INDIVIDUAL HEALTH INSURANCE AND
COMPLIANCE WITH PRICE CONTROLS
BY CLAYTON A. CARDINAL

INTRODUCTION

Section 130.61 of Part 130 (Cost of Living Council Phase III Regulations) of Chapter 1 (Cost of Living Council) of Title 6 (Economic Stabilization) continued into 1974 the subjection of price adjustments by institutional and noninstitutional providers of health services to the rules and regulations of the Price Commission in effect on January 10, 1973. Those rules and regulations of the Price Commission were contained in "Rate Increase Provisions Relating to Insurers" of subsection (b) of Section 300.20 (Insurers) of Part 300 (Price Stabilization of Chapter III (Price Commission) of Title 6.

This paper sets forth an approximate solution to problems associated with demonstrating compliance of a limited number of price adjustment activities with regulations such as those contained in Section 300.20(b). The price adjustment activities are those wherein it may not be possible or feasible to (re)construct a morbidity table of benefit costs from which adjusted premiums may be generated by direct methods. Application of such solution, where it would be appropriate, would lend support to any price increase. The paper is limited to a consideration of policies insuring individually underwritten risks.

Compliance would be demonstrated by showing that a premium adjustment proposed or accomplished would be less than that otherwise permitted under regulations such as Section 300.20(b). That premium adjustment permitted would of course have to be consistent with the prescriptions of the particular regulations. For the purpose of this paper, however, Section 300.20(b) is adopted as a sufficient model for advancing an approximate solution, and the premium adjustment permitted is hereinafter referred to as the Section 300.20(b) adjustment.

The Section 300.20(b) adjustment is calculated by a predetermined formula. The parameters of the formula are also predetermined for broad classes of policies and are taken from sources, such as prior profit studies, published industry data, loss ratio filings with insurance departments of some of the states, and so forth, which are readily available for many insurers. The Section 300.20(b) adjustment determined by the adjustment formula is a minimum adjustment in that prior funding deficiencies in the premium before adjustment are ignored. In particular, recoupment of prior excessive benefit costs, deficient reserve accumulations and excessive amortization of acquisition expenses are excluded from determination of the adjustment. If the Section 300.20(b) adjustment is found to be less than the actual adjustment, consideration of the impact of any prior funding deficiencies on the Section 300.20(b) adjustment would generally be proper so long as such consideration is inherent in the actual adjustment and does not constitute a material deviation from an insurer's prior rating practices. Under Phase III Regulations such a deviation could not have been made without prior approval of the Cost of Living Council. The comparison which is made between the actual and Section 300.20(b) adjustments is a comparison of aggregates wherein measure is given only to the overall effect of an adjustment and not to the effect on any individual risk, class or subdivision of policies for which premiums are being adjusted.

SECTION 300.20(b)

For any price adjustment activity, Section 300.20(b) substantively stated:

1. Benefit costs and expenses not expressed as a percentage of premium which reflected actual experience incurred at the time of the adjustment could be recognized in the price adjustment.
2. Benefit costs could be adjusted to recognize changed conditions of risk.
3. Recognition of any rate of inflation in an adjustment formula could not exceed five-eights of the rate of inflation otherwise justified at the time of the adjustment on the basis of consideration of the nature of the policies undergoing premium adjustment. In this paper no effect is given to the impact of the effect of inflation on any cost factor other than benefit cost.
4. Claim settlement or loss adjustment expenses could be recognized in the adjustment formula in the way "customary" for recognizing such expenses by an insurer, such as loading premiums or expected claims therefor on a percentage basis.
5. Contingencies, taxes and fees payable to a state, and selling commissions which would have been based on a percentage of premium could be recognized in a premium adjustment formula on the same basis.
6. Profit margins and margins for expenses not enumerated in items 1, 4 and 5 preceding, when recognized in a premium adjustment formula on a percentage of premium basis, could not exceed the "actual dollar amount when applied to the average premium per unit of exposure under the proposed rate in excess of 2 1/2 percent more than the actual dollar amount represented by those loadings applied to the average premiums per unit of exposure under the rates that are increased." This statement further limited to 2 1/2 percent any increase in

profit margins recognized in a premium adjustment formula on a basis other than percentage of premium. There was one inequity, however, which resulted from the statement. Insurers which provided in their premium adjustment formulas for non-percentage of premium expenses on a non-percentage of premium basis (that is expenses in item 1 preceding) could recognize the actual value of such expenses, whereas insurers which recognized such expenses on a percentage of premium basis were subject thereon to the 2 1/2 percent limitation.

The adjustment formula developed in the paper holds constant the absolute margin in the premium subject to adjustment for amortization of acquisition or excess first year expenses. Non-percentage of premium maintenance or level "all years" expenses could be taken either as subject to or not subject to the 2 1/2 percent limitation.

A caveat contained in Section 300.20(c) which could not be ignored was that "no insurer may change a rating formula, formula use or application, data base, rate-making procedure or technique, or other element in the rate making process."

DEFINITIONS

The terms used in the Section 300.20(b) adjustment formula are sufficiently general to permit inclusion of most elements requiring recognition. Most elements which cannot be included should be reexpressable in a form wherein they can be included. For example, reinsurance cost may be an element whose form would require reexpressing before it could be included in the Section 300.20(b) adjustment formula. The variables and parameters used are defined on the following pages.

1. x is the number of primary insureds on policies in force at the time when a premium adjustment is made.

2. y is the number of dependent adults insured on policies in force at the time when a premium adjustment is made.

3. z is the number of "at least one" dependent child insured on policies in force at the time when a premium adjustment is made.

4. ΣG is the aggregate annualized premium being adjusted on policies in force at the time when a premium adjustment is made.

5. G is the average per policy annualized premium being adjusted on policies in force at the time when a premium adjustment is made.

6. $\bar{G}$ is the average per policy annualized adjusted premium on policies in force at the time when a premium adjustment is made.

7. ${}^{cl}E^{A}$ is the weighted average per policy acquisition cost appropriate for insured class CL for the period during which the policies whose premiums are being adjusted have been issued, where insured class CL may be primary insureds (x), dependent adult insureds (y), or "at least one" dependent child insureds (z).

8. E^{A} is the weighted average per policy acquisition cost for all insured classes and equals

$$(x \cdot {}^{x}E^{A} + y \cdot {}^{y}E^{A} + z \cdot {}^{z}E^{A})/x$$

9. E^{M} is the weighted average per policy maintenance cost for all insured classes for the policies whose premiums are being adjusted at the time when the premium adjustment is made. By limitation imposed by Section 300.20(b), it may not exceed in value by more than a prescribed proportion (m') the comparable cost before the imposition of the price controls. See ${}^{x}e^{M}$ on next page.

10. e^A is the weighted average per dollar of premium acquisition cost appropriate for the policies, whose premiums are being adjusted, for the period during which the policies have been issued.

11. ${}^1e^M$ is the average per dollar of premium maintenance cost which may be recognized on the same percentage of premium basis after price controls as before.

12. ${}^2e^M$ is the average per dollar of premium maintenance cost which may not be recognized on the same percentage of premium basis after price controls as before. By the limitation imposed by Section 300.20(b), the application of ${}^2e^M$ to $\bar{G}$ may not produce an amount in excess of a prescribed proportion (m')of the amount produced by its application to G.

13. m' is the limitation imposed on E^M and ${}^2e^M$ by Section 300.20(b), which had a value of .025.

14. $a_{\overline{n}|}$ is the actuarial present value of one dollar of premium payable for n years. For policies funded by level premiums n represents the premium paying period of the average policy issued during the period in which the policies whose premiums are being adjusted have been issued. For policies funded by yearly renewable term or step-rate premiums, n represents the period over which acquisition costs have been amortized in the initial premium calculation or the period over which select morbidity is given effect, which ever is longer. For some insurers these definitions of n may not be appropriate.

15. k^T is a factor reflecting trend for T years, but not loss level. k^T is dependent on the nature of the benefits provided in the policy.

16. r is the ratio of actual to expected incurred claims on a present value basis at the time when the premium adjustment is made. By expected incurred claims is meant the claim assumptions inherent in the original calculation of G. By actual incurred claims is meant the claim assumptions inherent in $\bar{G}$.

Quantification of the terms represented by items 1 through 16 preceding is all that is required to calculate the Section 300.20(b) adjustment. That calculation is the quientessence of this paper. Additional definitions follow.

17. R is the Section 300.20(b) adjustment which $\bar{R}$ cannot exceed.

18. $\bar{R}$ is the average premium increase at the time when the premium adjustment is made. $\bar{R}$ equals

$$(\bar{G}/G) - 1.0$$

19. i is the effective annual rate of interest which is assumed to be invariant over time.

20. v is the value of 1 payable one year later, interest only considered. v equals

$$(1.0)/(1.0 + i)$$

21. ${}_s\overline{\omega p}_{t-1}$ is the probability that a policy entering its tth policy year shall commence its $(s+t)$th policy year. ${}_s\overline{\omega p}_{t-1}$ equals

$${}_1\overline{\omega p}_{t-1} \cdot {}_1\overline{\omega p}_{t} \cdots {}_1\overline{\omega p}_{t+s-3} \cdot {}_1\overline{\omega p}_{t+s-2}$$

22. ${}_s\overline{\omega q}_{t-1}$ equals

$$(1.0) - {}_s\overline{\omega p}_{t-1}$$

23. $A_{\overline{n}|}$ is the present value over n years of expected incurred claims inherent in the calculation of G.

24. $\overline{A}_{\overline{n}|}$ is the maximum present value over n years of expected incurred claims "permitted" by Section 300.20(b).

25. S_{t-1} is the value of incurred claims expected in policy year t inherent in the calculation of $A_{\overline{n}|}$.

26. $\overline{S}_{t-1}$ is the value of incurred claims expected in policy year t inherent in the calculation of $\overline{A}_{\overline{n}|}$.

27. f_{t-1} is the ratio of the ultimate and select morbidity experience expected in the policy year t, where select morbidity is a necessary consequence of the underwriting and selection of risk process.

28. j is the effective annual trend rate which is assumed to be invarient over time. j is dependent on the nature of the benefits provided in the policy. j fixes the relationship between S_{t-1} and $\overline{S}_{t-1}$

29. h may be approximated for our purpose by

$$\sum_{1}^{T} \{(S_t/S_{t-1}) - 1.0\} / T$$

For greater accuracy, h is more properly determined from the following relationship.

$$S_0 \sum_{1}^{T} {}_{t-1/2}\overline{\omega p}_0 \cdot v^{t-1/2} \cdot (1.0 + h)^{t-1} \cdot f_{t-1}$$

$$= \sum_{1}^{T} {}_{t-1/2}\overline{\omega p}_0 \cdot v^{t-1/2} \cdot S_{t-1} \cdot f_{t-1}$$

where $S_{t-1} = (1.0 + h)^{t-1} \cdot S_0$

RELATIONSHIPS

To facilitate the calculations, various relationships have been assumed. These relationships are self-evident and are given in the formulas below.

1. ${}_{1/2}\overline{\omega q}_{t-1} = (1/2) \cdot {}_{1}\overline{\omega q}_{t-1}$

2. $a_{\overline{n}|} = \sum_{1}^{n} v^{t-1} \cdot {}_{t-1}\overline{\omega p}_0 \cdot \{(1.0 + v^{1/2} \cdot {}_{1/2}\overline{\omega p}_{t-1}) / 2\}\, g_t$

   where g_t is the ratio of the policy year t premium to policy year 1 premium.

3. $$A_{\overline{n}|} = \sum_{1}^{n} {}_{t-1/2}\overline{\omega p}_0 \cdot v^{t-1/2} \cdot S_{t-1} \cdot f_{t-1}$$

4. $$\overline{A}_{\overline{n}|} = \sum_{1}^{n} {}_{t-1/2}\overline{\omega p}_0 \cdot v^{t-1/2} \cdot \overline{S}_{t-1} \cdot f_{t-1}$$

5. $$\overline{S}_{t-1} = r \cdot (1.0 + j)^{t-1/2} \cdot S_{t-1} \quad \text{for } t \leq T$$
$$= r \cdot (1.0 + j)^{T} \cdot S_{t-1} \quad \text{for } t > T$$

DERIVATION OF R AND r

In deriving R and r, we begin with a consideration of the values of the premium elements presumed to exist prior to price controls. From this consideration relationships are defined. The impact of Section 300.20(b) is then introduced into the relationships. And finally R and r are derived.

The values of the premium elements are defined or fixed by the gross premium formula. A simple formula adequate for our purpose is

$$G \cdot a_{\overline{n}|} = A_{\overline{n}|} + E^{A} + e^{A} \cdot G + E^{M} \cdot a_{\overline{n}|} + ({}^{2}e^{M} + {}^{1}e^{M}) \cdot G \cdot a_{\overline{n}|}$$

From the preceding, by transposition we express $A_{\overline{n}|}$ in terms of the other premium elements.

$$A_{\overline{n}|} = G \cdot a_{\overline{n}|} - \left\{ E^{A} + e^{A} \cdot G + E^{M} \cdot a_{\overline{n}|} + ({}^{1}e^{M} + {}^{2}e^{M}) \cdot G \cdot a_{\overline{n}|} \right\}$$

An expression for $\overline{A}_{\overline{n}|}$ is obtained from the Relationships assumed above. We have

$$\overline{A}_{\overline{n}|} = \sum_{1}^{n} {}_{t-1/2}\overline{\omega p}_0 \cdot v^{t-1/2} \cdot \overline{S}_{t-1} \cdot f_{t-1}$$

By substituting for $\overline{S}_{t-1}$ the S_{t-1} relationship, we obtain

$$\overline{A}_{\overline{n}|} = \sum_{1}^{T} {}_{t-1/2}\overline{\omega p}_0 \cdot v^{t-1/2} \cdot r\,(1.0 + j)^{t-1/2} \cdot S_{t-1} \cdot f_{t-1} + \sum_{T+1}^{n} {}_{t-1/2}\overline{\omega p}_0 \cdot v^{t-1/2} \cdot r \cdot (1.0 + j)^{T} \cdot S_{t-1} \cdot f_{t-1}$$

By adding and subtracting

$$\sum_{1}^{T} {}_{t-1/2}\overline{\omega p_0} \cdot v^{t-1/2} \cdot r \cdot (1.0 + j)^T \cdot S_{t-1} \cdot f_{t-1}$$

to the preceding expression, and combining terms where possible, we obtain

$$\bar{A}_{\overline{n}|} = r \cdot (1.0 + j)^T \cdot A_{\overline{n}|} - r \cdot \sum_{1}^{T} {}_{t-1/2}\overline{\omega p_0} \cdot v^{t-1/2} \cdot S_{t-1} \cdot f_{t-1}\left\{(1.0 + j)^T - (1.0 + j)^{t-1/2}\right\}$$

By substituting for S_{t-1} the h relationship, we obtain

$$\bar{A}_{\overline{n}|} = r \cdot (1.0 + j)^T \cdot A_{\overline{n}|} - r \cdot S_0 \cdot \sum_{1}^{T} {}_{t-1/2}\overline{\omega p_0} \cdot v^{t-1/2} \cdot (1.0 + h)^{t-1} \cdot f_{t-1} \cdot \left\{(1.0 + j)^T - (1.0 + j)^{t-1/2}\right\}$$

By letting

$$k^T = (1.0 + j)^T - (S_0 / A_{\overline{n}|}) \cdot \sum_{1}^{T} {}_{t-1/2}\overline{\omega p_0} \cdot v^{t-1/2} \cdot (1.0 + h)^{t-1} \cdot f_{t-1} \cdot \left\{(1.0 + j)^T - (1.0 + j)^{t-1/2}\right\}$$

we obtain a concise relationship between $\bar{A}_{\overline{n}|}$ and $A_{\overline{n}|}$, namely

$$\bar{A}_{\overline{n}|} = r \cdot k^T \cdot A_{\overline{n}|}$$

The factor k^T is examined further in Appendix A.

Since R by definition equals

$$(\bar{G}/G) - 1.0$$

we now consider the premium elements of $\bar{G}$. Again using the simple form of gross premium formula used for G, and keeping in mind the limitations of Section 300.20(b), we have

$$\bar{G} \cdot a_{\overline{n}|} = \bar{A}_{\overline{n}|} + E^A + e^A \cdot G + (1.0 + m') \cdot E^M \cdot a_{\overline{n}|} + {}^1e^M \cdot \bar{G} \cdot a_{\overline{n}|} + (1.0 + m') \cdot {}^2e^M \cdot G \cdot a_{\overline{n}|}$$

By transposing ${}^1e^M \cdot \bar{G} \cdot a_{\overline{n}|}$, substituting $r \cdot k^T \cdot A_{\overline{n}|}$ for $\bar{A}_{\overline{n}|}$, and solving for $\bar{G}$, we obtain

$$\bar{G} = \left\{ r \cdot k^T \cdot A_{\overline{n}|} + E^A + e^A \cdot G + (1.0 + m') \cdot (E^M + {}^2e^M \cdot G) \cdot a_{\overline{n}|} \right\} / (1.0 - {}^1e^M) \cdot a_{\overline{n}|}$$

By substituting in the above for $A_{\overline{n}|}$ its premium element form developed at the beginning of this section, collecting and rearranging terms, we obtain

$$\bar{G} = \{(1.0 - {}^{1}e^{M})\cdot r\cdot k^{T}\cdot G + (1.0 + m' - r\cdot k^{T})\cdot (E^{M} + {}^{2}e^{M}\cdot G) + (1.0 - r\cdot k^{T})(E^{A} + e^{A}\cdot G)/a_{\overline{n}|}\} / (1.0 - {}^{1}e^{M})$$

By dividing the preceding expression for $\bar{G}$ by G, substracting **1.0** therefrom, and again rearranging terms, we obtain a workable expression for calculating R, which is independent of the underlying morbidity tables of annual claim costs if the factors and terms of the expression are reasonably determinable.

$$R = [(1.0 - r\cdot k^{T})\{(e^{A} + E^{A}/G)/a_{\overline{n}|} - 1.0 + {}^{1}e^{M}\} + (1.0 + m' - r\cdot k^{T})({}^{2}e^{M} + E^{M}/G)] / (1.0 - {}^{1}e^{M})$$

The preceding expression gives the Section 300.20(b) adjustment, given r. Obviously r may be determined from this expression, given R. By transposing and rearranging terms, we obtain

$$r = \{(e^{A} + E^{A}/G)/a_{\overline{n}|} + (1.0 + m')({}^{2}e^{M} + E^{M}/G) - (1.0 + R)\cdot(1.0 - {}^{1}e^{M})\} / k^{T}\cdot\{(e^{A} + E^{A}/G)/a_{\overline{n}|} + ({}^{2}e^{M} + E^{M}/G) - 1.0 + {}^{1}e^{M}\}$$

In calculating r we are interested in knowing what ratio of actual to expected incurred claims is necessary to merit a Section 300.20(b) adjustment, R.

Appendix B sets out a worksheet for calculating either R or r.

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APPENDIX A

EXAMINATION OF TREND FACTOR k^T

Recall that

$$k^T = (1.0 + j)^T - (S_0/A_{\overline{n}|}) \cdot \sum_{t=1}^{T} {}_{t-1/2}\overline{\omega p_0} \cdot v^{t-1/2} \cdot f_{t-1} \cdot (1.0 + h)^{t-1} \left\{ (1.0 + j)^T - (1.0 + j)^{t-1/2} \right\}$$

To calculate k^T requires only that $S_0/A_{\overline{n}|}$, h, f_{t-1} and j be quantified. These are considered each in turn, beginning with $S_0/A_{\overline{n}|}$.

A. $S_0/A_{\overline{n}|}$

From the paper we have

$$A_{\overline{n}|} = \sum_{t=1}^{n} {}_{t-1/2}\overline{\omega p_0} \cdot v^{t-1/2} \cdot S_{t-1} \cdot f_{t-1}$$

and that

$$S_{t-1} = (1.0 + h)^{t-1} \cdot S_0$$

By substituting the latter expression for S_{t-1} into the equation and dividing the resulting expression for $A_{\overline{n}|}$ into S_0 , we obtain

$$S_0/A_{\overline{n}|} = (1.0) \Big/ \sum_{t=1}^{n} {}_{t-1/2}\overline{\omega p_0} \cdot v^{t-1/2} \cdot f_{t-1} \cdot (1.0 + h)^{t-1}$$

When the impact of ${}_{t-1}\overline{\omega p_0}$ for $t > 5$ and the validity of the substitution for $t \leq 5$ are realized, any error introduced by the substitution will be found to be immaterial.

B. h

For the purpose of the paper, it has been posited that h may be approximated by

$$\sum_{t=1}^{T} \left\{ (S_t/S_{t-1}) - 1.0 \right\} / T$$

Examination of various morbidity tables adjusted and weighted to reflect a population with a normal age distribution discloses that h can be expected to vary between .03 and .05. For the purpose of the paper, h is assigned the following values.

Benefit	h
Basic Medical	.035
Major Medical	.040
Non-Medical	.050

C. q_{t-1}

As for h, q_{t-1} may be determined from an examination of appropriate morbidity tables. In effect q_{t-1} reflects the underwriting standards of an insurer. For the purpose of the paper, q_{t-1} is assigned the following values.

	q_{t-1}		
t	Basic Medical	Major Medical	Non-Medical
1	.70	.65	.70
2	.90	.80	.80
3	1.00	.90	1.00
4	1.05	1.00	1.00
5	1.10	1.10	1.10
≥ 6	1.15	1.20	1.20

D. j

A formula for a general benefit is set forth below and the j factor for various types of benefits is then derived on the basis of this formula. The general benefit is a benefit which pays 100% of the first F dollars of eligible expenses after a deductible D and then pays p percent thereafter.

1. Definitions

   a. u^1 is the proportion of policyholders qualifying for benefits not in excess of F.

   b. u^2 is the proportion of policyholders qualifying for benefits in excess of F.

   c. u equals $u^1 + u^2$.

   d. C^1 is the average eligible medical expenses of u^1— claimants.

   e. C^2 is the average eligible medical expenses of u^2— claimants.

   f. C equals $(u^1 \cdot C^1 + u^2 \cdot C^2)/u$

   g. s is the effective annual rate of increase in utilization assumed operating equally on u^1 and u^2.

   h. w is the effective annual rate of inflation assumed operating equally on C^1 and C^2.

   i. m is the Section 300.20(b) limitation on w. m was equal to $5/8$

   j. S is the expected benefits before operation of s and w.

   k. $\bar{S}$ is the expected benefits after the effect of operation of s and w for one year.

2. General Benefit Formula

   By definition

$$S = u^1 \cdot (C^1 - D) + u^2 \cdot \{(.01) \cdot p \cdot (C^2 - D - F) + F\}$$

and

$$\bar{S} = (1.0 + s)\{u^1 \cdot C^1 \cdot (1.0 + m \cdot w) - u^1 \cdot D\} + (1.0 + s) \cdot$$
$$[(.01) \cdot p \cdot \{C^2 \cdot (1.0 + m \cdot w) - D - F\} + F].$$

By arranging the right hand term of preceding expression and substituting S where appropriate, we obtain

$$\bar{S} = (1.0 + s)\{S + m \cdot w \cdot (u^1 \cdot C^1 + .01p \cdot u^2 \cdot C^2)\}$$

3. General Formula for i

By setting $\bar{S} = (1.0 + i)\,S$, equating this to the preceding expression for $\bar{S}$, substituting in the general expression for S where appropriate, and solving for i, we obtain

$$i = (1.0 + s)\left[1.0 + (m \cdot w)\frac{u^1 \cdot C^1 + .01p \cdot u^2 \cdot C^2}{u^1 \cdot (C^1 - D) + u^2 \cdot \{.01p \cdot (C^2 - D - F) + F\}}\right] - 1.0$$

4. Specific Benefits

a. Disability Income

If $F = 0$, $D = 0$, $p = 100$, and $w = 0$, then $u^1 = 0$, $u^2 = u$, and $C^2 = C$. Making these changes in the general formula for i and simplifying give the expression for i appropriate for a typical disability income benefit, namely

$$i = s$$

b. Basic Medical Expense

If $F = 0$, $D = 0$, and $p = 100$, then $u^1 = 0$, $u^2 = u$ and $C^2 = C$. Making these changes in the general formula for i and simplifying give the expression for i appropriate for a typical hospital-surgical expense benefit, namely

$$i = (1.0 + s)(1.0 + m \cdot w) - 1.0$$

c. Major Medical Expense without Full-Pay Band

If $F = 0$, then $u^1 = 0$, $u^2 = u$, and $C^2 = C$. Making these changes in the general formula for i and simplifying give the expression for i appropriate for a typical major medical expense benefit without a full-pay band, namely

$$i = (1.0 + s)\{1.0 + m \cdot w \cdot C / (C - D)\} - 1.0$$

d. Major Medical Expense with Full-Pay Band

The general formula for j is appropriate for a typical major medical expense benefit with a full-pay band. However, noting that

$$\frac{x}{x-a} \approx 1.0 + \frac{a}{x} \quad ,$$

a first approximation for j somewhat easier to work with is given below.

$$j = (1.0 + \Delta)\cdot\left[1.0 + m\cdot w\cdot\left\{1.0 + \frac{u^2\cdot D + (.01)\cdot p\cdot u^2\cdot(D+F) - u^2\cdot F}{S + u^2\cdot D + (.01)\cdot p\cdot u^2\cdot(D+F) - u^2\cdot F}\right\}\right] - 1.0$$

Note that this value of j has the following boundaries:

$$(1.0 + \Delta)\cdot(1.0 + m\cdot w) \leq 1.0 + j \leq (1.0 + \Delta)\cdot\{1.0 + m\cdot w\cdot C/(C-D)\},$$

with, for the most part, $1.0 + j$ only slightly less than the value of the upper boundary.

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APPENDIX B

WORKSHEET FOR CALCULATING R OR r

1. a. Form:
   b. Effective Date of Rate Increase:
   c. Description of Form:

2. Level of Lapse Rates

   ☐ High ☐ Medium ☐ Low

3. Benefit

   ☐ Basic Medical ☐ Major Medical

   ☐ Non Medical

4. Basic Values

a. x =	b. y =	c. z =
d. ${}^{x}E^{A}$ =	e. ${}^{y}E^{A}$ =	f. ${}^{z}E^{A}$ =
g. E^{M} =	h. e^{A} =	i. ${}^{1}e^{M}$ =
j. ${}^{2}e^{M}$ =	k. $a_{\overline{n\rceil}}{}^{*}$ =	l. $k^{T}{}^{*}$ =
m. $\sum G$ =	n. r =	o. m' =

*See item 9 below.

5. Preliminary Calculations

a. (4.1) (4.n.) =

b. (4.m.) / (4.a.) =

c. $\{(4.a.)\ (4.d.) + (4.b.)\ (4.e.) + (4.c.)\ (4.f.)\} /$
$(4.a.) =$

d. (4.j.) + (4.g.) / (5.b.) =

e. $\{(4.h.) + (5.c.) / (5.b.)\} / (4.k.) =$

(Note the significance of the following items as a proportion of or margin inherent in the premium, before adjustment: (1) 5.e. is acquisition cost amortization, including present value of any excess bunched renewal commission; (2) 4.j. is profit; (3) 4.i. minus 4.j. plus 5.d. is maintenance expense; and (4) the complement of sum of 4.i., 5.d. and 5.e. is benefit margin. Note also that 5.b. is the average annualized premium in force before adjustment per policy.)

6. Calculation of R

$$R = \Big[\{1.0 - (5.a.)\}\ \{(5.e.) - 1.0 + (4.i.)\} + \{1.0 + (4.0) - (5.a.)\}(5.d.)\Big] / \{1.0 - (4.i.)\}$$

=

7. Calculation of r

$$r = \Big[(5.e.) + \{1.0 + (4.0)\}\ (5.d.) - \{1.0 + (6.)\}\{1.0 - (4.i.)\}\Big] / (4.1.)\ \{(5.3.) + (5.d.) - 1.0 + (4.i.)\}$$

=

8. Comparison of Average Premium Adjustment (R) with the Section 300.20(b) Adjustment ($\bar{R}$)

a. $\bar{R}$ =

b. R :

c. $\bar{R} / R$ = (This ratio should be less than 1.0.)

9. a. k^T Values *

Benefit	Premium	by Level of Lapses		
		Low	Medium	High
Basic Medical	Term	1.170	1.109	1.023
	Level	1.290	1.221	1.122
Major Medical	Term	1.186	1.172	1.154
	Level	1.335	1.292	1.260
Non-Medical	Term	1.046	1.043	1.039
	Level	1.078	1.068	1.052

b. $\alpha_{\overline{n}|}$ Values*

Premium	by Level of Lapses		
	Low	Medium	High
Term	2.784	2.331	1.930
Level	4.305	3.085	2.293

*Values are illustrative only.

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