

ON APPROXIMATIONS TO SOME LIMITING DISTRIBUTIONS WITH APPLICATIONS TO THE THEORY OF SAMPLING INSPECTIONS BY ATTRIBUTES

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§1. Introduction and summary.

In the previous papers [7], [8], [11] and [12], we have discussed on the several approximations to the probability distributions and noted their applications. The purposes of this paper are to continue and extend our discussions, hence this paper which is a continuation of [8] and [11] may be seen as the Part III of them.

Poisson approximations to binomial distribution and to Poisson binomial distribution were treated ([2], [3]), but in [2] the expressions of the evaluations for the error term are not quite simple ones. In §2, using the analogous technique to that in [8], we evaluate the errors of the approximation in term of p under some restrictive conditions, and remark that when binomial distribution is replaced by negative binomial distribution, the similar results hold. Based upon these results, we can deal with some of its applications to the sampling inspection theory.

Binomial approximation to Poisson binomial distribution was treated by LeCam [6]. In §3, we shall show that first approximating term of the above approximation can be expressed as the sum of binomial distribution and its difference of the second order. The error terms of the approximations of the approximation are evaluated in terms of the square sum of Δp_k where $\Delta p_k = p_k - \bar{p}$.¹⁾

The evaluation of the error of the normal approximation to the binomial distribution is given in [3] and [7]. In §4, we shall treat the normal approximation to the Poisson binomial distribution which seems to be not investigated ever. For evaluation of the error of approximation, we utilize the results of our previous paper [7], and obtain the similar expression to the results of [7].

Finally in order to show the applicability of our results in §1, we shall proceed to some problems on sampling inspections by attributes based on prior distribution, and add some remarks and tables.

In [9] and [10], we have also stated some results concerning with those problems from the other view points.

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1) Meaning of the notations of p_k and \bar{p} are described in [8].