Formula Derivation of Sample With Replacement and Without Considering Sample Mean Error in The Order Form

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Sample mean error is the squared mean value of sample error. In the preface of

$$E(\bar{x}) = (\overline{X})$$

sample mean error is also the standard error of a series of sample mean value, which reflects the mean error value between the sample mean value and population mean value. It is the important parameter, which decides the distribution of sample mean value and the degree of curve accumulation and decentralization, and it is the standard unit to measure sample limit error.

There are three forms of the sample mean " x " distribution in the simple random sampling:

1. Sample with replacement and considering the order form. It is the base of the sample mean distribution. Although the sample with replacement is not adopted very often in actual use, the explanation of the central of the sample mean " x " with replacement and considering the order form.
2. Sample without replacement. It has two forms: considering order and without considering order. Sample without replacement is often used in actual operation, but they have the same distribution.
3. Sample with replacement and without considering order form. This belongs to the weak link in sample theory. The form of " x " has its independent distribution, which is different form the above-mentioned two points. This kind of distribution is more decentralized than the above-mentioned two, and it has more mean errors.

It is difficult to calculate sample mean error by using theoretical formula, for there may have more sample mean error. The sample mean value has three kinds of forms, and three simple formulae. The familiar sample with replacement and considering its order is

$$\overline{x} = \sqrt{\frac{s^2}{n}\left(\frac{N-n}{N-1}\right)}$$

sample without replacement,

$$\overline{x} = \sqrt{\frac{s^2}{n}\left(\frac{N+n}{N}\right)}$$

sample with replacement and without considering the order,

This paper illustrates the sample with replacement and without considering the order. Every sample value may appear repeatedly in all the possible samples, but without considering the feature of order and the reason and the process of the sample mean error.

This has enriched the distribution of the sample mean value in the sample theory.

$$\bar{x} = \sqrt{\frac{s^2}{n}\left(\frac{N+n}{N+1}\right)}$$

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