RESEARCH REVIEW JOURNALS
Volume-04
Issue-02
February -2019

ISSN: 2455-3085 (Online)
RESEARCH REVIEW International Journal of Multidisciplinary
www.rrjournals.com [UGC Listed Journal]

Two Sided Modified Complete Chain Sampling Plan for Small Samples

*[1]C Milky Mathew & [2]M Rajeswari

[1]*PhD Research scholar, Karpagam Academy of Higher Education, Coimbatore- 641 021 (India)*
[2]*Assistant Professor, Dept of Biostatistics, JIPMER, Puducherry (India)*

ARTICLE DETAILS

Article History
Published Online: 20 February 2019

Keywords
OC function, probability of acceptance, chain sampling plan, modified chain sampling plan, two sided modified complete chain sampling plan

***Corresponding Author**
Email: milkyjeevan[at]gmail.com

ABSTRACT

In this paper the OC function for two sided modified complete chain sampling plan for small samples is derived considering OC function for modified chain sampling plan for small samples and the OC function for two sided complete chain sampling plan.

1. Introduction

The chain sampling plan of quality Chain Sampling Plan-1 of Dodge (1955) is satisfying in situations to what place the sample size needs oncoming essentially little because of expensive or destructive tests. The Chain Sampling plan achieves a better precaution to the composer, specially, it increases the probability of acceptance at useful quality levels when compared to the Operating Characteristic curve of the zero acceptance number single sampling attributes plan. This alteration is done by making serve of the investigation results of past i lots whenever an 'occasional' nonconforming unit' is observed in the sample gone from the advanced lot. That is, if the preceding i samples are informal of nonconforming units, earlier the nonconforming unit stay in the advanced sample is proposed as an alternate one and the advanced lot is accepted. Dodge's (1955) concern of 'chaining' past lot inspection results yields a biased Operating Characteristic curve but not a loss of value in sample size.

In literature, numerous sampling plans are to be had to just accept or reject lots. Dodge (1955) delights by a technique, called chain sampling plan (ChSP-1) without remarkably raising the sample size. Clark (1955) has developed OC curves for chain sampling plans. Hahn(1974) studied that the AC=0 plan needs the minimum sample size for a specified limiting quality and consumer's risk as compared to other type of sampling plans. Hald(1981) made a systematic discussion of the existing statistical theory of lot-by-lot sampling inspection by attributes and offered some tables for them. Soundararajan and Govindaraju (1983) have developed procedures and tables for construction and selection of ChSP(0, 1) plans by particular parameters. Latha (2002) have exposed the acceptance technique of Bayesian chain sampling plan on the groundwork of distinct sequences of new parameters with tables. Latha M and Rajeswari M (2013) derived the average probability of acceptance for Modified Chain Sampling Plan placed on gamma prior distribution and the promotion method for Bayesian Modified Chain Sampling Plan (BMChSP-1) is showed by all of the examples.

2. Two Sided Complete Chain Sampling Plan

The Chain Sampling Plans developed by many authors are one sided chaining and the Operating procedure mainly deals with only the results of past lots to decide about the current lot acceptance or rejection. To overcome the disadvantage in Chain Sampling Plans, Rebecca Jebaseeli Edna (2012) have designed and developed Two Sided Complete Chain Sampling Plans (TSCChSP-1). Since products are inexpensive or non-destructive while testing or inspection few defectives may be allowed instead of zero defective maintenance during sampling inspection. In order to compensate the allowance given, the chaining principle is applied on both sides of current lot (i.e) preceding and succeeding lots.

3. Two Sided Modified Complete Chain Sampling Plan (TSMCChSp-1)

In this paper by the recommendation of internal quality auditor, the pressure on the producer is reduced by allowing few defectives during sampling inspection and at the same time double sided chaining principle is embedded in the system. The new sampling plan is known to be modified complete chain sampling plans. K. Govindaraju and C. D. Lai (1998) have studied 'A Modified ChSP-1 Chain Sampling Plan (MChSP-1) with very small sample sizes'. The operating procedure of such a Modified Chain Sampling Plan (MChSP-1) is given below.

1. The current sample as well as the preceding *i* samples contain no nonconforming units.
2. The current sample contains no nonconforming unit, while any one of the *i* preceding samples contains only one nonconforming unit and the rest of (*i*-1) samples are free from nonconforming units.

It is therefore the OC function $P_a(p)$ of the MChSP-1 plan as

$$P_a(p) = p_0[{p_0}^i + ip_1{p_0}^{i-1}]$$

Operating characteristic function for Two Sided Complete Chain Sampling Plan (TSCChSP-1) is given by Rebecca Jebaseeli Edna K (2012).

i. Accept the current lot if d (the observed number of defectives) is zero in the sample of n units and reject the lot, if d > 1. If d = 1, then go to next step.
ii. Also accept the current lot, if d = 1 and, if no defectives are found in the immediately preceding 'i' samples and succeeding 'j' samples from the same steady state process.

It is therefore the OC function $P_a(p)$ for two sided complete chain sampling plan as

$$p_{0,n} + (p_{0,n})^i p_{1,n}(p_{0,n})^j$$

4. OC Function of TSMCChSP-1 Plan

In rules of order to achieve a smaller sample distribution size, the approach for chaining the results of the i preceding lots and j succeeding lots may be modified. The operating procedure of such a Modified Chain Sampling Plan (MChSP-1) is given below.

The Operating characteristic function for Two-Sided Modified Complete Chain Sampling Plan (TSMCChSP-1) is given by

1. The current sample as well as the preceding i samples and the succeeding j samples contain no nonconforming units.
2. The current sample contains no nonconforming unit, while any one of the i preceding samples and the succeeding j samples contains only one nonconforming unit and the rest of $(i-1)$and $(j-1)$ samples are free from nonconforming units.

It is therefore the OC function $P_a(p)$ of the Two Sided Modified Complete Chain Sampling Plan as

$$Pa(p) = p_0{p_0}^i{p_0}^j + p_0\,[(i+j)p_1]\,{p_0}^{i-1}{p_0}^{j-1} \qquad (1)$$

As in the case of TSCChSP-1 design , the OC part of the TSMCChSP-1 plan gives the proportion of lots expected to be accepted under the plan for the given process character p.

Under the conditions of the Poisson model, the OC function of the TSMCChSP-1 plan becomes

$$P_a(p) = e^{-np(i+j)}[e^{-np} + np(i+j)] \quad ; \; if\; i \neq j$$
$$= e^{-2inp}[e^{-np} + 2inp) \; ; \; if\; i = j \qquad (2)$$

Since, $p_0 = e^{-np}$ and $p_1 = npe^{-np}$. This expression is also employed in the construction of tables for selection of the TSMCChSP-1 plan.

5. Comparison with TSCChSp -1 plan

Figure 1 provides an analogy of the OC curve of the Two Sided Modified Complete Chain Sampling plan by all of the zero acceptance number Chain Sampling details when the sample size is 10. The related draw also shows the OC curves of the TSCChSP plan by all of $i = j = 1$ and $i = j = 2$. It is well-known that the modified matter of form decreases the probability of acceptance, $P_a(p)$ at disadvantaged quality levels anyhow maintains the probability of acceptance, $P_a(p)$ at useful quality levels when compared to the OC curve of the zero acceptance number Chain Sampling plan. The TSCChSP-1 plan, on the other employee, increases the probability of acceptance, $P_a(p)$ at useful quality levels anyhow maintains the probability of acceptance, $P_a(p)$ at disadvantaged quality levels. Since the OC curves are not intended, further analogy is not convenient but the same is discussed below.

FIGURE 1: Comparison of OC curves of TSCChSP-1 and TSMCChSP-1 Plans

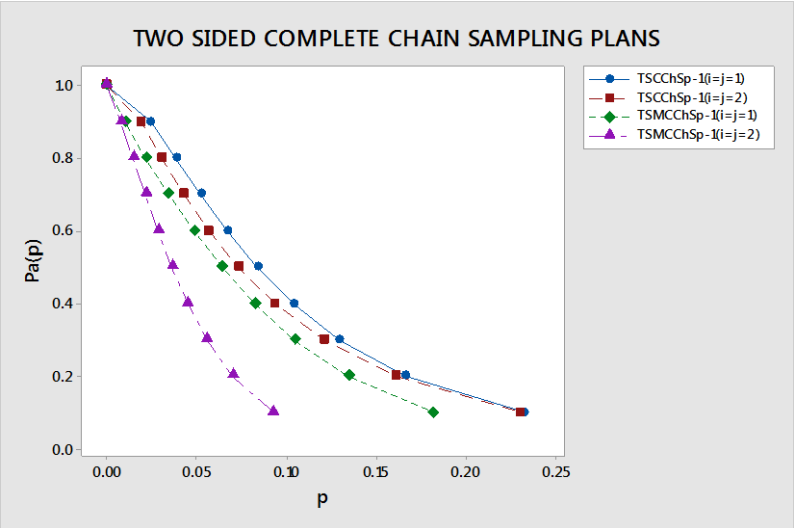

Table 1 recommending the values of p for particular values of $P_a(p)$ is alternately constructed numerically solving equation (2) for p for subject to values of $i = j$. This approach is similar to a well known followed by Soundararajan (1978) for the ChSP-1 plan. Based on Table 1, related TSCChSP-1 and TSMCChSP-1 plans can be obtained and compared. It should anyway be prominent that the OC curve of the TSCChSP-1 plan is somewhat more exacting than the OC curve of the TSMCChSP-1 plan.

TABLE 1
Values of p for given $i = j$ and $P_a(p)$ for TSMCChSP-1 plan

i	Pa(p)								
	0.99	0.95	0.90	0.75	0.50	0.25	0.10	0.05	0.01
0	0.0010	0.0051	0.0105	0.0288	0.0693	0.1386	0.2303	0.2996	0.4605
1	0.0010	0.0051	0.0105	0.0282	0.0644	0.1185	0.1819	0.2264	0.3240
2	0.0001	0.0044	0.0082	0.0185	0.0365	0.0624	0.0929	0.1146	0.1627
3	0.0009	0.0037	0.0064	0.0135	0.0255	0.0425	0.0627	0.0770	0.1089
4	0.0008	0.0031	0.0052	0.0105	0.0195	0.0323	0.0473	0.0581	0.0819
5	0.0008	0.0027	0.0044	0.0087	0.0158	0.0260	0.0380	0.0466	0.0656
6	0.0007	0.0023	0.0038	0.0073	0.0133	0.0218	0.0318	0.0389	0.0548
7	0.0007	0.0021	0.0033	0.0064	0.0115	0.0188	0.0273	0.0334	0.0470
8	0.0006	0.0019	0.0030	0.0056	0.0101	0.0165	0.0240	0.0293	0.0412
9	0.0006	0.0017	0.0027	0.0050	0.0090	0.0147	0.0213	0.0261	0.0367

6. Conclusion

The Two sided modified complete chain sampling plan, TSMCChSP-1 developed in this paper is a modification of the TSCChSP-1 plan in that it utilizes greater information from the prior lot quality history. The formula for the OC function of the TSMCChSP-1 plan is derived and tables based on the Poisson model are exposed for the study of the plan. The Two sided modified complete chain sampling plan is probably to be acceptable for inspections involving destructive or expensive testing by attributes.

References

1. Clark C R. OC Curves for ChSP-1, Chain sampling plans. Industrial Quality Control. 1955; 17(4):10-12.
2. Dodge H F. Chain sampling Inspection Plans. Industrial Quality Control. 1955; Vol 11, No.4, pp, 10-13.
3. Dodge H F, Stephens KS. Some new chain sampling inspection. Industrial Quality Control. 1966; 23(2):61-67.
4. Govindaraju K, Lai C D. A modified ChSp-1 chain sampling plan, MChSp-1, with very small sample sizes. American Journal of Mathematics and Management Sciences. 1998; 18, 343-358.
5. Hahn G.J. Minimum Size Sampling Plans. Journal of Quality Technology.1974; 6(3), 121-127.
6. Hald A. Statistical Theory of Sampling Inspection by attributes. Academic Press Inc., (London) Ltd. London, New York. In press 1981.
7. M Latha. Construction and Evaluation of Performance Measures for Bayesian Chain Sampling Plan (BChSP-1). Far East Journal of Theoretical Statistics. 2002; Vol.6, No.2, pp.129-139.
8. M Latha, M Rajeswari. A study on Bayesian modified chain sampling plan-1, Mathematical Sciences International Research Journal. 2013; 2278-8697.
9. Rebecca Jebaseeli Edna K. A Study and Contributions to Quality Control Measures Based on Acceptance Sampling Plans. Ph.D Thesis, Karunya University,Tamil Nadu, India; 2012.
10. Soundaryarajan V. Procedures, Tables for Construction, Selection of Chain Sampling Plans (ChSP-1) .1978; J.Qual.Technol.10, pp.6-60 and 99-103.
11. Soundararajan V, Govindaraju K. Construction and Selection of Chain Sampling Plans ChSP-1(0, 1).1983; Journal of Quality Technology, 15, 180-185.

