

A PRELIMINARY TERM VALUATION METHOD UNDER THE INSURANCE ACT, 1943, OF THE UNION OF SOUTH AFRICA

By S. ROBERT HELLIG, M.A., B.COM., F.F.A., A.A.S.
of Johannesburg

1. STATUTORY PROVISION

SECTION 4 of the Second Schedule, Insurance Act, 1943, of the Union of South Africa prescribes, as a minimum valuation basis for non-Union insurers, a net premium valuation on the basis of one of the three ultimate tables, A 1924-29 or A 1924-29 Light or A 1924-29 Heavy, and a rate of interest not exceeding $3\frac{1}{2}\%$ per annum where the valuation is being made ten years or longer after the commencement of the Act (4% per annum if within ten years).

The minimum basis for Union insurers is modified by section 5 which is, for convenience, set out below.

Minimum Basis for Liabilities under Life Policies: Union Insurers

5. In calculating liabilities under unmaturing life policies on the minimum basis a Union insurer shall comply with the applicable requirements of section *four*, but subject to the following modifications:

(a) In the case of whole-life policies at uniform premiums payable throughout life, the insurance period of each policy shall be deemed to have commenced one year later than it actually commenced.

(b) In the case of whole-life policies at uniform premiums payable for a stated number of years or in the case of endowment insurance policies at uniform premiums, either sub-paragraph (i) or sub-paragraph (ii) shall apply, whichever produces the higher liability, viz.:

(i) the insurance period of each policy shall be deemed to have commenced one year later than it actually commenced and the period for which premiums are payable under the policy or the endowment period shall be reduced by one year; or

(ii) each of the future net premiums mentioned in sub-paragraph (i) of paragraph (e) of sub-section (1) of section *four* shall be increased by an amount which, on the date of commencement of the insurance period equals $1\frac{1}{2}\%$ per cent of the sum insured, commuted over the whole period for which premiums are payable.

(c) In the case of life policies not mentioned in the preceding provisions of this section, the calculations prescribed by section *four* with reference to a non-Union insurer, shall, with reference to a Union-insurer, be modified in a manner analogous to the modifications prescribed in paragraphs (a) and (b) of this section.

2. PRINCIPLES

The writer is concerned with the valuation provisions as affecting Union insurers only, and proceeds from the assumption that preliminary term methods are permissible and indeed essential in the case of new companies. It has been observed, however, that a preliminary term method once introduced has a tendency to remain, and consequently the writer takes the view that the strict net premium valuation should not be lost sight of but should be made at each valuation, and that the preliminary term method should be subject to gradual adjustment towards the strict net premium valuation. This note demonstrates a simple procedure to facilitate the achievement of the objects in mind.

3. VALUATION METHOD

(a) Whole-life assurances

The statutory minimum basis permits the use of P_{x+1} as the valuation premium where x is the entry age. Examination of A 1924-29 (ultimate) net premiums shows that P_{x+1} can be represented very closely by a constant plus a percentage of P_x for the whole range of entry ages. Thus,

$$P_{x+1} \doteq (1+k)P_x - c.$$

In the following table are shown true values of P_{x+1} compared with values found by the method described.

Table of $100P_{x+1}$ by the A 1924-29 ultimate table

x	3 %		3½ %	
	True	Approximate	True	Approximate
20	1·012	1·008	·906	·898
25	1·189	1·187	1·075	1·068
30	1·417	1·416	1·296	1·291
35	1·714	1·714	1·586	1·582
40	2·097	2·099	1·962	1·963
45	2·600	2·601	2·460	2·461
50	3·279	3·277	3·136	3·136
55	4·211	4·201	4·065	4·061
60	5·495	5·475	5·349	5·341
	$k = .0575$ $100c = d = .02913$		$k = .0625$ $100c = d = .03382$	

The constants k and c were found by trial and error, and there is a special advantage in having c a convenient multiple of d , the rate of discount.

The above convenient relationship existing between P_{x+1} and P_x facilitates the calculation of the statutory preliminary term reserves from the strict net premium reserves. Thus,

$$\begin{aligned} P_{+1} \times a_{+t} &= (1+k)Pa_{+t} - ca_{+t} \\ &= (1+k)Pa_{+t} - .01(v - A_{+t}) \end{aligned}$$

(putting $c = .01d$ and substituting $da_{+t} = v - A_{+t}$),

which leads to $\Sigma SP_{+1}a_{+t} = (1+k)\Sigma SP_{+t} - .01(v\Sigma S - \Sigma SA_{+t})$.

This assumes that the premiums are to be valued by a factor of the form a_{+t} . The formula should be adjusted to allow for the uneven incidence of premium income.

The value of the increased net premium is found by multiplying the value of the unadjusted net premium by a constant, and subtracting an adjustment based on the total sum assured and total value of the sum assured. A valuer can therefore make the adjustment for the preliminary term allowance by a few simple calculations.

It is sufficient to tabulate the unadjusted net premium only in the valuation records. The valuer has before him at all times a presentation of the amount released from the reserves by availing himself of the preliminary term relief permitted by statute, and may set himself the goal of the full net premium reserve by gradual reduction of the calculated adjustment.

(b) *Endowment assurances*

Except for very long term endowment assurances (45 years and over) the maximum permissible adjustment is the adjustment set out in sub-paragraph (ii) of paragraph (b) of section 5 of the Second Schedule.

The adjusted valuation premium, π , is therefore

$$\begin{aligned}\pi &= P + \cdot 015/(1+a) \\ &= 1\cdot 015P + \cdot 015d\end{aligned}$$

(substituting $P + d = 1/(1+a)$).

This is in the same form as before, except that the second term is positive instead of negative.

The value of the unadjusted net premium is found, as before, by multiplying the value of the net premium by a constant and adding an adjustment based on the total sum assured and total value of the sum assured. The same advantages follow as in the case of the whole-life valuation.

(c) *Limited-premium assurances*

As actuaries generally prefer to make additional reserves above the normal net premium valuation to allow for expenses and profits after cessation of premiums, and as limited payments form a comparatively small part of the total business in force, the writer prefers to make the normal net premium reserve. The alternative adjustments to the net premium permitted by statute preclude the use of the methods described above.

The above method of deriving preliminary term reserves has been employed in making valuations under the Insurance Act and has been accepted by the Registrar of Insurance.