

ON A METHOD OF ESTIMATING THE INCREASE OF RATE PUT
ON ENDOWMENT ASSURANCES TO MEET DETERIORATION.

To the Editor of the Assurance Magazine.

SIR,—Tables of premiums for assurances payable at specific ages (50, 60, &c.), or at death, if before, are now contained in the prospectuses of most Companies, and I doubt not the transactions arising from them are proportionally numerous. In the use of such tables it will often happen that, from the arbitrary increase of rate, founded on adverse medical reports or other causes, it is not obvious how many years are thereby assumed to be added to the age of the assured; and I would submit to you the following simple method of arriving at this by inspection.

Since, for an assurance and endowment payable in n years, to be paid for in n annual premiums,

$$\pi_x = \frac{1}{1 + a_x} + v - 1,$$

then
$$\frac{1}{1 + \pi_x - v} = 1 + \frac{a_x}{n-1};$$

and, from the form in which Mr. Sang has tabulated his Short Annuity Values, we have but to substitute, in the last equation, for π_x , the increased premium per £1 (diminished by its proportion for Office commission), and look for the value in the “short annuity” column of the n th page of Sang—the age corresponding thereto, or to the annuity value nearest to it, being the advanced age wanted.

For an example, take a case of an Assurance Office which charges the Carlisle premium at 3 per cent., increased by 10 per cent. for management; the benefit, an assurance and endowment payable at death or on the assured (presently aged 27) attaining the age of 60. Therefore, $n=33$; and suppose that 10s. has been added to the Office premium per £100, π , the net premium per £1, is, therefore,

$$\frac{1}{110} (\text{£}2. 14s. 11d. + 10s.) = .0295075,$$

and
$$\frac{1}{1 + \pi - v} = 17.055.$$

On the thirty-third page of *Sang's Tables*, we find the nearest “short annuity” value to be £17.097, being the amount opposite age 40; and the premium charged by the Office is, therefore, slightly over the premium for assurance and endowment payable in 33 years on a life of the age of 40.

I am, Sir,

Your most obedient servant,

Aberdeen, 16th December, 1861.

H. AMBROSE SMITH.

P.S.—A wish to compare the results of the approximation for the values of annuities on three joint lives, given in your last Number, with the table in *Jones*, vol. ii., p. 1087, has led me to the discovery that the latter is based on the rate of *five* per cent., and not on *three* per cent., as stated. Perhaps it may be worth your making this known, for the benefit of others desirous of putting the table to a like use. I have re-computed it, and find it correct.

H. A. S.