UNEARNED PREMIUM RESERVE FOR LONG - TERM POLICIES

Victoria S. Lusk, ACAS, MAAA

Abstract: This paper describes and evaluates the statutory rule regarding the establishment of unearned premium reserves for long-term policies and discusses the consistency of the rule with statutory laws, procedures and philosophy, specifically as regards the rule's treatment of aggregation across policy years, discount date, risk margin and application to in-force policies. The paper also provides an example of the possible effect of the rule on an insurer's statutory earned premium.

In 1995, the NAIC adopted, as part of statutory accounting practices and procedures, a rule ("rule") addressing the establishment of unearned premium reserves (UPR) for policies with a period in excess of 13 months. Despite its adoption, debate and discussion of the rule continued over the subsequent months, and the rule was, as a result, amended in September of 1997.

The purpose of this paper is to provide an explanation, clarification and justification of the rule, with the expectation that a better understanding of the intent will assist in the calculation of the required reserve. Four primary issues considered in the development of this rule are discussed in this paper:

- Aggregation (or lack of aggregation) of results across policy years.
- Discount to date of occurrence.
- Risk margin through 1.5% reduction of the discount rate.
- Application to in-force policies.

In addition, application of this rule may, in rare cases, lead to counter-intuitive results as regards statutory earned premium; this paper will discuss the possible effect of the rule on the earned premium reported in an insurer's statutory annual statement.

In the evaluation of this rule, it is important to keep in mind that the rule is part of statutory accounting practices and procedures, and to understand both the philosophy and goals of statutory accounting practices. Statutory practices and procedures have an unquestionably conservative bent, and emphasize solvency and sufficiency of surplus even to the detriment of such otherwise laudable goals as revenue/expense matching and fair market valuations.

New statutory accounting practices and rules should be consistent with past statutory accounting practices while recognizing and addressing the specific problems and requirements of the affected business. In particular, this rule is as consistent as practical with the statutory treatment of UPR for short-term policies and with loss and loss expense reserve requirements. The difficulty in attaining this consistent treatment is heightened by the fact that the current body of statutorily permitted and prescribed practices are scattered throughout various NAIC publications, statutes, regulations and departmental rulings. However, the adoption of NAIC's codification project (effective January 1, 2001) will greatly ease the burden for insurers (and regulators) searching for rules governing correct statutory presentation of financial results.

The rule is included as part of SSAP #65 in the new codification manual, and was not materially changed as a result of the codification process. Most differences between the current and codification versions are minor format changes, but the codification version also eliminates the reference to the Statutory Excess Reserve (which will no longer be required) and to the rules affecting the phase-in of the rule (which will no longer be applicable). The rule, as included in the codification manual, is included as Appendix 2 of this paper, and the following discussion is equally applicable to current and codification language.

Brief Description of the Rule

This rule, both in its original 1995 form and as amended, may be sometimes difficult in application, but is quite straightforward in concept: the UPR must be the greater of three tests, separately applied:

1. Refund of premium,
2. In proportion to losses and expenses, and
3. The present value of the outstanding losses and expenses.

Test 1 is quite straightforward: the reserve must be at least as great as the amounts that the insurer would have to return to policyholders in the case of cancellation. Most contracts currently affected by this rule have no cancellation refund provision, and thus this test rarely is applicable.

Test 2 is similar in concept to the "Warranty Insurance Reserves" UPR rule which has been included in the NAIC's Accounting Practice and Procedures handbook, and which predates the implementation of this rule. Test 2 recognizes that, for long-term policies, the assumption that losses will be incurred uniformly throughout the policy period (which is implicit in the standard pro-rata calculation of the UPR for short-term policies) may not be valid. The rule therefore requires that the actuary estimate the loss and expense incurrence pattern, and earn premium in proportion to the losses and expenses, as is the assumption underlying the UPR calculation for short-term policies.

Test 3 is a test for premium deficiencies. Prior to this rule, insurers were not required to identify (and reserve for) those policies or groups of policies for which the estimated future losses and expenses exceeded the UPR. This rule establishes a premium deficiency reserve for long-term policies. It should be noted that under the new codification requirements, and in addition to the requirements of this rule, a premium deficiency reserve will be required to be established for all deficient contract groupings for all lines of business. This new codification requirement can be found in SSAP #53, paragraph 13.

In addition, the rule requires any reduction for anticipated deductible recoveries to be secured, such as by a letter of credit, and requires inclusion of the reserve calculated under this rule to be included in the statutory Statement of Actuarial Opinion.

Purpose of an Unearned Premium Reserve

There are five common reasons given for the establishment of the UPR (per IASA's Property & Casualty Insurance Accounting, Seventh Edition, page 4-4), with the primary reason listed last:

- Compliance with government requirements.
- Refund of unearned premium.
- Funding for the payment of future losses.
- Maintenance of an amount available for the purchase of reinsurance.
- Determination of the proper recognition of revenue.

In statutory accounting, the profits on property/casualty insurance policies should not be released to earnings until there is a reasonable certainty of their attainment. Therefore, statutory accounting requires the UPR for short-term policies to be established pro-rata on the written premium, with the profits, if any, recognized ratably over the policy period. Due to the fact that the income collected to cover the initial expenses is earned evenly throughout the policy period, while the initial costs are expensed (and charged against income) immediately, statutory UPR for short-term policies are generally recognized as being redundant as regards the other purposes listed above. The rule is consistent with the statutory UPR requirements for short-term policies in that it also requires the profits of the business to be earned evenly throughout the policy period. The rule departs from the short-term policy UPR calculation requirements by permitting the immediate recognition of sufficient premium to match the initial expenses (assuming the premiums are not deficient). This change was made due to the unique nature of the affected business, recognizing that a multi-year deferral of income that is needed to match expenses paid out immediately is an unreasonable burden, especially if a significant portion of the risk is reinsured. This earlier recognition of income to match expenses results in a reduction of the level of conservatism in the resultant UPR for long-term policies.

It should also be noted that, as the UPR for short-term policies is established as a pro-rata amount of each policy, the redundancy in the statutory UPR for a profitable line or policy year is established irrespective of whether or not there exists a different line of business or policy year that is unprofitable. The redundancy in the UPR is not used to offset unexpected losses, nor are the profits anticipated to be received on future business (included in the UPR) recognized in the current financial results.

Part 1: Discussion of Issues

1. Aggregation

Aggregation of the estimates of all accident years is permitted in the establishment of loss reserves. Under this rule, however, aggregation is not permitted for the three most recent policy years, but instead requires the UPR to be the greatest of three separate tests, separately calculated for the first three policy years. Although it may therefore appear that this rule's treatment of aggregation differs from the statutory treatment of loss reserves, this requirement was designed to be consistent with the underlying statutory accounting principal that profits should not be taken into income until it is reasonably certain that the profit will be received, and that profits should be earned evenly over the policy period.

Under statutory rules, the acknowledged redundancy in the UPR for short-term policies may not be reduced to offset a known adverse loss development or known expense. Likewise, the rule should not permit a known deficiency to be offset by a projected, but uncertain, profit. To do so would result in an inconsistency between the calculation of the UPR for short-term and long-term policies.

Offsetting known losses with uncertain, projected profits

In addition, it is appropriate to remember that all reserves are estimates, and later estimates are generally better and more sure than early estimates. If an insurer is in financial difficulties, there may be a regrettable temptation to reduce the reserve estimate of the most recent

incurred years. In the development of this rule, there was concern that, if unrestricted aggregation were permitted, an insurer could offset mature policies with identifiable, certain problems by aggressively writing new business and assuming it to be adequately priced, if not highly profitable. The result would be the offsetting the known deficiencies in the older years by projecting unreasonably favorable results in the most recent years, which would be contrary to statutory rules affecting short-term policies.

2. Discounting to occurrence date

Test 3 of the rule permits discounting between the valuation date and the date the loss or expense is incurred. The discounting period may not be extended to include the period of time between the date the claim or expense is incurred, and the date that the claim or expense is paid. In other words, in the calculation of the UPR under Test 3, insurers may offset the sum of the future, undiscounted claims payments only by the investment income assumed to be earned between the valuation date and the date that the claim is incurred, not to the date that the claim is paid. This limitation was included specifically to attain consistency between this rule, and statutory standards on loss reserving. Loss reserves are established for all incurred claims, and are not generally permitted to be discounted (with the usual exception of reserves established for losses with fixed and determinable future payments). To remove this limitation would be to allow an insurer, through its UPR calculation, a benefit which is not permitted other lines of business, for parallel situations.

A second reason flows from the first; at the time that the claim is incurred, the liability for that claim is transferred from the UPR, and established in the liability for loss reserves. If discounting were allowed to the date of payment in the calculation of the UPR, the UPR for that claim at the date of incurrence would be less than the full amount of the claim (since the provision for that claim in the UPR would be reduced for the investment income assumed to be earned between the date of incurrence and the date of payment). As the loss reserve is statutorily required to be equal to the full amount of the claim, the insurer's surplus would be reduced in the amount of the remaining anticipated investment income simply because the liability for the same event transferred from one line on the balance sheet to another. The limitation on discounting only to the date of incurrence removes this discontinuity, and requires the UPR to grow to the amount needed for the claim reserve at the time the reserve is transferred. Therefore, with discounting only from the date of incurrence, the insurer does not suffer an inappropriate surplus reduction simply because the reserve for the loss is transferred from one balance sheet liability to another.

3. Risk Margin through 1.5% reduction of the discount rate

A risk margin is defined as an amount that makes some provision for the uncertainty in a reserve estimate (Actuarial SOP #20). Happily, there is a satisfying degree of concurrence on the necessity of a risk margin for discounted reserves; threaded throughout any discussion of discounting, whether it is from the NAIC, the Casualty Actuarial Society, Model Regulations, or industry sources, is the assumption that if discounting is to be permitted, then an implicit or explicit risk margin must be established.

Therefore, given the demonstrated need, and the remarkable degree of agreement by all parties on the need for risk margins in discounted reserves, the argument as it pertains to this rule should center on *how much* of a margin is indicated, not *whether* a margin should be established.

Quantification of a Risk Margin

Although there is uniform agreement that a risk margin should be established if reserves are discounted, there was, at least at the time this rule was being developed and discussed, little agreement or guidance as to how to quantify that margin. The Casualty Actuarial Society has outlined several approaches, including empirical studies, confidence interval techniques, ruin theory applications, utility theory, reduction of an otherwise indicated discount rate, and the establishment of a margin that is set at a level that a third party would require to commute the reserves. In addition to these approaches, the CAS also clearly states that a reserve margin should distinguish among the various sources of risk, and emphasizes that the reserve margin should consider the best estimate of the un-discounted reserve and the corresponding discount.

Unfortunately, many of these approaches would either be inappropriate, impractical, or compliance would entail too great an expenditure of resources by both the affected insurers and by the regulators. These practical difficulties, and the fact that the state of the art on this issue is not well advanced, have not caused a great deal of difficulty in the regulatory community within the United States primarily because the discounting of reserves is not generally permitted. However, Canada does permit reserves to be discounted; the need for risk margin standards is therefore pressing and immediate, and the response has been a standard of practice issued in November of 1993. This Canadian Actuarial Standard of Practice requires the reserves established by an insurer to include margins separately determined for each of the three valuation variables:

1. Claims development (add 2.5% - 15% to the undiscounted reserves)
2. Reinsurance recovery (add 0% - 15% to the undiscounted reserves)
3. Interest rate (reduce interest rate by 50 to 200 basis points)

Since discounting is permitted in this rule, a risk margin must be established. This rule does not require an explicit or implicit risk margin to be included in the underlying estimate of ultimate claims and expenses. It does not require an explicit or implicit risk margin in the credit for reinsurance. The provision of this rule that does require an explicit risk margin in the reserve development is the reduction of the underlying interest rate.

Incorporating a risk margin through a reduction of the interest rate is an accepted means of accomplishing this goal; Actuarial SOP #20 states that "(t)he actuary may reduce the selected discount rate as a means of incorporating a risk margin." The amount of the reduction, 1.5%, is also not unreasonable. Canada requires the rate to be reduced by between .5% - 2% in addition to an explicit margin added to the undiscounted reserve. Canada's rules are reasonable to use as a model, as Canada's system has forced a quantification of risk margins. Regulators in the United States, who do not generally permit discounting, have had the luxury of deferring the issue for further study. It is the same issue, however, and reserves do not change in content or character at the border.

All reserves are subject to unexpected and random variation of results; that is a natural consequence of the business of insurance. However, the reserve estimates underlying the unearned premium calculations for business affected by the rule are even more uncertain than loss reserves. Loss reserves are the provision for incurred but unpaid claims; the estimations underlying the calculation of the UEP reserve are for losses that have not yet even been incurred, much less has any portion of them been paid. As the risk margin should vary directly

with the uncertainty of the estimate, the risk margins for this type of reserve should be at least equal to those required for incurred but unpaid loss reserves.

Risk margin through a reduction of the interest rate

Incorporating a risk margin through a fixed, 1.5% reduction of the otherwise acceptable interest rate is a reasonable method for incorporating a risk margin. As can be seen in Appendix 1 of this paper, a 1.5% reduction provides virtually the same amount of margin for policies of the same average duration irrespective of whether the "otherwise acceptable" discount rate is between 4% and 7%. This method also provides a greater risk margin for policies that have longer payout pattern, which is an appropriate and desirable result.

Lesser of insurer's yield and T-bill rate

The rule requires the discount rate to be the lesser of the insurer's future net yield to maturity on statutory invested assets less 1.5%, and a 5-year T-Bill rate. This "lesser of" requirement is easily justified by remembering that the 1.5% reduction is intended to only adjust for the claims development and change in the payout pattern risk (claims risk). There is another, quite material risk involved with discounting, and that is the asset risk. Central to the rule is the very reasonable assumption that the more the insurer's yield rate exceeds the risk-free rate, the more asset risk the insurer has assumed. This rule accepts the T-Bill rate as an asset risk-free rate. This rule does not require the insurer to account for the asset risk if the insurer is either yielding less than the risk free rate, or up to 1.5% above the risk free rate. For example, if the T-Bill (risk free) rate is 5%, and the insurer's rate is 6.5%, the discount rate acceptable under this rule is 5%; a 1.5% to account for the claims risk, and no reduction for the asset risk. If the insurer's rate is 5.5%, the discount rate acceptable under this rule is 4%, a 1.5% reduction to account for the claims risk, and no additional reduction for the asset risk. However, if the insurer is making more than 1.5% above the risk free rate, the rule does require the insurer to account for the asset risk; for example if the insurer's rate is 7.5%, the discount rate acceptable under this rule is 5%; a 1.5% reduction for the claims risk and a 1% reduction for the asset risk.

4. Application to inforce business

This rule was primarily developed to address the problem of deficient premiums on long-term policies. Prior to the adoption of this rule, statutory accounting was silent on this specific issue, and relied only on the general requirement that an insurer should establish all known liabilities in its financial statements. This general rule may have been sufficient to require insurers to establish additional liabilities when the UPR otherwise established would be insufficient to pay for the losses associated with those unearned premiums, but lacked the needed specificity regarding the methodology of calculating this liability. Inadequate premiums have been of little concern as regards the balance sheet presentation for short-term policies; the full amount of any inadequacy of the unearned premium is quickly transferred to the loss reserves. As the vast majority of property and casualty policies are short-term, there has not been, until recently, a pressing need for more specific statutory rules on this issue. This rule may be considered less of a new requirement and more of a clarification of an existing requirement; therefore, it is quite appropriate to require application to inforce business.

Finally, if non-aggregation of the three most uncertain policy years, and the reduction of the interest rate to provide for a risk margin were not required, this rule would not be consistent with the statutory requirements imposed on short-term business. Compare, for example, an insurer selling one-year general liability policies and an insurer selling ten-year single premium warranty policies. They both will pay out losses over at least ten years. They both are subject

to future uncertainties that will affect their current estimates of outstanding losses. They both have collected the entire premium they are entitled to collect to fund these future payments within one year of issuance.

It is important to emphasis the differences and the unfair advantages that would be given the hypothetical warranty insurer, if aggregation of all policy years had been permitted and the risk margin had been eliminated. The primary differences would be as follows:

- The general liability insurer, within a year of issuance, must recognize all losses associated with that policy on an undiscounted basis despite the fact that the losses will be paid many years in the future. At the same moment, the warranty insurer with deficient premiums would be permitted to discount the great majority of future claims payments, without any sort of explicit risk margin.

- At time of policy issuance, the general liability insurer must defer virtually all of the income needed to pay acquisition expenses; the warranty insurer could recognize the income associated with those costs immediately.

- At the year end valuation date, the general liability insurer must *defer* approximately one-half of the expected profits (as well as income for approximately one-half of the initial acquisition expenses) for six months, irrespective of whether the business as a whole is profitable or unprofitable; the warranty insurer could *recognize all* expected future profits immediately, if necessary to cover anticipated deficiencies.

Under the rule, the general liability insurer and the warranty insurer would be placed on a more even basis, and would be given more consistent treatment.

Part 2: Effect of the Rule on Earned Premium

A proper application of the rule may have a somewhat counter-intuitive effect on the earned premium. If the estimate of total incurred losses and expenses, and the estimated payout pattern of those losses and expenses do not change over time, the earned premium shown in the insurer's statutory financial statement will be precisely those amounts appropriate to the losses and expenses incurred in that year. However, if the estimate of ultimate losses and expenses does change over time (as is almost inevitable), then the effect on the earned premium can be significant from year to year.

Examples

Assume an insurer writes a book of $100 single premium auto warranty policies that have a five-year duration. The non-loss related expenses are fairly well known: $20 for commission and general expense, all incurred at the time of sale. The loss and loss expense component is initially assumed to be $80. There is no possibility of cancellation, and no possible refund of premium, so Test 1 of the rule is not applicable.

Example 1
Demonstration of earning pattern
Change in payment pattern, No change in ultimate incurred

Assumptions: Policies issued in 1994; Total written Premium of $100
Losses and expenses occur at mid-year
Discount interest rate (net of 1.5% reduction) is 5%

(shaded areas are actual incurred amounts; unshaded areas are estimates as of the valuation date)

Payout Year	Valuation Date 1/1/94	12/31/94	12/31/95	12/31/96	12/31/97	12/31/98
	Actual and projected payout pattern of losses					
1994	$35	$30	$30	$30	$30	$30
1995	$30	$35	$40	$40	$40	$40
1996	$15	$15	$10	$5	$5	$5
1997	$10	$10	$10	$15	$10	$10
1998	$5	$5	$5	$5	$10	$10
1999	$5	$5	$5	$5	$5	$5
Total Loss and Expense	$100	$100	$100	$100	$100	$100
Unpaid % (sum of unshaded numbers to total)	100%	70%	30%	25%	15%	5%

Unearned Premium Calculation

Test 1	$ -	$ -	$ -	$ -	$ -	$ -
Test 2 (note 1)	$ 100.00	$ 70.00	$ 30.00	$ 25.00	$ 15.00	$ 5.00
Test 3 (note 2)	$ 91.58	$ 65.18	$ 27.69	$ 23.71	$ 14.41	$ 4.88

Valuation Date UPR

Greatest of the three tests	$ 100.00	$ 70.00	$ 30.00	$ 25.00	$ 15.00	$ 5.00

Earned Premium Calculation

Total Earned	$ -	$ 30.00	$ 70.00	$ 75.00	$ 85.00	$ 95.00
Calendar Year Earned (Written plus change in UPR)	$ -	$ 30.00	$ 40.00	$ 5.00	$ 10.00	$ 10.00

Note 1: Formula for Test 2: percent of unpaid loss and expense multiplied by total written premium.
Note 2: Formula for Test 3: present value of unpaid loss and expense, e.g.: $14.41 = $10 * v^5 + $5 * $v^{1.5}$, where v = 1/(1.05).

Note that the total estimate of ultimate losses never changed: only the payout pattern was affected. Since the premium did not prove to be deficient, the reserve is determined by Test 2. Subsequent development periods can lead to both changes in the estimated ultimate losses and expenses, and the estimated payout pattern: the effect on earned premium is more dramatic, as demonstrated in Example 2:

Example 2
Demonstration of earning pattern
Change in payment pattern, Change in ultimate incurred

Assumptions: Policies issued in 1994; Total written Premium of $100
Losses and expenses occur at mid-year
Discount interest rate (net of 1.5% reduction) is 5%

(shaded areas are actual incurred amounts; un-shaded areas are estimates as of the valuation date)

Payout Year	Valuation Date 1/1/94	12/31/94	12/31/95	12/31/96	12/31/97	12/31/98
	Actual and projected payout pattern of losses					
1994	$35	$30	$30	$30	$30	$30
1995	$30	$30	$25	$25	$25	$25
1996	$15	$15	$15	$40	$40	$40
1997	$10	$10	$10	$20	$20	$20
1998	$5	$5	$5	$15	$15	$5
1999	$5	$5	$5	$10	$5	$5
Total Loss and Expense	$100	$95	$90	$140	$135	$125
Unpaid % (sum of unshaded numbers to total)	100%	68%	39%	32%	15%	4%

Unearned Premium Calculation

Test 1	$ -	$ -	$ -	$ -	$ -	$ -
Test 2 (note 1)	$ 100.00	$ 68.42	$ 38.89	$ 32.14	$ 14.81	$ 4.00
Test 3 (note 2)	$ 91.58	$ 60.30	$ 32.57	$ 42.31	$ 19.29	$ 4.88

Valuation Date UPR

Greatest of the three tests	$ 100.00 Test 2	$ 68.42 Test 2	$ 38.89 Test 2	$ 42.31 Test 3	$ 19.29 Test 3	$ 4.88 Test 3

Earned Premium Calculation

Total Earned	$ -	$ 31.58	$ 61.11	$ 57.69	$ 80.71	$ 95.12
Calendar Year Earned (Written plus change in UPR)	$ -	$ 31.58	$ 29.53	$ (3.42)	$ 23.02	$ 14.41

Note 1: Formula for Test 2: percent of unpaid loss and expense multiplied by total written premium.
Note 2: Formula for Test 3: present value of unpaid loss and expense, e.g.: $19.29 = $15 * v^5 + $5 * $v^{1.5}$, where v = 1/(1.05).

In example 2, a change in the estimate of ultimate incurred has led to a negative calendar year earned premium amount in 1996. Although this result may seem unfortunate from the point of view of matching income and expenses (incurred losses, after all, increased $50 in that same year), please remember that statutory accounting, unlike GAAP, places greater emphasis on the balance sheet than on the income statement.

SUMMARY

Statutory accounting rules should be sufficiently conservative, fairly standardized, and consistently enforced. Moreover, compliance by the affected insurers should be reasonably determinable.

The UPR as calculated under this rule results in more consistent treatment of long-term and short-term policies, and with general statutory accounting rules and philosophy. It does, however, have elements that both increase and decrease the conservatism of the UPR:

Reduction of Statutory Conservatism

1. Allows immediate recognition of income sufficient to cover immediate claims and expenses (not permitted under statutory short-term UPR calculations), that eliminates most of the existing conservatism of a statutory UPR.
2. Permits discounting of expected losses and expenses.
3. Does not require an explicit risk margin to cover the reinsurance risk or (in many cases) the asset risk, despite the allowance of discounting.

Consistent with Statutory Conservatism

1. Establishment of a risk margin through reduction of the interest rate.
2. Non-aggregation of results for the 3 most recent policy years.
3. Discounting permitted only to the incurred date.

It must be stressed in closing that the evaluation of this rule is not just an actuarial and technical issue. Proper evaluation of the reasonableness of, and the justification for, this rule must consider statutory accounting practices, consistency with the treatment of other types of business, and the statutory principles of conservatism as well as the evaluation of purely actuarial issues.

Appendix 1

USING A REDUCTION OF THE DISCOUNT RATE TO INCORPORATE A RISK MARGIN

If a loss reserve is discounted, a risk margin must be included in the reserve. Although many methods have been suggested, two of the most practical are to increase the undiscounted reserve amount by a certain percentage, and to decrease the otherwise acceptable discount rate.

The purpose of this appendix is to demonstrate the relationship between i and j, where i is the otherwise acceptable discount rate used to discount explicitly margined reserves, and j is the discount rate adjusted to include a risk margin, and applied against unmargined reserves. It is assumed that i has already been adjusted to reflect the asset rate risk (for example, by setting i equal to the risk free rate). The difference between i and j is intended to quantify the difference necessary to account for the claims risk (including the claims development risk, and the risk that the payment pattern will materially speed up), but does not include any provision for the asset risk.

The relationship between i and j is dependent on "k" and "d," where

- "k" is the percentage increase added to the un-discounted, expected value reserve to add margin, and
- "d" is the average amount of time that the losses will be discounted.

Finally, "x" is used to represent the undiscounted, unmargined reserve.

The basic equivalency formula is as follows:

$$x*(1+k)v^{d}_{i} = x*v^{d}_{j}$$

The main limiting assumption of this model is the decision to assume that the reserves will all be paid out on the average duration date d, rather than over some loss payout pattern over the period (0,y), y>d, y= time period of last payment.

With a little algebraic simplification, the basic equivalency formula reduces to:

$$(1+j)^{d} = (1+k)^{-1} * (1+i)^{d}$$

And then to:

$$j = (1+k)^{(-1/d)} * (1+i) - 1 \qquad \text{i.e., } j = f(k,d,i)$$

As three dimensional charts are tricky to present, the results of the above formula are presented below in a set of charts. For a given interest rate i, the chart on the left displays the value of the claims risk adjusted discount rate, j, for various k and d, and i, and the chart on the right displays the difference between i and j.

For i = 4%

The value of j:

d =	2	4	6	8	10
k =					
2%	0.030	0.035	0.037	0.037	0.038
5%	0.015	0.027	0.032	0.034	0.035
7%	0.005	0.023	0.028	0.031	0.033
10%	-0.008	0.016	0.024	0.028	0.030
12%	-0.017	0.011	0.021	0.025	0.028
15%	-0.030	0.004	0.016	0.022	0.026

The difference between i and j:

d =	2	4	6	8	10
k =					
2%	0.010	0.005	0.003	0.003	0.002
5%	0.025	0.013	0.008	0.006	0.005
7%	0.035	0.017	0.012	0.009	0.007
10%	0.048	0.024	0.016	0.012	0.010
12%	0.057	0.029	0.019	0.015	0.012
15%	0.070	0.036	0.024	0.018	0.014

For i = 5%

The value of j:

d =	2	4	6	8	10
k =					
2%	0.040	0.045	0.047	0.047	0.048
5%	0.025	0.037	0.041	0.044	0.045
7%	0.015	0.032	0.038	0.041	0.043
10%	0.001	0.025	0.033	0.038	0.040
12%	-0.008	0.021	0.030	0.035	0.038
15%	-0.021	0.014	0.026	0.032	0.035

The difference between i and j:

d =	2	4	6	8	10
k =					
2%	0.010	0.005	0.003	0.003	0.002
5%	0.025	0.013	0.009	0.006	0.005
7%	0.035	0.018	0.012	0.009	0.007
10%	0.049	0.025	0.017	0.012	0.010
12%	0.058	0.029	0.020	0.015	0.012
15%	0.071	0.036	0.024	0.018	0.015

For i = 6%

The value of j:

d =	2	4	6	8	10
k =					
2%	0.050	0.055	0.057	0.057	0.058
5%	0.034	0.047	0.051	0.054	0.055
7%	0.025	0.042	0.048	0.051	0.053
10%	0.011	0.035	0.043	0.047	0.050
12%	0.002	0.030	0.040	0.045	0.048
15%	-0.012	0.024	0.036	0.042	0.045

The difference between i and j:

d =	2	4	6	8	10
k =					
2%	0.010	0.005	0.003	0.003	0.002
5%	0.026	0.013	0.009	0.006	0.005
7%	0.035	0.018	0.012	0.009	0.007
10%	0.049	0.025	0.017	0.013	0.010
12%	0.058	0.030	0.020	0.015	0.012
15%	0.072	0.036	0.024	0.018	0.015

For i = 7%

The value of j:

d =	2	4	6	8	10
k =					
2%	0.059	0.065	0.066	0.067	0.068
5%	0.044	0.057	0.061	0.063	0.065
7%	0.034	0.052	0.058	0.061	0.063
10%	0.020	0.045	0.053	0.057	0.060
12%	0.011	0.040	0.050	0.055	0.058
15%	-0.002	0.033	0.045	0.051	0.055

The difference between i and j:

d =	2	4	6	8	10
k =					
2%	0.011	0.005	0.004	0.003	0.002
5%	0.026	0.013	0.009	0.007	0.005
7%	0.036	0.018	0.012	0.009	0.007
10%	0.050	0.025	0.017	0.013	0.010
12%	0.059	0.030	0.020	0.015	0.012
15%	0.072	0.037	0.025	0.019	0.015

Conclusions:

A risk margin through a reduction to the otherwise acceptable discount rate has a number of advantages:

1. The difference between i and j for a given combination of k and d is relatively insensitive to i; as i changes from 4% to 7%, the difference between i and j remains fairly constant, as can be seen from a review of the tables to the right.

2. As demonstrated in the tables above, for the same fixed percentage reduction from i to j, the risk margin k increases with the length of the payout of the losses d. For example, with an average payout of two years, a 1.5% reduction from i translates to an explicit risk margin k of 3%-4%, while for an average payout of 10 years, the same reduction of interest rate implies a risk margin of 15%. As it is reasonable to require a larger risk margin for a longer (and therefore more uncertain) payout schedule, the fact that the risk margin implicit in a fixed interest differential is sensitive to the average payout duration is very appropriate. (The cell nearest to the 1.5% reduction has been shaded for easier comparison.)

Appendix 2

Policies with Coverage Periods Equal to or in Excess of Thirteen Months (From SSAP #65 paragraphs 21 to 33; Statutory Codification Project)

21. Some property and casualty insurance contracts are written for coverage periods that equal or exceed thirteen months. These contracts may be single premium or fixed premium policies, and generally are not subject to cancellation or premium modification by the reporting entity. The most common policies with such coverage periods are home warranty and mechanical breakdown policies. Accordingly, this guidance is primarily focused on home warranty and mechanical breakdown policies and does not apply to multiple year contracts comprised of single year policies each of which have separate premiums and annual aggregate deductibles.

22. Revenues are generally not received in proportion to the level of exposure or period of exposure. In order to recognize the economic results of the contract over the contract period, a liability shall be established for the estimated future policy benefits while taking into account estimated future premiums to be received. Unearned premiums shall be recorded in accordance with paragraphs 23 to 33 of this statement.

23. Paragraphs 24 to 33 shall apply to all direct and assumed contracts or policies ("contract"), excluding financial guaranty contracts, mortgage guarantee contracts, and surety contracts, that fulfill both of the following conditions:

a. The policy or contract term is greater than or equal to 13 months; and

b. The reporting entity can neither cancel the contract, nor increase the premium during the policy or contract term

24. At any reporting date prior to the expiration of the contracts, the reporting entity is required to establish an adequate unearned premium reserve, to be reported as the unearned premium reserve. For each of the three most recent policy years, the gross (i.e., direct plus assumed) unearned premium reserve shall be no less than the largest result of the three tests described in paragraphs 27 to 29. For years prior to the three most recent policy years, the gross unearned premium reserve shall be no less than the larger of the aggregate result of Test 1 or the aggregate result of Test 2, or the aggregate result of Test 3 taken over all of those policy years.

25. Any reserve credit applicable for reinsurance ceded shall be appropriately reflected in the financial statements with the resulting net UPR being established by the reporting entity.

26. The projected losses and expenses may be reduced for expected salvage and subrogation recoveries, but may not be reduced for anticipated deductible recoveries, unless the deductibles are secured by a letter of credit (LOC) or like security. Projected salvage and subrogation recoveries, (net of associated expenses) shall be established based on reporting entity experience, if credible; otherwise, based on industry experience.

27. Test 1 is management's best estimate of the amounts refundable to the contract holders as of the reporting date.

28. Test 2 is the gross premium multiplied by the ratio of subparagraph 28 a. to subparagraph 28 b:

a. Projected future gross losses and expenses to be incurred during the unexpired term of the contracts; and

b. Projected total gross losses and expenses under the contracts.

29. Test 3 is the projected future gross losses and expenses to be incurred during the unexpired term of the contracts as adjusted below, reduced by the present value of the future guaranteed gross premiums, if any.

a. A provision of investment income is permitted in the UPR only with respect to the projected future losses and expenses used to determine the UPR, and not with respect to incurred but unpaid losses and expenses;

b. A provision for investment income on projected future losses and expenses may be calculated to the expected date the loss or expense is incurred, not from the expected date of payment;

c. The rate of interest used to calculate the provision for investment income shall be reviewed and changed as necessary at each reporting date and shall not exceed the lesser of the following two standards:

i. The reporting entity's future net yield to maturity on statutory invested assets as shown in Schedule D, less a 1.5% actuarial provision for adverse deviations; or

ii. the current yield to maturity on a United States Treasury debt instrument maturing in five (5) years of the reporting date

d. The reporting entity's statutory invested assets shall be reduced by the loss and loss adjustment expense reserve on unpaid losses and expenses to calculate "available invested assets." If the available invested assets are less than the result of Test 3, as calculated above, an "invested assets shortfall" exists. In this event, the Test 3 reserve shall be recalculated with the provision for investment income based on the restricted amount of available invested assets.

30. For the purposes of Tests 2 and 3 above, "expenses" shall include all incurred and anticipated expenses related to the issuance and maintenance of the policy, including loss adjustment expenses, policy issuance and maintenance expenses, commissions, and premium taxes.

31. The projected future losses and expenses are to be re-estimated for each reporting date, and the most recent estimate of these projected losses and expenses is to be used in these Tests. If a range is selected and no single point in the range is identified as being the most likely, then the midpoint of the management's estimate of the range shall be used. For purposes of this statement, it is assumed that management can quantify the high end of the

range. If management determines that the high end of the range cannot be quantified, then a range does not exist, and management's best estimate shall be accrued.

32. The reporting entity shall provide an Actuarial Opinion and Report in conformity with the NAIC *Annual Statement Instructions for Property and Casualty Insurers*. The scope paragraph on the actuarial opinion shall include the following three items: the Reserve for Ceded Unearned Premiums (as reported on page 3 of the Annual Statement), the Reserve for Direct Unearned Premiums (as reported on the State Page) and the Reserve for Net Unearned Premiums (as reported on page 3). These three items must also be covered in the opinion and relevant comments paragraphs of the actuarial opinion. The actuarial opinion shall also disclose the following with regard to both direct insurance and reinsurance assumed subject to this rule:

a. The provision of investment income in the projected future losses and expenses under the unexpired policies; and

b. The amount of reduction in unearned premium and loss reserve for each of the following (i) salvage and subrogation, (ii) reinsurance, (iii) credits for deductibles and self-insured retentions, and (iv) other statutory approved credits.

33. The actuarial report shall include a description of the manner in which the adequacy of the amount of security for deductibles and self-insured retention is determined. The actuarial report need not assess the credit-worthiness of the specific securities (e.g. LOC's) but the actuarial opinion must report collectibility problems if know to the actuary.