CORRESPONDENCE.

To the Editor of the Transactions of the Faculty of Actuaries.

SIR,

SCOTTISH BANKERS' EXPERIENCE, 1903-1923.

The annuity values applicable to All Males combined given in Table VII. of this Experience (*T.F.A.*, vol. x., p. 257), are calculated, as there stated, from the totals of the l columns of the Combined Marriage and Mortality Table (Table V.). In using these annuities for the valuation of contributions it is assumed that the proportions of married men (including widowers) and bachelors in a Fund are the same as in Table V., but it was considered that any error due to variations in the proportions would be small.

Mr. Hugh W. Brown has recently valued a Fund in which he had occasion to value separately the contributions payable by bachelors, and he has kindly handed me a note of the formulas employed, and of the resulting annuity values at 4 per cent. interest. For the valuation of contributions payable by bachelors, he used (1) the value of an annuity payable while the bachelor remains unmarried, the formula for which is

$$(ba)_x = \Sigma_1^\infty v^{x+t}(bl)_{x+t} \div v^x(bl)_x;$$

and (2) the value of an annuity deferred until marriage, the formula for which is

$$(bma)_x = \Sigma_0^\infty \{v^{x+t+\frac{1}{2}}(bm)_{x+t} \times {}_{\frac{1}{2}}|(ma)_{x+t+\frac{1}{2}}\} \div v^x(bl)_x,$$

where ${}_{\frac{1}{2}}|(ma)_{x+t+\frac{1}{2}}$ is taken from Table VI., applicable to married men. (The latter formula is slightly different from that given by Dr. T. B. Sprague, who assumes that the first payment is due one year after marriage.) The sum of the two annuity values gives the total annuity for the valuation of bachelors' contributions when these are not altered on marriage.

In order to test the error in the original assumption, I re-valued (at 4 per cent. interest) the contributions in the specimen Fund, omitting for simplicity a small class of messengers and some minor special payments, and the following are the results in respect of each £1 of contribution. The contributions of bachelors were valued by Mr. Brown's combined table, and those of married men by Table VI.

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Class.	Table VII.	H.W.B. & VI.	Difference.
Bachelors . . .	£9,576·1	£9,464·3	+£111·8
Married and Widowers	6,007·2	6,131·0	— 123·8
Total . .	£15,583·3	£15,595·3	— £12·0

The net difference was thus less than one-tenth of one per cent., which may be regarded as negligible. In order to ascertain whether the closeness of the approximation was due to the membership in the particular Fund being very near in distribution to the figures in Table V., the respective proportions of bachelors and married were found for quinquennial groups of ages, and the differences were sufficiently large to indicate that the closeness of the approximation was not accidental. Mr. Brown calculated the values of contributions in the other Fund by the same method, and found that there also the difference between the results was quite negligible.

I append the tables of annuity values at 4 per cent. interest calculated by Mr. Brown, giving the separate values, and the sum of the two. At ages 20 and under the combined figures should in theory equal the annuity values in Table VII., and the actual differences do not exceed ·002.

I am,

Yours faithfully,

ALEX. FRASER.

15 SOUTH LEARMONTH GARDENS,
EDINBURGH,
January 1928.

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Bachelors' Annuities.

Scottish Bankers' 1903-1923 *Experience—Interest* 4%.

Age	$(ba)_x$	$(bma)_x$	$(ba)_x + (bma)_x = a_{(b)x}$	Age	$(ba)_x$	$(bma)_x$	$(ba)_x + (bma)_x = a_{(b)x}$
15	13·945	6·718	20·663	55	9·569	·979	10·548
16	13·538	7·004	20·542	56	9·318	·868	10·186
17	13·114	7·302	20·416	57	9·053	·767	9·820
18	12·673	7·613	20·286	58	8·774	·672	9·446
19	12·213	7·938	20·151	59	8·480	·584	9 064
20	11·733	8·276	20·009	60	8·174	·504	8·678
21	11·253	8·611	19·864	61	7·862	·431	8·293
22	10·782	8·931	19·713	62	7·546	·365	7·911
23	10·318	9·238	19·556	63	7·225	·307	7·532
24	9·871	9·523	19·394	64	6·901	·254	7·155
25	9·454	9·772	19·226	65	6·579	·207	6·786
26	9·097	9·955	19·052	66	6·264	·166	6·430
27	8·835	10·037	18·872	67	5·962	·131	6·093
28	8·699	9·983	18·682	68	5·676	·100	5 776
29	8·660	9·826	18·486	69	5·405	·074	5·479
30	8·706	9·573	18·279	70	5·149	·052	5·201
31	8·829	9·235	18·064	71	4·905	·034	4·939
32	9·027	8·808	17·835	72	4·664	·020	4·684
33	9·302	8·290	17·592	73	4·430	·010	4·440
34	9·621	7·712	17·333	74	4·201	·003	4·204
35	9·909	7·157	17·066	75	3·974	...	3·974
36	10·163	6·625	16·788	76	3·745	...	3·745
37	10·384	6·118	16·502	77	3·513	...	3·513
38	10·572	5·636	16·208	78	3·273	...	3·273
39	10·729	5·178	15·907	79	3·028	..	3·028
40	10·856	4·742	15·598	80	2·785	...	2·785
41	10·953	4·332	15·285	81	2·545	...	2·545
42	11·015	3·953	14·968	82	2·309	...	2·309
43	11·048	3·599	14·647	83	2·079	...	2·079
44	11·047	3·276	14·323	84	1·852	...	1·852
45	11·019	2·978	13·997	85	1·631	...	1·631
46	10·967	2·700	13·667	86	1·424	...	1·424
47	10·895	2·438	13·333	87	1·227	...	1·227
48	10·803	2·193	12·996	88	1·042	...	1·042
49	10·690	1·964	12·654	89	·867	...	·867
50	10·555	1·753	12·308	90	·700	...	·700
51	10·398	1·561	11·959	91	·536	...	·536
52	10·220	1·389	11·609	92	·360	...	·360
53	10·021	1·237	11·258	93	·186	...	·186
54	9·804	1·101	10·905				

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