rating principles.

We agree that if actual developing experience indicates that intended rating principles will not be realized or if regulators decide to add conservatism for practical reasons, then statutory reserves would differ from those established by theoretical principles. As indicated, discussions of these matters were beyond the scope of our paper. However, we continue to feel that theoretical principles should be the foundation or starting point in developing statutory rules which take these other matters into account.

Mr. Barnhart correctly observes that reserves could be based on gross premium valuations. However, this procedure is complicated when future premiums are subject to change. Here, the rating principles that will be used to set future premium levels come into play. The rating principles determining which claim payments are chargeable to future premiums are also important to the extent that allocation of claim payments to past versus future premiums impacts on the level of future premiums.

Regarding the deferral of recognizing claim liabilities brought about by premium/claim matching, we feel that proper matching theoretically can create a situation where future premiums offset current or past claim obligations (e.g., where level premiums are being charged for the decreasing costs of maternity benefits). However, the general subject of matching was

included primarily to address the appropriateness of deferring recognition of contingent claims under calendar year major medical policies, wherein ongoing liability is subject to ongoing in-force status. From a theoretical matching standpoint, we feel that claim reserves under such policies should recognize ongoing claims if they are to be funded by past earned premiums. If they are to be funded by future earned premiums, then these ongoing claims would be recognized under contract reserves. Mr. Barnhart's AAA Subcommittee on Liaison with the NAIC Accident and Health (B) Committee has recommended that these contingent claims never be recognized in claim reserves, regardless of applicable rating principles. His committee does recognize these claims in contract reserves, but this recognition could be subject to offsets by future margins.

Also in regard to deferring recognition of obligations, Mr. Barnhart's subcommittee supports deferring recognition of contract reserves (or new business expenses) via preliminary term systems based on recognition of future revenue margins.

While we agree that contract provisions establish the future claim payments that will be made by the insurer, regardless of rating principles, we feel this does not preclude the allocation of future claim payments to claim reserves versus contract reserves based on rating principle matching.

Mr. Litow points out that the rating principles being utilized should be ignored to the extent that they will fail to be realized. For example, if an insurer intends to adjust premiums in future years in order to maintain a profit in each future year, but inflation, antiselection, and/or state regulation will keep the insurer from realizing this intention, then contract reserves should be adjusted accordingly.

We agree with Mr. Litow that when making a decision as to whether unaccrued claims contingent on in-force status should be charged to past or future revenues, one should consider the rating principles being used; the viability of those rating principles; and the NAIC concept of conservative accounting. Charging contingent claims to past premiums via claim reserves, where this is called for by an insurer's rating principles, automatically satisfies all three of these considerations. Charging contingent claims against future revenues by recognizing them in contract reserves would be proper if consistent with viable rating principles in use, but this may not meet the test of conservatism (as Mr. Litow points out).

Since contract reserves are based on the going concern concept, the allocation of contingent claims to claim reserves versus contract reserves may be more a matter of proper matching of claims with revenues than whether or not a going concern concept is being used. A problem with automatically delegating contingent claims to contract reserves is that this produces improper matching and, thus, improper experience analysis when such a del-

egation is in conflict with rating principles. Delegation to contract reserves may also lead to contingent claims being overlooked or their recognition deferred since the shortfall of future revenues in meeting contract reserve expenditures can be nebulous under contracts where the insurer has the right of nonrenewal and/or the right to adjust future premiums.