

April 2, 1940

My dear Darmois,

I am very glad to have your letter and to hear that you were able, in spite of the frightful weather, to carry out your mission to England, which I hope you found enjoyable.

I should be very much surprised in a practical case to get a divergent series by the process which I think is easiest in principle, namely:

If $m_r(\theta_1, \dots, \theta_p)$, when $r = 1 \dots s$, is the expected frequency in class r for given values of the parameters θ_1 to θ_p , let

$$I_{jk} = \sum_{r=1}^s \frac{1}{m_r} \frac{dm_r}{d\theta_j} \frac{dm_r}{d\theta_k}$$

and let V_{jk} be the corresponding element in the reciprocal matrix, then, if a_r is the observed frequency, let

$$\sum_{r=1}^s \frac{a_r}{m_r} \frac{dm_r}{d\theta_j} = A_j$$

then $\theta_1 = \theta_j + \sum_{k=1}^p V_{jk} A_k$

gives a second approximation. The matrices are determined at

the trial values, and for more precise values of the variances and co-variances of the values fitted may usefully be re-determined from the improved values. From my own experience I should expect in practice that this would fail to give a convergent series of approximations only if the trial values were exceptionally unfortunate. I think, however, I should have time in the near future to try my hand at any batch of data which has been giving trouble. An approximation based on percentiles is often quicker to obtain than one based on moments, and is likely to be more accurate if the data are heavily grouped. If I ran into a divergent series I should more readily suspect that the theoretical form chosen was unsuitable to the data, i.e., that the goodness of fit was very unsatisfactory, than that my starting point, supposing this to be ordinarily plausible, was the cause of the trouble.

I think Koshal's paper should be useful in its practical exemplification of processes, especially where high precision is being aimed at, as it must be if one tries to draw distinctions between different efficient fittings, such as those provided by maximal likelihood and minimal χ^2 .

I shall be much interested to see the report of the Geneva meetings, and I do hope, as my wife does also, that, when you revisit England, we shall have the pleasure of seeing you.

Thank you for your news of Dugué. I have had a little correspondence with him about blood groups. My Laboratory has been collecting the very extensive data now becoming

available in England and Scotland, owing to the activities of our blood transfusion service. It would be of very great interest, if a parallel activity is in progress in France, to get the data collected, and I should like to do all that is possible to bring this about. It is possible that in Paris you know whether anything extensive of the kind is being done, and could discover who is in a position either to make a compilation or to permit me to be of assistance in this respect.

Yours sincerely,