

## CORRESPONDENCE

(To the Editors of the Journal of the Institute of Actuaries)

DEAR SIRS,

Review of C. W. Jordan's *Life Contingencies*

I wonder if I may ask your kind indulgence to comment briefly on one portion of the highly stimulating review by P.F.H. of the book, *Life Contingencies*, by C. Wallace Jordan, which appeared in *J.I.A.* 79, 233. On page 235 the reviewer says:

On p. 29 he says that, in a select table with a 3-year select period,  $l_{25}$  represents the survivors of the  $l_{[20]}$  lives insured at age 20 and of the  $l_{[22]}$  lives insured at age 22; this was the misconception that lay at the root of Sprague's famous theory of damaged lives. There is a curious lapse on pp. 118 and 119 where the rather tricky problem of equality of policy values by two different tables is investigated. In his anxiety to avoid Sprague's error of first proving that a condition is necessary and then assuming that it is sufficient, the author blindly follows Mr Thomas N. E. Greville (*T.S.A.* 3, 533) in thinking that the most convenient way to complete the proof is by induction; he apparently fails to realize that when the problem is limited to a range of ages one has only to reverse the steps in the proof by which the necessary condition has been established in order to show that the condition is sufficient.

In the same paragraph on page 29, a few sentences before the statement cited by the reviewer, Jordan says:

The select symbol  $[x]$  is not used in the  $l_{x+3}$  column, since the effects of selection do not carry over into the fourth year, and  $l_{x+3}$  is therefore equally representative of the number of survivors of the  $l_{[x]}$  lives insured 3 years previously, the  $l_{[x-1]}$  lives insured 4 years previously, and so on. (*Italics mine.*)

The actual sentence commented on by the reviewer reads:

Note that this same value for  $l_{25}$  also represents the survivors at age 25 of the  $l_{[20]}$  lives insured at age 20 and of the  $l_{[22]}$  lives insured at age 22. (*Italics mine.*)

The use of the words 'number' and 'value' seems to me to make it reasonably clear that it is not being suggested that the same lives appear as survivors in the two cases—which, I am informed, is the idea underlying the misconception attributed to Sprague.

The reference to the problem of equal policy values by different tables could easily give the incorrect impression that, when the problem is limited to a range of ages, the necessary condition can be shown to be sufficient by merely reversing the steps in the proof, without resorting to any form of induction. As the reviewer points out in the very next sentence, the two conditions are not identical, since the sufficient condition requires the additional hypothesis that the relation  $\ddot{a}_x = (1+k) \ddot{a}'_x$  holds for some one age in the range. I think the point the reviewer wishes to make is that it is unnecessarily repetitious to give a fresh proof of the sufficient condition, since all the steps but one can be reversed, and that one can be taken care of by merely citing the additional hypothesis that the relation just mentioned holds for the next higher or the next lower age. In this connexion, it is interesting to note that the demonstration of the sufficient condition given in the Institute's new book, *Life and Other Contingencies*, Vol. 1 (of which the reviewer is a joint author), parallels closely

Jordan's demonstration of the necessary condition. Finally, I should like to point out (since a reader of the review might assume otherwise) that my discussion to which reference is made deals with the sufficient condition only, as I considered that the necessary condition had been correctly established by Spurgeon and others.

Yours faithfully,

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2 January 1954

(To the Editors of the Journal of the Institute of Actuaries)

DEAR SIRs,

Thank you for giving me this opportunity of commenting on the letter which Mr Greville has written to you. I should also like to express my appreciation of the courtesy which Mr Greville has extended to me by sending me, in advance, a draft of his letter.

I should be very sorry to think that anything I said in my review was unjust either to Prof. Jordan or to Mr Greville. However, I still think that the wording on page 29 of the book gives the student the impression that the  $l_{25}$  individuals who survive to age 25 out of the  $l_{[20]}$  lives at age 20 are identical with the  $l_{25}$  individuals who survive to age 25 out of the  $l_{[22]}$  at age 22. I must admit that in my reference to the problem of equality of policy values I did not express myself very clearly; as Mr Greville points out, the necessary condition cannot be proved sufficient without some form of induction. What I should have said was that the additional proof which Prof. Jordan introduces with the words 'We proceed by induction' could have been avoided.

I should like to add that these two matters, on which Mr Greville has so nobly taken up the cudgels on Prof. Jordan's behalf, are very small ones. The general impression which I experienced on reading the book (and which I hope I conveyed by my review) was one of admiration for the painstaking thoroughness with which the author demonstrated all the proofs. However, when a reviewer sees (or thinks that he sees) small blemishes in an otherwise excellent book, it is his duty to draw attention to them. I have no doubt that *Life and Other Contingencies* contains blemishes too, and that I shall before long receive the retribution that comes to glasshouse dwellers who throw stones.

As Mr Greville has penetrated the partial anonymity conferred by my initials, I may as well sign myself,

Yours faithfully,

P. F. HOOKER

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