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Construction and selection of double inspection resampling scheme [DIRSS (0,1)]

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Abstract
Several sampling plans are active in production Industries, for inspect the samples and analysing performance of the population. Each plan has some unique structure and methodology, some plans reduce the producer risk, some plans reduce the consumer risk some time favour for both. This article describes the construction and selection of double inspection resampling scheme for acceptance number tightening (c_1=0, c_2=1, m=2) also this articles discussed the various resubmissions 'm'. Table is constructed for easily determine the required sample size based on plan parameters and given a suitable numerical example.

Keywords: Double inspection single sampling plan, resampling scheme, OC and AOQ

Introduction
Acceptance sampling is the foremost concept in statistical quality control, several plans, schemes and systems are federalism in many industries. Cost playing vital role in production, producer chooses some sampling inspection to check the quality of the product. In the situation of expensive or large number of lot will be rejected producer face heavy loss so they do some additional support, some situation non acceptance overcomes the reference plan add some additional plan or scheme try to accept the lot that named as resampling scheme. These crucial situations producers move to some special purpose plan. Senthilkumar and Sabarish (2020) [5] have developed the Construction and Selection of Double Inspection Single Sampling Plan [DISSP (0,1)]. Its inspect the two major quality characteristics of the same product to reduce the error free product in production and also the plan help to the consumer to get good quality products. Senthilkumar and Sabarish (2021) [6-7] have developed Selection and Development of Double Inspection Single Sampling Plan. Senthilkumar and Sabarish (2021) [6-7] have developed Economic Design of Double Inspection Single Sampling Plan. Senthilkumar and Sabarish (2022) [8-9] have developed Design of Double Inspection Quick Switching System [DIQSS (0,1)] Senthilkumar and Sabarish (2022) [8-9] have developed Construction and Selection of Double Inspection Single Sampling Plan for an Independent Process using Bivariate Poisson Distribution. K. Govindaraju and S Ganesalingam (1997) [3] have developed Sampling inspection for resubmitted lots. Aslam, M., Balamurali, S, Jun, C-H And Ahmad, M. (2012) [1],"Bayesian Sampling Inspection for Resubmitted Lots under Gamma-Poisson Distribution" Jyun-You Chiang *et al* have developed (2017) [4] "An innovative sampling scheme for resubmitted lots by attributes" Balamurali S and Usha M. (2015) [2],"Optimal Designing of Variables Sampling Plan for Resubmitted Lots. After several authors are developed and apply this concept in several plans and schemes In order to design this article Double Inspection Single Sampling Plan band with Resampling Scheme by attributes using bivariate Poisson distribution as a base line distribution. Using the plan parameters acceptance numbers c1& c2, proportion defective p, and Probability of acceptance Pa(p). These plan parameter values of c1, c2, p, m=2 and Pa(p), can be solved with computer search technique using C++ programming and values of 'n' are tabulated.

Operating procedural statement

First inspection

- Select a random sample of size 'n' units from the lot and test each unit for conformance to the specified attribute requirements.
- Count the Number of defectives in the first inspection 'd_1' then move to next step.
- If $d_1 \leq 0$ Pass the same sample for the second inspection for the same sample of size 'n' otherwise ($d_1 > 0$) reject the lot in the original inspection, apply the reference plan 'm' times and reject the lot if it is not accepted on $(m-1)^{st}$ resubmission.

Second Inspection

- Count the number of defectives in second inspection for the same sample, d_2 then move to next step.
- If $d_2 \leq 1$ accept the lot otherwise ($d_2 > 1$) reject the lot in the original inspection, apply the reference plan 'm' times and reject the lot if it is not accepted on $(m-1)^{st}$ resubmission.

Operating Characteristic Function

$$P_a(p) = P_a(2- P_a) \quad (1)$$

$$P_{a1}(p) = P_{a1}(2- P_{a1}) \text{ and } P_{a2}(p) = P_{a2}(2- P_{a2}) \quad (2)$$

$$P_a(p) = P_{a1}(p)* P_{a2}(p) \quad (3)$$

Average Outgoing Quality

$$AOQ = p* P_a(p) \quad (4)$$

Illustration

Gold ornaments produce various types of jewelleries like ring, chain, and bracelet and so on. Sometimes they designed and make jewellery for their customer needs and its input materials are very costly. Here we fix two major quality characteristics shank and design two inspectors start the quality checking they fix sample size (n) = 60, acceptance number (c_1) = 0 for the first inspection (shank) and the acceptance number (c_2) = 1 for the second inspection (Design) for the same sample size and m=2.

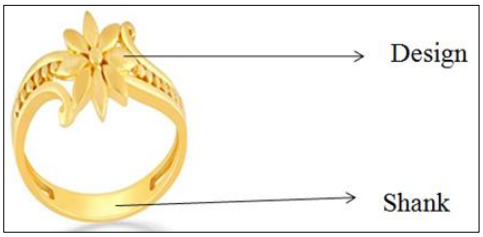

Table 1: Values for Plotting Curves

p	OC	AOQ
0.01	0.67039	0.0067
0.02	0.41921	0.00838
0.03	0.25104	0.00753
0.04	0.14594	0.00584
0.05	0.08304	0.00415
0.06	0.04649	0.00279
0.07	0.02569	0.0018
0.08	0.01405	0.00112
0.09	0.00762	0.00069
0.1	0.0041	0.00041

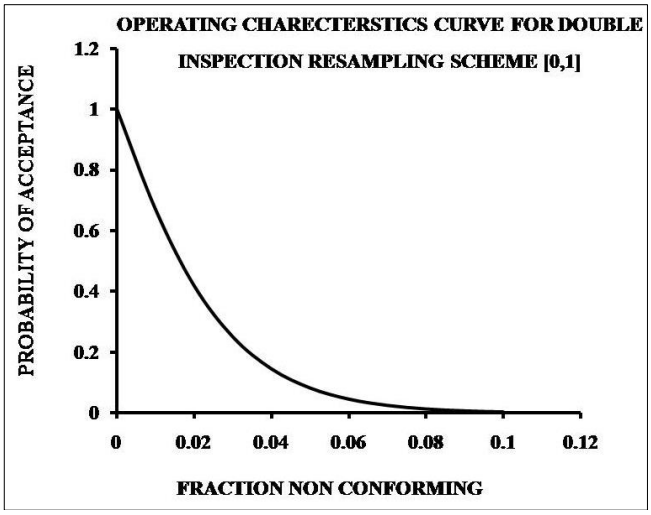

Fig 1: Operating characterstics curve for double Inspection resampling scheme [0, 1]

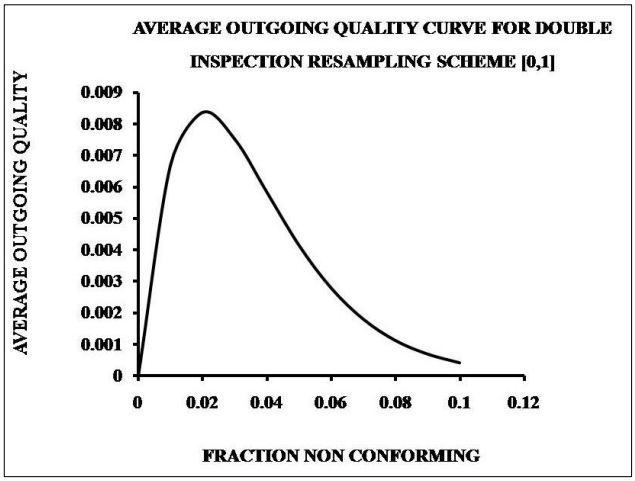

Fig 2: Average outgoing quality curve for double inspeciron rfsampling scheme [0, 1]

Descriptions of curves

Table1 gives the values of probability of acceptance of Double Inspection Resampling Scheme size n=60, c_1=0, c_2=1 and m=2. Also the table 1 provides the values Average Outgoing Quality. Figure 1 Operating Characteristics curve of Double Inspection Resampling scheme and Figure 2 shows the Average Outgoing Quality curve for the Double Inspection Resampling Scheme.

Description and Access Table 2

Table 2 shows the values of sample size '*n'* for the Double Inspection Resampling Scheme with reference to Single sampling plan. They are indexed by the parameters of c_1= 0, c_2= 1 and m = 2 by Pa (p).

The following steps shows, how to access the table 5.1.2 for selecting sample size,

- Fix the parameters, probability of acceptance Pa (p) and proportion defective 'p'.
- Find the sample size 'n' for the corresponding of the parameters Pa (p) and 'p'.

For example, if one fixes $P_a(p)$=0.99 and p=0.003, then the resulting DIRS as follows.

- In the column headed by $P_a(p)$=0.99, p=0.003 and fixing the acceptance number c_1= 0 c_2=1 and m=2.

- Check the corresponding sample size for the above parameter is n = 35.

Description and access table 3

The entries in Table 3 are the values of Sample size '*n'* they are indexed by the parameters of c_1=0, c_2=1 and 'm' vary by Pa (p).

The following steps shows, how to access the table 5.1.3 for selecting sample size,

- Fix the parameters, probability of acceptance Pa (p) and proportion defective 'p'.
- Find the sample size 'n' for the corresponding of the parameters Pa (p) and 'p'.

For example, if one fixes P_a(p)=0.99 and p=0.004, then the resulting DIRS as follows.

- In the column headed by P_a(p)=0.99, p=0.004 and fixing the acceptance number c_1= 0 c_2=1 and m=3.
- Check the corresponding sample size for the above parameter is n = 60.

Table 2: gives the values of sample size '*n'* for the Double Inspection Resampling Scheme with reference to Single sampling plan. They are indexed by the parameters of c_1= 0, c_2= 1 and m = 2 by Pa (p).

p	Pa(p)							
	0.99	**0.95**	**0.90**	**0.75**	**0.50**	**0.25**	**0.10**	**0.05**
0.001	105	251	373	661	1108	1690	2333	2777
0.002	52	125	186	331	554	845	1166	1388
0.003	35	83	124	221	369	563	777	925
0.004	26	93	166	227	277	422	583	964
0.005	21	50	74	133	221	338	466	555
0.006	17	42	62	111	184	282	388	462
0.007	15	36	53	95	158	242	333	396
0.008	13	32	46	83	138	211	291	347
0.009	11	28	41	74	123	188	259	308
0.010	10	25	37	67	110	169	233	217

Table 3: The entries in are the values of Sample size '*n'* they are indexed by the parameters of c_1=0, c_2=1 and 'm' vary by Pa (p)

m	Pa(p)	Proportion Defective (p)									
		0.001	**0.002**	**0.003**	**0.004**	**0.005**	**0.006**	**0.007**	**0.008**	**0.009**	**0.01**
1	0.99	10	5	4	3	2	-	-	-	-	-
	0.95	50	25	17	13	10	9	8	7	6	5
	0.90	100	50	34	25	21	16	15	12	11	10
2	0.99	105	52	35	26	21	17	15	13	12	10
	0.95	251	125	83	63	50	42	36	32	28	25
	0.90	373	186	124	93	74	62	53	46	41	37
3	0.99	242	121	80	60	48	40	34	30	26	24
	0.95	457	228	152	114	91	76	65	57	51	46
	0.90	618	309	206	154	123	103	88	77	69	61
4	0.99	380	190	126	95	76	63	54	47	42	38
	0.95	638	319	212	159	127	106	91	80	71	64
	0.90	821	410	273	205	164	136	117	102	92	82
5	0.99	507	253	169	126	101	84	72	63	56	50
	0.95	795	397	265	198	159	132	113	99	88	80
	0.90	993	496	331	248	198	165	141	124	110	99
6	0.99	623	311	207	155	124	103	89	77	69	62
	0.95	932	466	310	233	186	155	133	116	104	93
	0.90	1140	570	380	285	228	190	162	142	126	114
7	0.99	729	364	243	182	145	121	104	91	81	72
	0.95	1054	527	351	263	210	175	150	132	117	105
	0.90	1269	634	423	317	253	211	181	158	141	126
8	0.99	826	413	275	206	165	137	118	103	91	82
	0.95	1163	581	387	290	232	193	166	145	129	116
	0.90	1383	691	461	345	276	230	197	172	153	138
9	0.99	914	457	304	228	182	152	130	114	101	91
	0.95	1261	630	420	315	252	210	180	151	140	126
	0.90	1486	743	495	371	297	247	212	185	165	148
10	0.99	996	498	332	249	199	166	142	124	110	99
	0.95	1350	675	450	337	270	225	193	169	150	135
	0.90	1579	789	526	394	315	236	226	197	175	157

Conclusion

The proposed Double Inspection Resampling Scheme (n; c_1, c_2 and m) is suitable, when there is a possibility of producing expensive products (or) large number of units production, with the aim to produce good products under the OC function for Double Inspection Single Sampling Plan of bivariate Poisson distribution. This plan provides protection to both producer and consumers. It can be applicable for manufacturing industries like Foods, Smart phones, Gold

ornament and so on where the human intervention is much involved.

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