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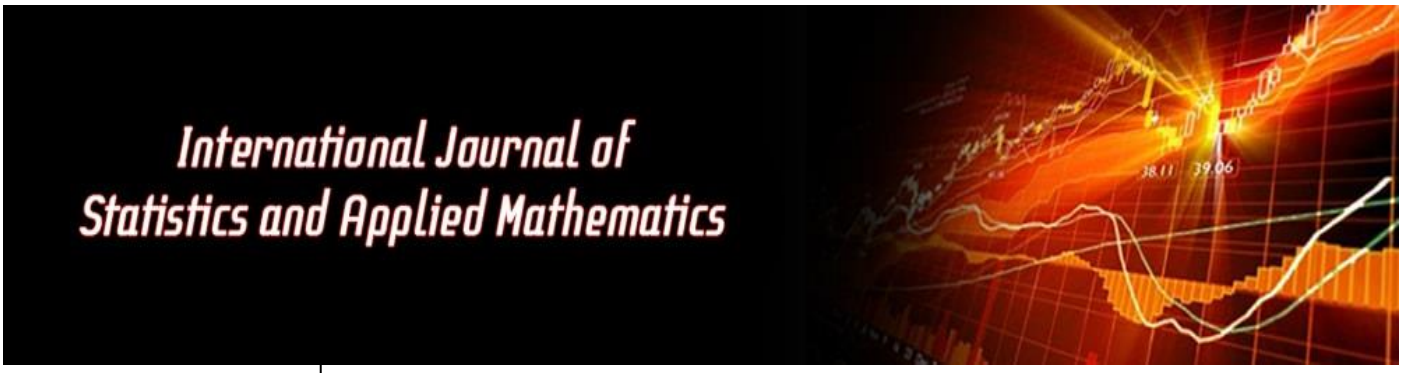

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Designing of quick switching system with conditional repetitive group sampling plan (n, kn, c_0) -1 minimum angle method

S Jayalakshmi and K Kaviyamani

Abstract
This paper presents the technique for the Designing of Quick Switching System Conditional Repetitive Group sampling plan (n, kn, c_0) -1. The optimizes method such as Minimum Angle Method is carried out for the readymade choice of the plan parameter. Further these methods are illustrated through suitable numerical examples.

Keywords: Quick switching system, conditional repetitive group sampling plan, minimum angle method

Introduction
Acceptance sampling is the technique of randomly inspecting a sample of goods and deciding whether to accept or reject the entire lot based on the sample solutions. Acceptance sampling method determines whether a batch of goods should be accepted or rejected. Statistical quality control is simply a statistical method for identifying the defined to which quality goals are being met without essentially checking every item produced and for choosing whether or not the variations which occur one exceeding normal presumption.

Quick switching system
A new two-plan sampling system was designed by Dodge (1967) [2] consisting normal and tightened inspection, followed by Romboski (1969) [7] proposed Quick Switching System (QSS), that consists instantaneous switching from normal to tightened inspection when the rejection comes under normal inspection.
Soundararajan and Aruminayagam (1988) [10] constructed tables for the selection of QSS of type QSS-1(n, c_N, c_T) and QSS-1 (n, kn, c_0) and formed tables and presented certain items.
Suresh (1993) [12] studied the Quick Switching System of type QSS-1(n, c_N, c_T) and (n, kn, c_0) with Single sampling plan as Reference plan. Deepa (2003) investigated the Quick Switching System of type QSS-1(n, c_N, c_T) and (n, kn, c_0) with Special Type Double Sampling as Reference plan.

$$P_a(p) = \frac{P_T}{1 - P_N + P_T}$$

Where
$P_a(p) =$ Probability of acceptance a lot when a system of sampling plans is under Operation.
$P_N =$ Proportion of lots expected to be accepted using (n, c_N) and (n, c_0) plan.
$P_T =$Proportion of lots expected to be accepted using (n, c_T) and (kn, c_0) plan.

Where
(n, c_N, c_T) and (n, c_0), (kn, c_0) for QSS-1 (n, kn, c_0).

Conditional Repetitive Group Sampling Plan

Shankar and Mohapatra (1984) [8] first developed a new sampling plan constructed as Conditional Repetitive Group Sampling,that came into existence as the extension of RGS Plan designed by Sherman (1965) [9]. Devraj Arumainayagam (1991) [1] has Designed QSS-1 with RGS plan as reference plan.

Suresh and Kaviyarasu (2008) [4] judge all quality levels of QSS-1 with CRGS as reference plan. Suresh and Divya (2009) has designed the technique for Single Sampling Plan through Decision Regions.

Jayalakshmi (2009) [3] Quick Switching System-2, 3 (n, c_N, c_T) and (n, kn, c_0) with Special Type Double Sampling (STDS) plan, Quick Switching System -1, 2 and 3(n, c_N, c_T) and (n, kn, c_0) with Repetitive Deferred Sampling (RDS) plan and Quick switching System -1, 2 and 3 (n, c_N, c_T) and (n, kn, c_0) with Multiple Deferred Sampling (MDS) plan as reference plan.

Minimum Angle Method

Norman bush *et al*. (1953) [5] has studied different procedure to describe the direction of the OC curve.

Further they have examine two points on the OC curve as (AQL, 1-α) and (IQL,.50) for minimizing the consumer's risk. But Peach and Littauer (1946) [6], have taken two points on the OC curve as *(p_1, 1-α)* and *(p_2, β)* for ideal condition to reduce the consumer's risk. Here next approach of reduce of angle between the lines joining the points (AQL, β), (AQL, 1-α), (LQL, β) is given due to Singaravelu (1993) [11] using this sentences one can get a better plan which has an OC curve approaching to the ideal one. The formula for then θ is given as

$$tan\,\theta = \frac{Oppositeside}{Adjacentside}$$

$$= (p_2 - p_1)/(1 - \alpha - \beta)$$

$$tan\,\theta = (p_2 - p_1)/[p_a(p_1) - p_a(p_2)]$$

Norman Bush *et al*. (1953) [5] has stated the approach which consists definition of some portion of the OC curves. The chord line AB coincides with that of B and the operating characteristic curve. That is the ideal OC curve passes through $(P_1, 1-\alpha)$ and $(p_2 - \beta)$. Singaravelu (1993) [11] has further designed plans involving reduce angle for single and double sampling plans. Here another approach for reduce of angle between the lines joining the points (AQL, β), (AQL, 1-α), and (AQL, 1-α), (LQL, β) is given. Applying this sentences one can get a better plan by reduce the above mentioned points, through which one can get an ideal OC curve. The expression for *(tan θ)* is given as

$$\tan\theta = \frac{\text{Oppositeside}}{\text{Adjacentside}}$$

This can written as

$$n\,tan\,\theta = \frac{np_2 - np_1}{P_a(p_1) - p_a(p_2)}$$

With the help of the stated expression, the angle θ is minimized for the given $np_1$and np_2values.

Nick for Application

1. The production is steady so that results on current and preceding lots are broadly indicative of a continuing process.
2. Lots are submitted substantially in the order of their production.
3. The inspection involves costly or destructive normally tests such that normally only a small number of tests per lot can be justified.

Operating Protocol

For a lot, take a random sample of size 'n' at the normal level. Count the number of defectives 1

1. If $d \le c_0$ accept the lot and repeat step 1.
2. If $d > c_0$, reject the lot and go to step 2. From the next lot, take a random sample of size 'kn' at the tightened level.

Count the number of defectives 'D'.

1. If $D \le c_0$, accept the lot and use step l
2. If $D > c_0$, reject the lot and repeat step 2.

Operating Characteristics function

The Quick Switching Conditional Repetitive Group Sampling plan (n, kn, c_0)-1

$$\frac{P_T}{1 - P_N + P_T}$$

$$P_T = \sum_{X=0}^{c_0} \frac{e^{-knp}(knp)^x}{x!}$$

$$P_N = 1 - \sum_{x=0}^{c_0} \frac{e^{-np}(np)^x}{x!}$$

Numerical Example

For aP_1=0.06, P_2=0.3, α =0.05,β =0.10 one can obtain QSSCRGS (n, kn, c_0) -1 as follows

1) P_2 =0.3,P_2 =0.06. Thus the close tabulated operating ration 5 Corresponding to acquire operating ratio the boundary values is $a_1 = 4, a_2 = 3, k = 4.75$,
2) np_1 =0.082
3) $n = \frac{np_1}{P_1} = \frac{0.082}{0.06} = 1.366$
4) $\theta = tan^{-1}(n\,tan - 1/n)$ $= tan^{-1}$ (0.082)/1=4.687765 Thus the best plan is (1,4,3,4,7,5) with the minimum angle θ =4.687705

Table 1: Values of Quick Switching System -1 (n, kn, c_0) Plan with Conditional Repetitive Group Sampling Plan -1

c_0				Probability of acceptance							
a_1	a_2	k	0.99	0.95	0.90	0.75	0.50	0.25	0.10	0.05	0.01
1	1	3.75	0.0007	0.028	0.009	0.024	0.067	0.189	0.467	0.067	0.069
2	3	4.25	0.0007	0.035	0.007	0.009	0.056	0.148	0.71	0.750	0.868
2	4	4.75	0.0006	0.03	0.006	0.018	0.049	0.122	0.5008	0.641	0.716
3	1	3.25	0.016	0.0161	0.016	0.016	0.018	0.023	0.063	0.078	0.899
3	4	4.75	0.0266	0.0272	0.035	0.038	0.042	0.053	0.118	0.138	0.143

4	1	3.75	0.0163	0.0164	0.040	0.040	0.011	0.003	0.0757	0.116	0.1166
4	3	4.75	0.0145	0.0148	0.034	0.030	0.004	0.010	0.082	0.08	0.1210
5	1	2.75	0.0269	0.027	0.027	0.005	0.06	0.087	0.0324	0.0512	0.130
5	3	4.75	0.0162	0.0164	0.048	0.046	0.037	0.003	0.065	0.0376	0.1331
6	1	2.75	0.0134	0.0137	0.015	0.019	0.022	0.025	0.022	0.0229	0.0008
6	3	4.25	0.0127	0.013	0.013	0.013	0.14	0.003	0.02	0.1477	0.00089
7	1	4.75	0.0689	0.0687	0.065	0.012	0.015	0.016	0.0723	0.0152	0.0009
8	1	2.75	0.0204	0.0208	0.030	0.033	0.043	0.054	0.0654	0.0786	0.0871
8	3	0.030	0.0310	0.031	0.031	0.033	0.036	0.043	0.0561	0.0654	0.0871
9	1	4.75	0.0257	0.0259	0.026	0.026	0.028	0.031	0.0359	0.0423	0.0542
9	3	4.25	0.027	0.0278	0.027	0.028	0.029	0.032	0.035	0.0432	0.05013
10	1	2.75	0.0022	0.023	0.065	0.066	0.068	0.072	0.0766	0.0823	0.0876
10	3	4.75	0.0019	0.0445	0.044	0.045	0.046	0.048	0.0516	0.0716	0.8234

Table 2: Parametric values of QSSCRGS-1(n, kn, c_0) plan through Minimum angle method

a_1	a_2	k	np_1	np_2	$n\tan\theta$	OR
1	1	3.75	0.028	0.467	0.477	16.678
2	3	4.25	0.035	0.710	0.750	20.285
2	4	4.75	0.030	0.500	0.535	16.69
3	1	3.25	0.016	0.063	0.055	3.913
3	4	4.75	0.027	0.118	0.106	4.338
4	1	3.75	0.016	0.075	0.071	4.615
4	3	4.75	0.014	0.082	0.082	5.540
5	1	2.75	0.027	0.032	0.006	1.200
5	3	4.75	0.016	0.065	0.052	3.963
6	1	2.75	0.013	0.022	0.009	1.605
6	3	4.25	0.013	0.020	0.007	1.538
7	1	4.75	0.068	0.072	0.004	1.052
8	1	2.75	0.020	0.065	0.052	3.144
8	3	0.030	0.031	0.056	0.028	1.809
9	1	4.75	0.025	0.035	0.011	1.386
9	3	4.25	0.027	0.035	0.008	1.258
10	1	2.75	0.023	0.076	0.066	3.330
10	3	4.75	0.044	0.051	0.008	1.159

Conclusion

Acceptance sampling uses statistical test to describe whether to accept or reject a lot of information making. It has been a common quality control approach used in construction and require both the producer's and the consumer's risk. Switching rules in order to alter or change over from one to another plan is hold as an Acceptance Sampling Plan. Here pair of sampling plans was chosen and switching between normal and tightened so this structure named as Quick Switching System. Using Minimum Angle Method. some portion of OC curve can be simply evaluated with keep in touch person of the ideal OC curve which may shield both the producer as well as consumer which plays a presiding role. Hence one may authorize certain level of risks involved in producer as well as consumer there risk should be minimized at maximum level of using α and β.

Reference

1. Arumainayagam SD. Contribution to the study of Quick Switching System and its Applications", Ph.D., Thesis, Department of Statistics, Bharathiar University, Coimbatore, Tamil Nadu, 1991.
2. Dodge HF. A new dual system of acceptance sampling, Technical Report No.16, The Statistics Center, Rutgers - The State University, New Brunswick, NJ, 1967.
3. Jayalakshmi S. Contribution to the Selection of Quick Switching System and Related Sampling Plans", Ph.D., Thesis, Department of Statistics, Bharathiar University, Coimbatore, Tamil Nadu, India, 2009.
4. Kaviyarasu V. Certain Results and Tables Relating QSS-1 with Conditional RGS Plan, IAPQR Transactions. 2008; 33(1):61-70
5. Norman Bush, Leonar EJ, Marvin QM, Marchant JR. A Method of Discrimination for Single and Double Sampling OC curves Utilizing the Tangent of the point of Inflection", ENASR No.PR- 7, US Army Chemical Crops, 1953.
6. Peach P, littauer SB. A Note on Sampling Inspection", Annals of Mathematical Statistics. 1946; 17:81-84. New Jersey.
7. Romboski LD. An Investigation of Quick Switching Acceptance Sampling Systems, Ph.D., Thesis, Rutgers-The State University, New Brunswick, New Jersey, 1969.
8. Shankar, Mohapatra. developed a new sampling plan, repetitive group Sampling plan and designated as conditional repetitive group sampling, 1984.
9. Sherman RE. Design and Evaluation of a Repetitive Group Sampling Plan Technometrics**.** 1965; 7(l):1-21.
10. Soundararajan V, Arumainayagam SD. Quick Switching System, Department of Statistics, Bharathiar University, Technical Report. 1988, 24.
11. Singaravelu N. Contribution to the Study of Certain Acceptance Sampling Plans, Ph.D Thesis, Department of Statistics, Bharathiar University, Coimbatore, Tamil Nadu, India, 1993.
12. Suresh KK. A Study on Acceptance Sampling using Acceptable and Limiting Quality Levels, Ph.D., thesis, Department of Statistics, Bharathiar University Coimbator Tamil Nadu, 1993.