DISCUSSION BY CHARLES F. COOK

The Society is indebted to Mr. Ferguson for a clear and understandable analytical disclosure of one of the arcane processes which have lead to the remarkable increases in recent excess of loss reinsurance rates. As a reinsurance buyer with no significant reinsurance actuarial experience, I feel enlightened and somewhat reassured that my reinsurance is not a rip-off.

The technical portion of my review may be divided into three sections: some generalization of the formula details from the author's Appendix II; a buyer's guide to simplified rate estimates; and an example from my experience with a related type of indexed property catastrophe contract, which might serve as an extension of the author's concept from casualty and property insurance. My review is indebted to the author for discussion of some of his earlier developmental concepts, and to my company's reinsurance broker and reinsurers, who have worked patiently with us for over four years of indexation.

FORMULAS

The author implicitly questions the adequacy of early reserves for large claims; indeed, his examples assume that settlements tend to be approximately $(1 + i)^v$ greater than early reserves for a period from valuation to settlement of v years. The loss development factor is assumed to take care of this part of inflation. Similarly, R is set as a fixed retention level as of the initiation of the new contract. In experience rating of an existing index contract, there may be a retention for some past period which has already been inflated to the present period. The existence of an LDF that does not reflect (or imperfectly reflects) inflation, or of an earlier level of R, requires generalization of the formulas in the author's Appendix II.

LDF *Inadequate for Inflation*

First consider an LDF which reflects no inflation. Then it is appropriate to inflate G_j (an individual claim valuation) from its present estimate to the settlement value of a comparable claim which might occur during the new exposure period. If the observed claim has been settled, that inflation period is u (occurrence to midpoint of new exposure period), as the author shows, but if it is an outstanding case, the period would be u + v, where v is the period from present valuation to settlement.

For example, consider a claim reported at \$100,000 on July 1, 1969. If it is expected to be settled in about three years, it is implicit in the index-clause-to-settlement-date concept that it will inflate at i per year from 7/1/69 to 7/1/72, an inflation of $(1 + i)^3 = (1 + i)^v$. If a rate were set as of 1/1/70 for one year, u would be 1, but properly this claim would be inflated by $(1 + i)^4 = (1 + i)^{u+v}$, because a comparable claim occurring in 1970 would be expected to be settled in 1973, four years after the \$100,000 valuation used for rating. In this type of situation, each place the author shows $G_j\ (1 + i)^u$, we should use $G_j\ (1 + i)^{u+v}$, a higher claim valuation.

If the LDF includes some element of inflation, or if inflation is assumed to be different from occurrence of a claim to its settlement than it is from earlier to later occurrences, then we can estimate k = the rate of inflation on known open claims, beyond the inflation part of LDF. Then the proper valuation of G_j is $G_j\ (1 + i)^u(1 + k)^v$. Obviously, $v = 0$ for settled claims or for claims fully developed and reserved for expected inflationary increases (as assumed by Mr. Ferguson).

It should be noted that this approach may be advisable even if LDF could be totally adequate, because LDF is applied to $(G_j - R)$; in the calculation LDF would apply to R as well as G, which requires that LDF be adequate for the leveraged excess claim, whereas the reviewer's explicit inflation of G_j without inflating R need only be adequate to inflate the unleveraged gross loss G_j.

Indexed Retention During the Experience Period

In re-rating an already existing indexed contract, we have net claims $G_j - R^*$ where R^* is $< R =$ presently proposed initial retention. Generally, $R = R^*\ (1 + i)^u$, unless i has changed. If it has, let h = the old index per year, and $R = R^*\ (1 + h)^u$. Then, if R^* is substituted for R, the formulas would use $R(1 + i)^t(1 + h)^u$ instead of $R(1 + i)^t$.

New Generalized Formulas

$$\overline{X} = \frac{\Sigma[G_j(1+i)^u(1+k)^v - R(1+i)^t(1+h)^u]}{n}$$

$$P_{WI} = \frac{\Sigma[G_j(1+i)^u(1+k)^v - R(1+i)^t(1+h)^u]}{E(1+i)^u} \cdot LDF$$

$$= \frac{n\,\overline{X} \cdot LDF}{E(1+i)^u}$$

$$P_{NI} = \frac{\Sigma[G_j(1+i)^u(1+k)^v - R] + \triangle}{E(1+i)^u} \cdot LDF$$

$$= \frac{\Sigma[G_j(1+i)^u(1+k)^v - R(1+i)^t(1+h)^u + R(1+i)^t(1+h)^u - R] + \triangle}{E(1+i)^u} \cdot LDF$$

$$= \frac{n\overline{X} + nR[(1+i)^t(1+h)^u - 1] + \triangle}{E(1+i)^u} \cdot LDF$$

$$\frac{P_{WI}}{P_{NI}} = \frac{n\overline{X}}{n\overline{X} + nR[(1+i)^t(1+i)^u - 1] + \triangle}$$

$$P_{NI} = P_{WI} + \frac{nR[(1+i)^t(1+h)^u - 1] + \triangle}{E(1+i)^u} \cdot LDF$$

These formulas yield the author's formulas if $h = 0$ and $k = 0$ or $v = 0$. If $i = k = h$, we have (perhaps must usefully, if least generally):

$$\overline{X} = \frac{\Sigma[G_j(1+i)^{u+v} - R(1+i)^{t+u}]}{n}$$

Other formulas can be similarly expressed by substituting $u + v$ for u and $t + u$ for t.

BUYER'S GUIDE

A premium with no inflation can be derived from P_{WI} or P_{NI} by setting $i = 0$:

$$P^* = \frac{\Sigma(G_j - R)}{E} \cdot LDF$$

If claims are fully developed, so that the valuations G_j are fully adequate, then $v = 0$, and if R is chosen currently so that the factor $(1+h)^u$ is unnecessary, and if $u \simeq t$ (which can be set by an appropriate selection of experience period), we have:

$$PWI \simeq P^*(1+i)^u$$

In words, if the experience period is old enough so that the average claim has just been settled, then $u \simeq t$ and $v \simeq 0$, and for the current retention R the indexed premium equals the inflationless experience premium indication multiplied by the gross, unleveraged trend factor from the experience period to the exposure period. This is approximate, but is a rational buyer's test of the reasonableness of a reinsurer's quote.

INDEXED PROPERTY CATASTROPHE COVER

It may be useful to consider the use of an index clause in a property catastrophe treaty. Other property reinsurance does not really fit Mr. Ferguson's concept, but this type of cover has only one major difference. Instead of inflating only for the change in money value, an aggregate property cover (or a casualty stop-loss cover) also should inflate to reflect the increase in units exposed.

With reason, premiums in property covers measure both value changes, because the price is set per $100 of insured value. If insurance-to-value is kept current, both the inflation in unit values and the increase of units are measured by the gross premium subject to the treaty.

In early 1971, faced with the same kind of dramatic rate of inflation illustrated by the author for a casualty excess of loss contract, United Services Automobile Association negotiated a long-term treaty providing the following coverage:

Net retention = 5% of subject premium for the prior twelve months.
First excess = 50% of 2½%, excess of 5%
Second excess = 75% of 5%, excess of 7½%
Third & Fourth excess = 90% of 20%, excess of 12½%

Similar to Mr. Ferguson's examples, this treaty provides a complete sharing of inflation, plus, in this case, growth. The retention, coinsurance participation, and the total amount recoverable all increase with the subject premium, which serves as a surrogate measure of exposure in floating dollars. The ceding company accepts a fixed percentage risk, and receives in turn a fixed percentage of coverage, both of which grow with the primary carrier's volume.

For a company with a compound growth rate in excess of 30% per year, this type of indexed contract provides comfort for both parties and stabilizes the relationship and the premium without annual renegotiation.

Substantial judgment is required in rating such a cover. In our case, the rate per $100 declines as volume grows, to reflect an assumed improvement in geographic spread due to the small initial exposure concentrated on the Gulf and Atlantic coasts. For other companies this might be inappropriate, but in our case the rate declines each year while the premium increases, to the satisfaction of both parties.

The use of historical experience (which was ten years in our case but could be up to twenty or more if relevant experience exists) is facilitated by an indexed approach. We valued each past catastrophe by inflating it by the ratio of current subject premium to subject premium at the time of the observed catastrophe, generating a catastrophe loss valued at current price level and market size. In some cases we used state premiums, in some countrywide, depending on judgment as to whether the hazard was local or national. This produced an indicated ten-year average pure premium adjusted to current retention, exposure, and cost levels. Subsequent development is dealt with by the index clause. During the period this contract has been in force, we have more than doubled in volume without a major renegotiation, other than increasing the cut-off limit. The rates have been constant, despite the occurrence of catastrophes for which USAA had losses larger than in the past, because our increasing retention has protected our reinsurers. I recommend the approach heartily, in both casualty and property coverages.