SOCIETY OF ACTUARIES

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Letters

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letter in the June issue of *The Actuary* also expressed concern about the social significance of insurance companies.

Perhaps actuaries located near colleges and universities could work with small groups of students on the investigation of scientific problems related to Man's physical, biological, or social environment. Investigations would estimate the effects of air pollution, water pollution, and other forms of environment problems on human mortality and morbidity. For the layman, various tables could be derived showing estimated effects of various pollution levels on the expectation of life and "expectation of healthy life" (expectation of life less time bedridden). Perhaps a computerized simulation model of the interaction between a community and its environment could be designed to forecast mortality and morbidity losses under different assumed growth rates in pollution levels.

The Student Originated Studies program, sponsored by the National Science Foundation, offers to pay students up to $80 per week for 10 to 12 weeks to attack environmental abuse next summer. These students must be part of an interdisciplinary group of five to fifteen students sponsored by a college or university. The group must decide on a project and formally request aid. The deadline for proposals is December 1. Any local college or university is probably familiar with this program. Local actuaries could initiate volunteer assistance on such projects. Several persons in our company are members of the *Sierra Club* and are attempting to initiate such a project with local students.

The Epidemiology Laboratory of the State Health Department, Berkeley, California, has conducted studies on the effects of human mortality induced by air pollution. Louis Jaffe has published "Photochemical Air Pollutants and Their Effects on Men and Animals, II. Adverse Effects," in the *Archives Environmental Health*, Volume 16, February 16, 1968.

Another approach to involve insurance companies and young people indirectly with the problems of environment and their effects on morbidity has been the development of "mini-insurance" companies. The development of a Minnesota Junior Achievement Insurance Company is mentioned in the October, 1969 issue of *The Actuary*. This company marketed a $1 premium, $40 accident-only medical expense policy which had a benefit period of two months. Most of the claims were related to the increasingly complex environment of our modern age. As a point of information for others starting such companies, the company issued 835 contracts and experienced nine claims having an average payout of $35. Four claims were for automobile accidents, one claim was for a snowmobile accident, and another claim was due to a fall in an elevator shaft. As each claim came in, students could have easily been led into discussions on what might be done to improve "environment" conditions to lessen the morbidity cost of their policyholders.

Doug Sanders

TRUE SURPLUS VS. VALUATION SURPLUS

by Richard G. Driskell

In the distribution of surplus it is important to make a distinction between *true surplus*, which arises from profits, and *valuation surplus*, which is the excess of assets over liabilities and which depends on the particular values assigned to the assets and to the liabilities. The purpose of this actuarial note is to discuss the relationship between *true surplus* and *valuation surplus* upon lapse or surrender of a policy at three different points in time, making use of the interrelationships of the cash value, reserve, and asset share.

Upon lapse or surrender of a policy:

(1) *true surplus* is measured by the excess of the asset share over the cash value, i.e., ${}_t(AS) - {}_t(CV)$

(2) *valuation surplus* is measured by the excess of the policy reserve over the cash value, i.e., ${}_tV - {}_t(CV)$.

There are $3! = 6$ possible permutations of the three quantities ${}_t(AS)$, ${}_t(CV)$, and ${}_tV$, but only three of these permutations are of practical interest. (That is, the three permutations where the reserve is less than the cash value will not be discussed).

$$\text{Now, } \textit{true surplus} = {}_t(AS) - {}_t(CV) = [{}_t(AS) - {}_tV] + [{}_tV - {}_t(CV)]$$
$$= [{}_t(AS) - {}_tV] + \textit{valuation surplus.}$$

First, if ${}_t(AS) < {}_t(CV) < {}_tV$ (This situation would occur in the "early policy years" before the excess initial expenses have been amortized.), then *true surplus* is negative, *valuation surplus* is positive, and ${}_t(AS) - {}_tV < 0$. Thus, *valuation surplus* exceeds *true surplus*. Note, that ${}_t(AS) - {}_tV$ represents the amount which must be borrowed from surplus to set up the reserves in the early years.

Secondly, if ${}_t(CV) < {}_t(AS) < {}_tV$ (This situation would occur during the "intermediate" years.), then *true surplus* is positive, *valuation surplus* is positive, and ${}_t(AS) - {}_tV < 0$. Since ${}_t(AS) < {}_tV$, $[{}_t(AS) - {}_t(CV)] < [{}_tV - {}_t(CV)]$, i.e., *valuation surplus* exceeds *true surplus*. Note, that ${}_t(AS) - {}_tV$ still represents the amount which must be borrowed from surplus to set up the reserves, even though both *true surplus* and *valuation surplus* are now positive.

Finally, if ${}_t(CV) < {}_tV < {}_t(AS)$ (This situation would occur during the "later" years.), then *true surplus*, *valuation surplus*, and ${}_t(AS) - {}_tV$ are all positive. The fact that ${}_t(AS) - {}_tV > 0$ reflects the fact that funds originally borrowed from surplus to set up reserves can now be returned to surplus. Since, ${}_tV < {}_t(AS)$, $[{}_t(AS) - {}_t(CV)] > [{}_tV - {}_t(CV)]$, i.e., *true surplus* exceeds *valuation surplus*.