CORRESPONDENCE

A Matter of Interest

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Sirs,

This is a very simple story. It had to be, for it deals with compound interest and probability—and we are a bit shaky on some of the finer points.

Not so long ago we overheard a discussion on investments. One of the men was singing the praises of a stock: 'It's a gilt-edged ten per cent', he said. His friends' comments were equally odd. 'O King, live for ever!'; to which the other added, cynically, 'Why is a mouse when it spins?' The answer to the riddle, in case you have forgotten, is 'Because the higher the fewer'. We were puzzled. If it is gilt-edged it can't be 10%—and if it is 10% it cannot be gilt-edged. 4% is the same thing as 25 years' purchase, 5% as 20 years, 10% as 10. The higher the fewer—that seemed a little too obvious. But once we had decided that only the first speaker believed in the investment as a perpetuity, we began to see daylight.

A little historical research revealed that 'O King...' was an ancient usurers' prayer. The moneylenders were all right so long as conditions remained stable, but wars, revolutions and assassinations—which were pretty frequent in those days—played havoc with the security for their loans. The higher the risk, the fewer the payments they expected to receive. The old usurers were very wise birds who knew something about catastrophe risks and the mortality rates of monarchs; and they demanded 8 or 10 or 20%, expecting to clear 5% or whatever the ruling rate was.

In these days, when everybody seems to know what is a reasonable return to expect from a 'risk-free' investment, one might examine a few more or less speculative stocks to see whether they are likely to give a better return. The crude yield of course isn't very much help, except as a red light to show that a risk is thought to exist.

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We had a serious talk about what we remembered of Probability, and evolved a factor called π. Suppose the value is required of a perpetuity of £1 to yield i—or rather to return i—for 'yield' might be confused with 'crude yield'. If the investor was hoping to get on the average 15*s*. in the £ of the payment due at the end of the nth year, we decided we could say π_n was ·75. The value of the perpetuity to return i would be expressed as $\sum_{n=1}^{n=\infty} v^n \pi_n$. Of course in practice one might be certain of receiving 75% of the nth payment (neither more nor less) or there might be a 75% chance of receiving the full payment (and no chance of receiving a proportionate sum) or a certainty of getting 50% and an even chance of getting the other 50%—but you will remember what was said earlier about the finer points.

The next thing considered was the possible relationship between π_n and π_{n+1}; how π might vary with n. The chances are that $\pi_{n+1} \ngtr \pi_n$, though π might be independent of n. It seemed more likely that the values of π might form an arithmetical or geometrical progression. Mortality tables suggested l_x and D_x. The idea of an investment being subject to a sickness rate seemed all too reasonable. You can almost see the stage of chronic sickness being reached, with the inevitable morbid conclusion. Payments would, of course, only be forthcoming in respect of the healthy weeks.

At this stage it was something of a disappointment to realize that we could not possibly apply our theory directly, because no accurate forecast could be made of the shape of π for a particular stock. But we thought the experts could tell us what return they would hope for from a stock 'yielding' a high rate of interest. Obviously it would not be as much as the 'yield' and ought to be more than the return on a safe stock—because nobody would risk a loss without some compensation.

We decided to work out some figures, show them to an expert and ask him whether he thought the actual payments were likely to be larger or smaller than this or that series. Just to make it more complicated there seemed no reason why we should not assume a preliminary period when there was no default at all, or give a sudden twist to π after a time, making it accelerate its downward

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trend. At all events we hoped to get an indication whether stock exchange prices of particular bonds were too high or too low.

On the point of working out some calculations to show what forms π might take to turn a y % 'yield' into an r % 'return', one of us murmured 'tax'. Should the calculations be gross-gross or net-net? It makes all the difference. For private investors and many institutions, some form of net-net seemed to be correct. Can the surtax payer afford to speculate on net-net? Not in money stocks!

Money stocks? What about equities? Prices, it seems, depend on confidence! We had not the heart to complete all our calculations; though we did take a sneaking look at some of them yesterday. They were rather interesting.

Yours faithfully,

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