International Journal of Statistics and Applied Mathematics 2019; 4(2): 10-15

International Journal of Statistics and Applied Mathematics

ISSN: 2456-1452
Maths 2019; 4(2): 10-15

www.mathsjournal.com
Received: 03-01-2019
Accepted: 06-02-2019

M Latha
Principal (Red), Kamarajar Government Arts College, Surandai, Tamil Nadu, India

A Palanisamy
Research Scholar, Department of Statistics, Government Arts College, Udumalpet, Tamil Nadu, India

Correspondence
M Latha
Principal (Red), Kamarajar Government Arts College, Surandai, Tamil Nadu, India

Selection of multiple deferred sampling (0, 1) plan with zero – inflated poisson distribution based on quality region

M Latha and A Palanisamy

Abstract
This paper presents a new procedure for the construction and selection of Multiple Deferred State MDS (0, 1) plan with zero inflated possion distribution and demonstrate how it can facilitate to find Average Quality Level (AQL) and Limiting Quality Level (LQL) and bring about the result to reduce the producers risk (α) and consumer risk (β). In this article, we further introduce probabilistic Quality Region (PQR), and Indifference Quality Region (IQR) which gives potential application to improve the quality level in industry products. This paper proposes Multiple Deferred State sampling (0, 1) plan to improve the quality of any product and service.

Keywords: Multiple deferred state sampling plan MDS (0,1) plan, zero – inflated poisson distribution, average quality limit (AQL), limiting quality limit (LQL), producer's risk, consumer risk, indifference quality level (IQL), probabilistic quality region (PQR), indifference quality region (IQR)

1. Introduction

Statistical Quality Control is the term used to describe the set of statistical tools used to describe the set of statistical tools used by quality engineers professionals. One of the major areas of Statistical Quality Control is Acceptance sampling. Acceptance sampling is a methodology that deals with procedures, by which decision to accept or reject are based on the inspection of sample. Acceptance sampling is "the middle of the road" approach between no inspection and 100% inspection. There are two major classifications of acceptance plan: by attributes and variables. Therefore, there is a change of rejection a good lot (Producer's risk) and acceptance a bad lot(consumer's risk). Acceptance sampling by attributes each item is tested and classified as conforming and non- conforming. A sampling is taken and contains two many non –conforming items, then the batch is reject, otherwise it is accepted.

To ensure a good quality of the final product from the factory, inspection of the raw material and the product material should be done. The acceptance sampling plans are well known to reduce the above risks. In all the type of sampling plans namely single sampling plan, double sampling, multiple sampling plan and chain sampling plan, the basic assumption is the lot or fraction of defective goods is constant. Even though the process is stable, in practical situations, the goods produced from a process will slightly differ in their quality due to random fluctuations.

The concept of the Multiple Dependent (or deferred) State (MDS) sampling plan was introduced by Wortham and Baker (1976) [12]. MDS sampling plan belongs to the group of conditional sampling procedures. Subramani. and Govindaraju (1990) [8] have presented tables for the selection of multiple deferred state MDS-1 sampling plan for given acceptable and limiting quality levels using Poisson distribution. Suresh (1993) has proposed procedures to select Multiple Deferred State Sampling plan of type MDS and MDS- 1 index through producer and consumer quality levels considering filter and incentive effect.

The Zero-Inflated Poisson (ZIP) distribution can be used as the appropriate probability distribution to data which are consisting of many over dispersed zeros. ZIP distribution has been used in a wide range of disciplines such as agriculture, epidemiology, econometrics, public health, process control, medicine and manufacturing, etc.

Some of the applications of ZIP distribution can be found in Bohning *et al*. (1999) [1], Lambert (1992) [3], and Yang *et al*. (2011) [13]. Construction of control charts using ZIP distribution are discussed in Sim and Lim (2008). Some theoretical aspects of ZIP distributions are mentioned in McLachlan and Peel (2000) [7]. Single sampling plans by attributes under the condition of ZIP distribution are determined by Loganathan and Shalini (2013) [4], Suresh and Sangeetha (2010) [10] have given a procedure for selection of Repetitive Deferred Sampling plan through quality region. Latha and Palanisamy (2018) [5] have discussed the Selection of Bayesian Single Sampling Plan with Zero – Inflated Poisson Distribution Based on Quality Region**.** Latha and Palanisamy (2019) [6] have discussed the Selection of Multiple Deferred Sampling (0,1) Plan with Zero – Inflated Poisson Distribution

The main aim of this paper is to account for determining Acceptance Quality Level (AQL), Limiting Quality Level (LQL), Producer's Risk (α), Consumer's Risk (β) and Indifference Quality Level (IQL). This article also leads to final the Probabilistic Quality Region (PQR) and Indifference Quality Region (IQR) for specified parameters. Procedures and tables given in this article provides applications in industrial ground

2. Condition for application of MDS-1(C_1, C_2)

Rembert Vaerst (1980) has developed Multiple Deferred State MDS-1(C_1, C_2) Sampling Plans in which the acceptance or rejection of a lot is based in not only on the results from the current lot but also on sample results of the past or future lots.

- Interest centers on an individual quality characteristic that involves destructive or costly tests such that normally only a small number of tests per lot can be justified.
- The product to be inspected comprises a series of successive lots or batches (or material or of individual units) produced by an essentially continuing process.
- Under normal conditions the lots are expected to be essentially of the same quality.
- The product comes from a source in which the consumer has confidence.

3. The Operating procedure of the MDS (C_1, C_2)

The operating procedure for this plan is stated as:

- From each lot, select a random sample of n units and observe the number of nonconforming units d.
- If $d < C_1$, accept the lot.
- If $d > C_1 + C_2$ reject the lot.
- If $C_1 +1` < d < C_1+ C_2$, accept the lot if the forthcoming m lots in succession are all accepted

4. Operating Procedure for MDS (0, 1) Plan

A multiple deferred state sampling plan of Wortham and Baker (1979) with $C_1 = 0$ and $C_2 = 1$ is operated as follows:

- From each lot, take a random sample of n units and observe the nonconforming units, d.
- If d = 0, accept the lot; if d > 1, reject the lot.
- If d = 1, accept the lot, provided the forthcoming m lots in succession are all accepted (previous m lots in case of multiple dependent state sampling).

The OC function of the MDS (0.1) plan is given by the equation

$$Pa\ (p) = P_{C1} + [P_{C2} - P_{C1}]\ [P_{C1}]^m \tag{1}$$

Where

$$P_{C1} = \varphi + (1-\varphi)e^{-np} ,$$

$$P_{C2} = \varphi + (1-\varphi)e^{-np} \ ) + (1-\varphi)e^{-np}\, np$$

Rembert Vaerst has presented certain tables giving minimum MDS-1(C_1,C_2) plans indexed by AQL and LQL and observes the following properties.

- MDS-1(C_1,C_2) Plans are natural extension of ChSP-1 Plans of Dodge (1955) [2].
- MDS-1 (C_1,C_2) plans allows significant reduction in sample size as compared to single sampling plans.
- The use of acceptance number C_2 increases the chances of acceptance in the region of principal interest. Where the product percent defective is very low.
- When m= 0, the plan becomes a single sampling plan with sample size n, and acceptance number C_2.
- When m = ∞, the plan becomes a single sampling plan with sample size n, and acceptance number C_1

5. Operating characteristic function for multiple deferred sampling mds (0, 1) plan with zip model

The OC function is defined as

$$P_a(p) = P[X \le c]$$

Where "p" is the probability of fraction defective

The numbers of defects are zero for many samples there may consider Zero – inflated Poisson probability distribution. The probability mass function of the ZIP (φ, λ) distribution is given by Lambert (1992) [3] and McLachlam and peel (2000) [7]

$$P(X = x \mid \varphi, \lambda) = f(x) + (1-\varphi)\, P(X = x \mid \lambda) \tag{2}$$

where

$$f(x) = \begin{cases} 1, if\ x = 0 \\ 0, if\ x \neq 0 \end{cases}$$

and

$$P(X = x / np) = \frac{e^{-np}\ (np)^x}{x!} \text{, when x =0, 1, 2, …}$$

The probability mass function can also be expressed as

$$P(X = x \mid \varphi, np) = \begin{cases} \varphi + (1-\varphi)e^{-np} & when \quad x = 0 \\ (1-\varphi)\dfrac{e^{-np}(np)^x}{x!}, & when \quad x = 1, 2, ..., 0 < \varphi < 1,\ \lambda > 0 \end{cases}$$

In this distribution, φ may be called as the mixing proportion. φ and *(np)* are the parameters of the ZIP distribution. According to McLachlan and Peel (2000) [7], a Zip distribution is a special kind of mixture distribution.

The probability of acceptance for Multiple Deferred State Sampling MDS (0,1) Plan based on Zero- inflated Poisson distribution

$$P_a(p) = (\varphi + (1-\varphi)e^{-np} \ ) + (1-\varphi)e^{-np}\, np)\ \ (\varphi + (1-\varphi)e^{-np} \ )^m \tag{3}$$

6. Designing Plans for given AQL, LQL, α and β

Tables 1 and 2 are used for selecting a Modified chain sampling plan with zero inflated possion for specified AQL and LQL, α, β and *i* by the following steps.

7. The steps utilized for selecting Multiple Deferred State Sampling MDS (0,1) Plan with Zero Inflated Possion Plan are as follows

- To design a plan for given (AQL, 1-α) and (LQL, β) first calculate the operating ratio p_2/p_1.
- For a fixed m, locate the tabular value of p2/p1 which is equal to or just less than the desired p_2/p_1 in the column of desired α and β.
- Corresponding to the located value of p_2/p_1 the value of φ and *m*, can be obtained.

Example 1: For φ =0.01, m=3, $\bar{p}$ = 0.50 the corresponding IQL value np_0 = 0.7784

For φ =0.09, i=3, and AQL value np_1= 0.1149 and LQL values np_2=4.5153

From Table 1 for the given variation Probability of Acceptance of the above equations. The average product obtained. The above examples, we can understand that when φ and *m* are increased, the average product quality is decreased.

Example 2: Suppose the value for p_1 is assumed as 0.02and value for p_2 is assumed as 0.037 then the operating ratio is calculated as 18.5. Now the integer approximately equal to this calculated operating ratio and their corresponding parametric values are observed from the table 2. The actual np_1=0.1265 and np_2=2.3337at (α=0.05 and β=0.01).

8. Designing of quality interval Multiple Deferred State Sampling MDS (0,1) Plan with Zero - Inflated Poisson Model

8.1 Probabilistic Quality Region (PQR)

The PQR is an interval of quality ($p_1< p< p_2$) in which product is accepted with a minimum probability 0.10 and maximum probability 0.95. The probabilistic quality range, denoted by $d_2= (p_2 – p_1)$, is derived through the probability of acceptance.

$$\bar{p}\ (p_1 < p < p_2) = (\varphi+(1-\varphi)e^{-np}) + (1-\varphi)e^{-np}\, np)\ (\varphi+(1-\varphi)e^{-np})^m$$

for $p_1<p<p_2$ (4)

8.2 Indifference Quality Region (IQR)

The IQR is an interval of quality ($p_1< p< p_0$) in which product is accepted with a minimum probability 0.50 and maximum probability 0.95. The indifference quality range, denoted as $d_0= (p_0 – p_1)$, is derived through the probability of acceptance.

$$\bar{p}(p_1 < p < p_2) = (\varphi+(1-\varphi)e^{-np}) + (1-\varphi)e^{-np}\, np)\ (\varphi+(1-\varphi)e^{-np})^m$$

for $p_1<p< p_0$ (5)

9. Selection of the Sampling plan

Table 3, gives unique values of T for different values of ‘ φ ’ and ‘*m*’. Here operating ratio $T = \dfrac{np_2 - np_1}{np_0 - np_1} = \dfrac{d_2}{d_0}$, where $d_2 = (np_2 - np_1)$, and $d_0 = (np_0 - np_1)$ is used to characterize the sampling plan. For any given values of PQR (d_2), and IQR (d_0), one can find the ratio $T = \dfrac{d_2}{d_0}$, Find the value in the Table 3, under the column T, which is equal to or just less than the specified ratio, corresponding ‘ φ ’ and ‘m’ values are noted. From this ratio one can determine the parameters for Multiple Deferred State Sampling MDS (0,1) plan with Zero- inflated Poisson distribution.

Example 3: Given φ =0.05, m=5 and np_1= 0.0869 compute the values of PQR and IQR then compute T. Select the respective values from Table 3. The nearest values of PQR and IQR corresponding to φ =0.05, m=3 and np1=0.0869 are d_2= 2.2072 and d_0= 0.6818, Then T= 4.1911. Hence the required plan has parameters φ =0.05, m =5, through Quality Interval.

In the similar way, the above equations are equated to the average probability of acceptance 0.95 and 0.10; AQL (np_1) and IQL (np_2) are obtained in Table 3.

10. Conclusion

Acceptance Sampling is the best technique, which deals with the procedure in which decision to accept or reject lots or process based on their examination of past history or knowledge of samples. The ZIP distribution has been shown to be useful for modeling outcomes of manufacturing process producing numerous defect-free products. The work presented in this paper mainly related to procedure for designing multiple deferred state sampling plan for probability of acceptable, producer’s and consumer’s risk and limiting, indifference for quality levels and quality regions. The quality level and quality interval sampling plan possesses wider potential applicable in industry ensuring higher standard of quality attainment for product or process. Thus quality interval and quality level are good measure for defining and designing for acceptance sampling plan which are readymade use to industrial shop-floor situations

Table 1: *np* values for MDS (0,1) with Zero Inflated Poisson for given Probability Acceptance

		Pa(p)						
φ	m	0.99	0.95	0.90	0.50	0.10	0.05	0.01
0.0001	1	0.0778	0.2067	0.2244	1.0065	2.4912	3.1264	4.6587
	2	0.0669	0.1264	0.2453	0.8388	2.3254	3.0050	4.6155
	3	0.0569	0.1058	0.2116	0.7672	2.3057	2.9980	4.6151
	4	0.0505	0.0925	0.1905	0.7317	2.3037	2.9976	4.6151
	5	0.0458	0.0829	0.1758	0.7132	2.3035	2.9976	4.6151
	6	0.0365	0.0757	0.1648	0.7035	2.3034	2.9976	4.6151
	7	0.0339	0.0699	0.1563	0.6984	2.3034	2.9976	4.6151
	8	0.0318	0.0947	0.1496	0.6959	2.3034	2.9976	4.6151
	9	0.0299	0.0906	0.1440	0.6945	2.3034	2.9976	4.6151
0.001	1	0.0778	0.2068	0.2246	1.0079	2.5001	3.1446	4.7542

	2	0.0670	0.1265	0.2455	0.8399	2.3337	3.0224	4.7100
	3	0.0569	0.1059	0.2118	0.7682	2.3139	3.0153	4.7095
	4	0.0505	0.0925	0.1907	0.7326	2.3118	3.0149	4.7095
	5	0.0459	0.0831	0.1760	0.7141	2.3116	3.0149	4.7095
	6	0.0366	0.0757	0.1650	0.7044	2.3116	3.0149	4.7095
	7	0.0339	0.0700	0.1565	0.6994	2.3116	3.0149	4.7095
	8	0.0340	0.0648	0.1497	0.6968	2.3116	3.0149	4.7095
	9	0.0318	0.0606	0.1441	0.6955	2.3116	3.0149	4.7095
0.01	1	0.0784	0.2085	0.3134	1.0212	2.5948	3.3485	0.5687
	2	0.0676	0.1275	0.2478	0.8511	2.4208	3.2167	0.4279
	3	0.0574	0.1067	0.2139	0.7784	2.4002	3.2092	0.3515
	4	0.0510	0.0933	0.1925	0.7423	2.3981	3.2088	0.3019
	5	0.0463	0.0837	0.1777	0.7235	2.3979	3.2088	0.2667
	6	0.0369	0.0764	0.1666	0.7137	2.3978	3.2088	0.2399
	7	0.0342	0.0706	0.1580	0.7086	2.3978	3.2088	0.2189
	8	0.0320	0.0659	0.1511	0.7059	2.3978	3.2088	0.2018
	9	0.0302	0.0515	0.1455	0.7046	2.3978	3.2088	0.1876
0.05	1	0.0899	0.1714	0.3263	1.0855	3.1945	0.5751	0.5837
	2	0.0702	0.1320	0.2585	0.9048	2.9729	0.4345	0.4793
	3	0.0597	0.1107	0.2233	0.8272	2.9473	0.3577	0.4683
	4	0.0530	0.0968	0.2011	0.7887	2.9447	0.3078	0.4579
	5	0.0482	0.0869	0.1855	0.7687	2.9444	0.2722	0.4012
	6	0.0383	0.0793	0.1740	0.7583	2.9444	0.2452	0.3504
	7	0.0356	0.0733	0.1650	0.7528	2.9444	0.2238	0.2924
	8	0.0333	0.0684	0.1579	0.7500	2.9444	0.2065	0.1244
	9	0.0314	0.0554	0.1520	0.7486	2.9444	0.1920	0.1225
0.09	1	0.0933	0.2254	0.3403	1.1586	4.8989	0.5909	0.5997
	2	0.0651	0.1778	0.1854	0.9661	4.5550	3.5674	0.4546
	3	0.0623	0.1149	0.2336	0.8830	4.5153	3.3752	0.3750
	4	0.0553	0.1006	0.2104	0.8418	4.5113	3.3356	0.3230
	5	0.0503	0.0904	0.1942	0.8203	4.5109	3.2352	0.2858
	6	0.0399	0.0826	0.1821	0.8091	4.5108	3.2340	0.2576
	7	0.0371	0.0764	0.1727	0.8033	4.5108	3.2252	0.2353
	8	0.0347	0.0713	0.1652	0.8003	4.5108	3.1403	0.2171
	9	0.0327	0.0670	0.1591	0.7988	4.5108	3.0679	0.2020

Table 2: Values of p_2/p_1 tabulated against φ, and m for given α and β for *Multiple Deferred State Sampling Plan* with Zero inflated Poisson

φ	m	p_2/p_1 $\alpha=0.05$ $\beta=0.10$	p_2/p_1 $\alpha=0.05$ $\beta=0.05$	p_2/p_1 $\alpha=0.05$ $\beta=0.01$	p_2/p_1 $\alpha=0.01$ $\beta=0.10$	p_2/p_1 $\alpha=0.01$ $\beta=0.05$	p_2/p_1 $\alpha=0.01$ $\beta=0.01$
0.0001	1	12.0552	15.1290	22.5439	32.0206	40.1851	59.8805
	2	18.3972	23.7737	36.5150	34.7593	44.9178	68.9910
	3	21.7930	28.3365	43.6210	40.5220	52.6889	81.1090
	4	24.8995	32.3995	49.8822	45.6540	59.4055	91.4606
	5	27.7865	36.1592	55.6709	50.2948	65.4498	100.7668
	6	30.4280	39.5984	60.9659	63.1068	82.1260	126.4416
	7	32.9528	42.8841	66.0246	67.8868	88.3466	136.0189
	8	24.3231	31.6536	48.7341	72.5252	94.3829	145.3123
	9	25.4238	33.0861	50.9395	77.0368	100.2542	154.3518
0.001	1	12.0895	15.2060	22.9893	32.1350	40.4190	61.1078
	2	18.4482	23.8921	37.2332	34.8313	45.1097	70.2985
	3	21.8499	28.4731	44.4712	40.6661	52.9930	82.7680
	4	24.9924	32.5935	50.9135	45.7782	59.7010	93.2574
	5	27.8338	36.3022	56.7068	50.3507	65.6698	102.5811
	6	30.5363	39.8269	62.2127	63.1585	82.3743	128.6749
	7	33.0040	43.0454	67.2401	68.1888	88.9351	138.9233
	8	35.6728	46.5262	72.6775	68.0683	88.7780	138.6779
	9	38.1452	49.7508	77.7145	72.7147	94.8380	148.1441
0.01	1	12.4451	16.0600	2.7276	33.0969	42.7105	7.2540
	2	18.9867	25.2290	3.3561	35.8107	47.5843	6.3299
	3	22.4948	30.0769	3.2942	41.8153	55.9094	6.1235
	4	25.7031	34.3923	3.2358	47.0677	62.9794	5.9254
	5	28.6487	38.3369	3.1861	51.7905	69.3045	5.7598
	6	31.3848	42.0000	3.1401	64.9810	86.9593	6.5014
	7	33.9487	45.4314	3.0992	70.1111	93.8251	6.4006
	8	36.3965	48.7067	3.0631	74.9313	100.2750	6.3063

	9	46.5592	62.3068	3.6427	79.3186	106.1462	6.2058
0.05	1	18.6355	3.3549	3.4051	35.5339	6.3971	6.4928
	2	22.5220	3.2917	3.6311	42.3490	6.1895	6.8276
	3	26.6242	3.2313	4.2304	49.3685	5.9916	7.8442
	4	30.4205	3.1798	4.7304	55.5604	5.8075	8.6396
	5	33.8826	3.1323	4.6170	61.0491	5.6438	8.3189
	6	37.1299	3.0921	4.4187	76.8773	6.4021	9.1488
	7	40.1692	3.0532	3.9891	82.7079	6.2865	8.2135
	8	43.0472	3.0190	1.8187	88.4213	6.2012	3.7357
	9	53.1486	3.4657	2.2112	93.6524	6.1069	3.8963
0.09	1	21.7344	2.6216	2.6606	52.5073	6.3333	6.4277
	2	25.6187	20.0641	2.5568	69.9693	54.7988	6.3831
	3	39.2977	29.3751	3.2637	72.5000	54.8940	6.0212
	4	44.8439	33.1571	3.2107	81.5934	60.3292	5.8419
	5	49.8993	35.7876	3.1615	89.6799	64.3181	5.6819
	6	54.6234	39.1620	3.1194	113.0526	81.0526	5.4561
	7	59.0651	42.2312	3.0811	121.5849	86.9326	6.3423
	8	63.2828	44.0558	3.0457	129.8446	90.3944	6.2493
	9	67.3153	45.7827	3.0145	137.9450	93.8196	6.1774

Table 3: Value of PQR and IQR, p_2/p_1 for specified value of $\varphi, and \ m$

φ	m	np_1	np_0	np_2	d_2	d_0	T	p_2/p_1
0.0001	1	0.2067	1.0065	2.4912	2.2846	0.7999	2.8562	12.0552
	2	0.1264	0.8388	2.3254	2.1990	0.7124	3.0867	18.3972
	3	0.1058	0.7672	2.3057	2.1999	0.6614	3.3261	21.7930
	4	0.0925	0.7317	2.3037	2.2112	0.6392	3.4594	24.8995
	5	0.0829	0.7132	2.3035	2.2206	0.6303	3.5231	27.7865
	6	0.0757	0.7035	2.3034	2.2277	0.6278	3.5484	30.4280
	7	0.0699	0.6984	2.3034	2.2335	0.6285	3.5537	32.9528
	8	0.0947	0.6959	2.3034	2.2087	0.6012	3.6738	24.3231
	9	0.0906	0.6945	2.3034	2.2128	0.6039	3.6642	25.4238
0.001	1	0.2068	1.0079	2.5001	2.2933	0.8011	2.8628	12.0895
	2	0.1265	0.8399	2.3337	2.2072	0.7134	3.0939	18.4482
	3	0.1059	0.7682	2.3139	2.2080	0.6623	3.3338	21.8499
	4	0.0925	0.7326	2.3118	2.2193	0.6401	3.4671	24.9924
	5	0.0831	0.7141	2.3116	2.2286	0.6311	3.5315	27.8338
	6	0.0757	0.7044	2.3116	2.2359	0.6287	3.5562	30.5363
	7	0.0700	0.6994	2.3116	2.2416	0.6294	3.5616	33.0040
	8	0.0648	0.6968	2.3116	2.2468	0.6320	3.5551	35.6728
	9	0.0606	0.6955	2.3116	2.2510	0.6349	3.5456	38.1452
0.01	1	0.2085	1.0212	2.5948	2.3863	0.8127	2.9363	12.4451
	2	0.1275	0.8511	2.4208	2.2933	0.7236	3.1693	18.9867
	3	0.1067	0.7784	2.4002	2.2935	0.6717	3.4145	22.4948
	4	0.0933	0.7423	2.3981	2.3048	0.6490	3.5511	25.7031
	5	0.0837	0.7235	2.3979	2.3142	0.6398	3.6171	28.6487
	6	0.0764	0.7137	2.3978	2.3214	0.6373	3.6426	31.3848
	7	0.0706	0.7086	2.3978	2.3272	0.6380	3.6478	33.9487
	8	0.0659	0.7059	2.3978	2.3319	0.6400	3.6435	36.3965
	9	0.0515	0.7046	2.3978	2.3463	0.6531	3.5926	46.5592
0.05	1	0.1714	1.0855	3.1945	3.0231	0.9141	3.3072	18.6355
	2	0.1320	0.9048	2.9729	2.8409	0.7728	3.6760	22.5220
	3	0.1107	0.8272	2.9473	2.8366	0.7165	3.9590	26.6242
	4	0.0968	0.7887	2.9447	2.8479	0.6919	4.1161	30.4205
	5	0.0869	0.7687	2.9444	2.8575	0.6818	4.1911	33.8826
	6	0.0793	0.7583	2.9444	2.8651	0.6790	4.2196	37.1299
	7	0.0733	0.7528	2.9444	2.8711	0.6795	4.2253	40.1692
	8	0.0684	0.7500	2.9444	2.8760	0.6816	4.2195	43.0472
	9	0.0554	0.7486	2.9444	2.8890	0.6932	4.1677	53.1486
0.09	1	0.2254	1.1586	4.8989	4.6735	0.9332	5.0081	21.7344
	2	0.1778	0.9661	4.5550	4.3772	0.7883	5.5526	25.6187
	3	0.1149	0.8830	4.5153	4.4004	0.7681	5.7289	39.2977
	4	0.1006	0.8418	4.5113	4.4107	0.7412	5.9510	44.8439
	5	0.0904	0.8203	4.5109	4.4205	0.7299	6.0563	49.8993
	6	0.0826	0.8091	4.5108	4.4282	0.7266	6.0948	54.6234
	7	0.0764	0.8033	4.5108	4.4344	0.7269	6.1002	59.0651
	8	0.0713	0.8003	4.5108	4.4395	0.7291	6.0894	63.2828
	9	0.0670	0.7988	4.5108	4.4438	0.7318	6.0725	67.3153

11. References

1. Bohning D, Dietz E, Schlattmann P. The Zero- Inflated Poisson model and the decayed, missing and filled teeth index in dental epidemiology. Journal of Royal Statistical Society, Series A. 1999; 162:195-209.
2. Dodge HF. Chain sampling inspection plans, Industrial Quality Control. 1955; II(4):10-13.
3. Lambert D. Zero-inflated Poisson regression with an application to defects in manufacturing. Technometrics. 1992; 34:1-14.
4. Loganathan A, Shalini K. Determination of Single sampling plans by attributes under the conditions of Zero – inflated Poisson distribution. Communications in Statistics – Simulation and Computation. 2013; 43(3):538-548.
5. Latha M, Palanisamy A. Selection of Bayesian Single Sampling Plan with Zero – Inflated Poisson Distribution Based on Quality. International Journal of Scientific Research in Mathematical and Statistical Sciences. 2018; 5(6):313-320.
6. Latha M, Palanisamy A. Selection of Multiple Deferred Sampling (0,1) Plan with Zero – Inflated Poisson Distribution. Journal of Applied Science and Computations. 2019; VI(III), 8(9):441-450.
7. McLachlan G, Peel D. Finite Mixture Models. New York: John Wiley & Sons, 2000.
8. Subramani K, Govindaraju K. Selection of Multiple Deferred State MDS-1Sampling Plan for Given Acceptable and Limiting Quality Levels Involving minimum Risks, Journal of Applied Statistics. 1990; 17(3):427-434.
9. Suresh KK. A Study on acceptance sampling using Acceptable and limiting Quality levels, Ph.D Thesis, Bharathiar University Coimbatore, 1983.
10. Suresh KK, Sangeetha V. Selection of Repetitive Deferred Sampling Plan through Quality Region, International Journal of Statistics and Systems. 2010; 5(3):379-389.
11. Varest R A Procedure of Construct Multiple Deferred State Sampling plans, Methods of Operation Research. 1982; 37:477-485.
12. Wortham AW, Baker RC. Multiple Deferred State Sampling Inspection, The International Journal of Production Research. 1976; 14(6):719-731.
13. Yang J, Xie M, Goh TN. Outlier identification and robust parameter estimation in a zero-inflated Poisson model. Journal of Applied Statistics. 2011; 38:421-430.