CORRESPONDENCE

55 Broadway,
Westminster, S.W. 1,
12*th July* 1960.

The Editor,
T.F.A.

Dear Sir,

It was with the greatest interest that we read Mr. Donald's "Actuarial Note on the Calculation of Yields" in *T.F.A.* vol. 26, p. 368, for we have over the last few years, when giving advice on the investments of a pension fund, assumed an average reinvestment rate lower than the current high yields as given by the customary formula for the calculation of yields to redemption.

We note, however, that Mr. Donald assumes that (in his notation) annual amounts of i_2A are retained for use by the investor, only the balance of interest payments gC$-i_2$A being reinvested at an assumed rate i_1 to provide A$-$C at redemption. These assumptions do not seem applicable to a pension fund where contribution income is likely to exceed outgo for many years, and in any event, at the present time A, the purchase price per cent., is nearly always less than the redemption price C.

We have always assumed that the whole of the interest payments of gC per annum will be reinvested at rate i_1 for the remainder of the term of the security. Our yield, i_3 say, is then given by

$$\mathrm{A}(1+i_3)^n = g\mathrm{C}s'_{\overline{n}|} + \mathrm{C}$$

or

$$i_3 = \frac{g\mathrm{C}s'_{\overline{n}|}}{\mathrm{A}s''_{\overline{n}|}} - \frac{\mathrm{A}-\mathrm{C}}{\mathrm{A}s''_{\overline{n}|}}$$

where $s'_{\overline{n}|}$ is at the reinvestment rate i_1, and $s''_{\overline{n}|}$ is at rate i_3. It can be shown that the yield i_2 by Donald's formula, and our yield i_3 are related by the equation

$$1+i_2 s'_{\overline{n}|} = (1+i_3)^n$$

This may be verified by general reasoning.

It is of interest to compare our yields with the normal yields and with those by Mr. Donald's formula, for the examples quoted in Section 11 of his note. The yields according to our formula, when

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the prices are as set out in the corresponding position in Table 2 of that note, are as follows :

Yield i_3 per cent. when price is as set out in corresponding column of Table 2

Security	(1)	(2)	(3)	(4)	(5)	(6)
A	4·997	5·077	4·500	4·583	3·454	3·544
B	4·956	5·030	4·500	4·577	3·534	3·618
C	4·938	5·009	4·500	4·574	3·571	3·652

Comparison with Table 3 of the note shows that when the yield, calculated in the customary manner, is higher than the assumed reinvestment rate, our yields are lower than those obtained by Mr. Donald's formula but, like his, point to the advantages of the lower coupon stocks. When yields by the normal method are below the assumed re-investment rate, our yields are higher than Mr. Donald's, but, again like his, point to the advantages of the higher coupon stocks. In the case quoted by Mr. Donald, namely that of switching from C(5) to A(6), where the customary formula shows a gain of ·125 per cent., Mr. Donald shows a loss of ·036 per cent. and we show a loss of ·027 per cent., but in other cases our results differ more widely from Mr. Donald's.

It can be shown that, when a switch shows a gain in yield by Mr. Donald's formula, it will also show a gain in yield by ours, and similarly for losses. But to the extent that a difference in current yields to redemption is only one of the factors affecting the desirability of a switch (or the selection of an investment for new monies) it is important that the calculated variation in yields should give the best possible indication of magnitude as well as being of the right sign, in relation to the most realistic assumptions that can be made.

The approach to be adopted in practice must depend on the circumstances of the investor. Mr. Donald's formula is better suited to the investor who spends the interest income available after allowing for amortisation. We believe that for a growing fund, which in effect reinvests all its interest income, our method is more realistic.

Yours faithfully,

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