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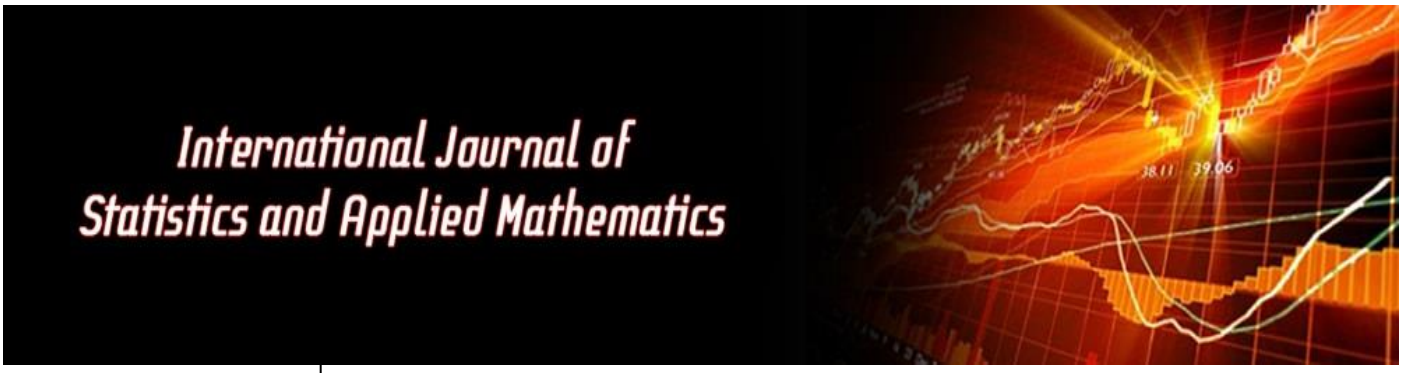

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Construction and selection of quality interval Bayesian RGS Plan through trigonometric ratios

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Abstract
Bayesian Sampling Plan is that experiment or analytical study which can yield prior frequency distribution for the quality of the submitted lots and these 'prior' distributions can in turn be used to derive lot-by-lot sampling plans.
In this paper we have constructed a new method for designing Bayesian Repetitive Group sampling plan indexed through trigonometric ratios, hypotenuse ratios along with decision region (d_1) and probabilistic region (d_2) which is more applicable in practical situations. Maximum Allowable Percent Defective (MAPD) is also considered for the selection of parameters for Bayesian Repetitive Group Sampling Plan. New quality descriptors called operating ratios are introduced to design the sampling plan and related information's are provided. Numerical Illustrations are also provided for ready made use of the tables to shop-floor situations.

Mathematical Subject Classification: 62P30/62D05.

Keywords: Bayesian sampling, quality decision regions, operating characteristic curve, trigonometric ratios

Introduction
Classical statistics is directed towards the use of sample information. In addition to the sample information two other types of information are typically relevant. The first is knowledge of the possible consequences of the decision and the second source of non-sample information is prior information. Thomas Bayes was first to use the prior information in inductive inference and the approach to statistics, which formally seeks to utilize prior information is called Bayesian analysis. Suppose a product in a series is supplying a product, due to random fluctuations can be separated in to within lot (sampling) variations of individual units and between lot (sampling and process) variations.
Bayesian Acceptance Sampling approach is associated with the utilization of prior process history for the selection of distributions (*viz*., Gamma Poisson, Beta Binomial) to describe the random fluctuations involved in Acceptance Sampling. Bayesian sampling plans requires the user to specify explicitly the distribution of defectives from lot to lot. The prior distribution is the expected distribution of a lot quality on which the sampling plan is going to operate. The distribution is called prior because it is formulated prior to the taking of samples. The combination of prior knowledge, represented with the prior distribution, and the empirical knowledge based on the sample leads to the decision on the lot.
To enhance product and service quality while reducing inspection costs, it's common to modernize quality practices. An effective quality improvement program can boost productivity while cutting costs. With increasing customer demands and evolving technology, existing quality assurance techniques often require modification. The demand for statistical and analytical techniques in quality assurance is rising due to intense industry competition for better product quality.
Acceptance sampling serves as a tool for consumers to reject subpar lots and for producers to streamline process control. In a dynamic production environment where non-conforming items may occur, statistical process control enhances process capability, while acceptance sampling logically prevents the passage of non-conforming units.

In continuous production settings, acceptance sampling systems are crucial for maintaining quality. However, when robust process control mechanisms are established by producers, acceptance control procedures may become unnecessary, only to be reinstated as needed. Sampling plans do not estimate product parameters but instead make holistic decisions to maintain and improve product quality.

This paper introduces a method for selecting Bayesian sampling plans based on quality ranges instead of specific quality points, using a novel approach called Quality Interval Sampling (QIS) plans. Divya (2009) explored single sampling plans through Quality Region and devised single sampling plans indexed with quality regions involving QIS. This method appears versatile and applicable in elementary production processes, where defining quality levels at later stages is advisable, offering a new concept for selecting Bayesian Repetitive Group sampling plans based on quality levels. The sampling plan provides decision rules for both vendors and buyers regarding product acceptance to meet current quality requirements. With the rapid advancement of manufacturing technology, suppliers demand high-quality products with minimal defects, often measured in parts per million. However, traditional methods may fail to detect minute defects in certain situations. To address such challenges, Quality Interval Sampling (QIS) plans are introduced. This paper designs plan parameters indexed with quality regions involving QIS. Case and Keats [1] have examined the relationship between defectives in the sample and defectives in the remaining lot for each of the five prior distributions. They observe that the use of a binomial prior renders sampling useless and inappropriate. These results serve to make the designers and users of Bayesian Sampling Plans more aware of the consequence associated with selection of particular prior distribution. Calvin [2] has presented in a clear and concise treatment by means of 'How and When to perform Bayesian acceptance Sampling'. These procedures are suited to the sampling of lots from process or assembly operations, which contain assignable causes. These causes may be unknown and awaiting isolation, known but irremovable due to the state of the art limitations, or known but uneconomical to remove. He has considered the Bayesian sampling, in which, primary concern is with the process average function non-conforming p, with lot fraction non-conforming p and its limitations being discussed.

Hald [4] has derived optimal solutions for the cost function k(n,c) in the cases where the prior distribution is rectangular, polya and binomial. Tables are given for optimum n,c and k(n,c) for various values of the parameters, which is an important result on Bayesian Acceptance Sampling(BAS). Hald [5] has given a rather complete tabulation and discussed the properties of a system of single Sampling attribute plans obtained by minimizing average costs, under the assumptions that the costs linear in the fraction defective p, and that the distributions of lot quality is a double binomial distribution. The optimum sampling plan (N.C) depends on six parameters namely N, p_r, p_s, p_1, p_2 and w_2 cost parameters and p_1, p_2, w_2 are the parameters of prior distribution. It may be shown, however, that the weights combine with the p's is such a way that only five independent parameters are left out.

A set of tables presented by Oliver and Springer [8] are based on assumptions of beta prior distribution with specific posterior risk to achieve minimum sample size, which avoids the problem of estimating cost parameters. It is generally true that Bayesian Plan requires a smaller sample size than a conventional sampling plan with the same producer and consumer risks. Sherman [10] has introduced a new acceptance sampling plan, called repetitive group sampling plan designated as RGS plan. Repetitive Group Sampling (RGS) plan comes under the special purpose plans. Ramaswamy [9] has studied RGS plan indexed with AOQL and MAPD. Usha [16] has highlighted over Bayesian Single Sampling plan for three attribute classes for double binomial prior and point binomial prior distribution.

Suresh [11] has studied the RGS plan indexed through producer and consumer quality level considering filter and incentive effects. Hemalatha [6] has studied the acceptance probabilities of sampling plans where the proportion defective p, in the lot being submitted follows a Gamma Distribution. Deepa [3] has studied the formulation of a Bayesian Sampling Plan using acceptance probability with Gamma Prior Distribution for product quality using producer and consumer quality levels. Latha [7] has studied to evaluate the proportion of lot expected to be accepted for repetitive group sampling plan in an environment that the proportion defective varies from lot-by-lot according to gamma distribution. The acceptance probabilities for RGS (c_1=0, c_2=1) for different sample size are then calculated, similar tables are also provided for overall average outgoing quality.

Suresh and Saminathan [12] have given a procedure to define multiple repetitive group sampling plans indexed with MAPD and MAAOQ.Suresh and Kaviyarasu [13] have explained the desirability for developing Quick Switching System with Conditional RGS plan indexed through quality levels. Suresh and Divya [14] have given the new procedure for Single Sampling Plan through Decision Regions. Suresh and Sangeetha [15] have studied the selection of Repetitive Deferred Sampling plan with Quality Regions. This paper designs the parameters of the plan indexed with QDR, PQR, LQR and IQR with numerical illustrations are also provided.

Bayesian Repetitive Group Sampling Plan

This paper related to Bayesian Repetitive Group Sampling Plan for average probability function of incoming quality levels.

Conditions for Application

The conditions for application for RGS plan are given below

1. The size of the lot is taken to be sufficiently large
2. Under normal conditions the lots are expected to be of essentially the same quality (expressed in percent defective).
3. The product comes from a source in which the consumer has confidence.

Procedure for Operating Characteristic function

Step 1. Take a random sample of size n.

Step 2. Count the number of defectives d, in the sample.

Step 3. If $d \leq c_1$, accept the lot.

If $d > c_2$, reject the lot.

If $c_1 < d \leq c_2$, repeat steps 1, 2 and 3.

The RGS plans are characterized by 3 parameters namely n, c_1 and c_2. When $c_1=c_2$ the resulting plan is the usual single sampling plan.

The operating characteristic function of RGS is obtained by Sherman [10] as

$$P_A(p) = \frac{P_a(p)}{P_a(p) + P_r(p)} \tag{2.1}$$

Where $P_a(p)$ be the probability of acceptance in a particular group sample, $P_r(p)$ be the probability of rejection in a particular group sample.
The probability density function for the Gamma distribution with parameters α and β is

$$\Gamma(p/\alpha,\beta) = \begin{cases} \dfrac{e^{-p\beta}p^{\alpha-1}\beta^{\alpha}}{\Gamma\alpha}, p \geq 0, \alpha \geq 0, \beta \geq 0 \\ 0 \qquad\qquad ,otherwise \end{cases} \tag{2.2}$$

Suppose that the defects per unit in the submitted lots p can be modeled with Gamma Distribution having parameters α and β. For any RGS plan, the probability of eventually accepting the lot is given as

$$Pa = P_1/(P_1+P_1') \tag{2.3}$$

Where P_1 is the Probability of acceptance and P_1' is the probability of rejection.

The probability of acceptance in a particular group sample is

$$P_1(p) = \sum_{k_1=0}^{c_1} \frac{e^{-np}(np)^{k_1}}{k_1!} \tag{2.4}$$

The probability of rejection in a particular group sample is

$$P_1'(p) = \sum_{k_2=c_2}^{\infty} \frac{e^{-np}(np)^{k_2}}{k_2!} \tag{2.5}$$

The OC function of RGS plan is

$$P_a = \frac{\sum_{k_1=0}^{c_1} \frac{e^{-np}(np)^{k_1}}{k_1!}}{1 - \sum_{k_2=c_1+1}^{c_2} \frac{e^{-np}(np)^{k_2}}{k_2!}} \tag{2.6}$$

Let p has a prior distribution with density function given as

$$w(p) = e^{-pt}p^{s-1}t^s/\Gamma(s), \qquad s,t>0 \, and \, p>0 \tag{2.7}$$

With parameters s and t and mean $\overline{p} = s/t = \mu(say)$.

The APA function is given as

$$\overline{P} = \int P_a w(p)dp$$

$$= \sum_{k1=0}^{c1} (n^{k_1} t^s \Gamma(s+k_1)/k_1!(n+t)^{s+k_1}\Gamma(s))$$

$$+ \sum_{k_1=0}^{c_1}\sum_{k_2=c_1+1}^{c_2} n^{k_1+k_2} t^s \Gamma(s+k_1+k_2)/k_1!k_2!(2n+t)^{s+k_1+k_2}\Gamma(s)$$

$$+ \sum_{k_1=0}^{c_1}\sum_{k_2=c_1+1}^{c_2} (n^{k_1+2k_2} t^s \Gamma(s+k_1+2k_2)/k_1!(k_2!)^2(3n+t)^{s+k_1+2k_2}\Gamma(s))$$

$$+ \sum_{k_1=0}^{c_1}\sum_{k_1\neq k'_2=c_1+1}^{c_2} (n^{k_1+k_2"} t^s \Gamma(s+k_1+k_2+k_2")/k_1!k_2!k_2"(3n+t)^{s+k_1+k_2+k_2"}\Gamma(s))$$

$$+ \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2.8)$$

In particular, the average probability of acceptance for $c_1=0$, $c_2=1$ is obtained as follows

$$\overline{P}((n,0,1)/s,t) = t^s \sum_{k=0}^{\infty} n^{k-1}\Gamma(s+k-1)/(kn+t)^{s+k-1}\Gamma(s) \quad (2.9)$$

Selection of Bayesian Rgs Plan

Designing of Quality Interval Bayesian Repetitive Group Sampling Plan (QIBRGS) through trignometric ratios

Quality Decision Region (QDR)

It is an interval of quality $(\mu_1 < \mu < \mu_*)$ in which product is accepted at engineer's quality average. The quality is reliably maintained up to μ_* (MAPD) and sudden decline in quality is expected. This region is also called Reliable Quality Region (RQR).

Quality decision Range is denoted as $d_1 = (\mu_* - \mu_1)$ is derived from the average probability of acceptance.

$$\overline{P}(\mu_1 < \mu < \mu_*) = t^s \sum_{k=0}^{\infty} n^{k-1}\Gamma(s+k-1)/(kn+t)^{s+k-1}\Gamma(s) \quad for \quad \mu_1 < \mu < \mu_* \quad (3.1)$$

Where $\mu = \frac{s}{t}$, is the mean value for the product quality p.

Probabilistic Quality Region (PQR)

It is an interval of quality $(\mu_1 < \mu < \mu_2)$ in which product is accepted with a minimum probability 0.10 and maximum probability 0.95.

Probabilistic Quality Range denoted as $d_2 = (\mu_2 - \mu_1)$ is derived from the average probability of acceptance

$$\overline{P}(\mu_1 < \mu < \mu_2) = t^s \sum_{k=0}^{\infty} n^{k-1}\Gamma(s+k-1)/(kn+t)^{s+k-1}\Gamma(s) \quad for \quad \mu_1 < \mu < \mu_2 \quad (3.2)$$

Where $\mu = \frac{s}{t}$, is the mean value of the product quality p.

Limiting Quality Region (LQR)

It is an interval of quality $(\mu_* < \mu < \mu_2)$ in which product is accepted with a minimum probability 0.10 and maximum probability 0.95.

Limiting Quality Range denoted as $d_3 = (\mu_2 - \mu_*)$ is derived from the average probability of acceptance

$$\overline{P}(\mu_* < \mu < \mu_2) = t^s \sum_{k=0}^{\infty} n^{k-1}\Gamma(s+k-1)/(kn+t)^{s+k-1}\Gamma(s) \quad for \quad \mu_* < \mu < \mu_2 \quad (3.3)$$

Where $\mu = \frac{s}{t}$, is the mean value of the product quality p.

Indifference Quality Region (IQR)

It is an interval of quality $(\mu_1 < \mu < \mu_0)$ in which product is accepted with a minimum probability 0.50 and maximum probability 0.95.

Indifference Quality Range denoted as $d_0 = (\mu_0 - \mu_1)$ is derived from the average probability of acceptance

$$\overline{P}(\mu_1 < \mu < \mu_0) = t^s \sum_{k=0}^{\infty} n^{k-1}\Gamma(s+k-1)/(kn+t)^{s+k-1}\Gamma(s) \quad for \quad \mu_1 < \mu < \mu_0 \tag{3.4}$$

Where $\mu = \frac{s}{t}$, is the mean value of the product quality p.

Selection of the Sampling plan

This paper provides a new procedure for designing Bayesian Repetitive Group Sampling plan indexed through trigonometric ratios and hypotenuse ratios. Also considering the ability of the declination angles of the tangent at the inflection point on the OC curve for discrimination of the Bayesian Repetitive Group Sampling plan (BRGSP)

Here $\tan\theta_1 = \frac{0.95 - L(p^*)}{d_1}$ (3.5)

From (1) one can find the parameter for a particular L(p*) and d1.So we can state that both $\theta_1$and $d_1$uniquely determines the DSP.

Similarly, $\tan\theta_2 = \frac{L(p^*) - 0.10}{d_2 - d_1}$ (3.6)

Rom (2) one can find (n,c) for a particular L(p*) and (d_2-d_1). So we can state that both θ_2 and (d2-d1) uniquely determines the DSP.

And $\tan\theta_3 = \frac{L(p^*)}{d_2}$ (3.7)

From (3.5) one can find (n,c) for a particular L(p*) and d2. So we can state that both θ_3 and $d_2$uniquely determines the DSP. From figure1, we have ΔABC represents the approximate area inscribed by the quality levels μ_1 and μ^*. ΔCDE represents the approximate area inscribed by the quality levels μ^* and μ_2. And the ΔBFG represents the approximate area inscribed by the quality levels p_1 and p_2. θ_1 is the inscribed triangle by OC with quality levels μ_1 and μ^*. θ_2 .represent the inscribed triangle by OC with quality levels p* and p_2. And $\theta_3$is the inscribed triangle by OC with quality levels μ_1 and μ_2.

For specified QDR and PQR

Table 1 is used to construct the plans when the QDR and PQR are specified. For any given values of the QDR (d_1) and PQR (d_2), one can find the ratio $T=d_1/d_2$ which is a monotonic increasing function. Find the value in Table 1 under the column T which is equal to or just less than the specified ratio. Then the corresponding values of c_1, c_2 and s are noted. From this, one can determine the parameters n, c_1, c_2 and s for the Bayesian Repetitive Group Sampling Plan.

Example

For a company 2% defects are seen in QDR and 5% defects are seen in PQR.
Then d_1=0.02 and d_2= 0.05, T= d_1/d_2 =0.4.
Find the ratio taking value 0.4. Select value of T equal to or just less than this ratio using Table 1. The value of T is 0.405 which is associated with c_2=2, c_1= 0 and s=1. Also nd_1=0.756, nd_2=1.868 corresponding to c_2=2, c_1= 0 and s=1. Thus n is calculated. The parameters for the Bayesian Repetitive Group Sampling Plan is (37, 2, 0, 1).

For specified QDR and LQR

Table 1 is used to construct the plans when the QDR and LQR are specified. For any given values of the QDR (d_1) and LQR (d_3), one can find the ratio $T_1=d_1/d_3$ which is a monotonic increasing function. Find the value in Table 1 under the column T_1 which is equal to or just less than the specified ratio. Then the corresponding values of c_1, c_2 and s are noted. From this, one can determine the parameters n, c_1, c_2 and s, for the Bayesian Repetitive Group Sampling Plan.

Example

For a company 3% defects are seen in QDR and 6% defects are seen in LQR.
Then d_1=0.03 and d_3= 0.06, T_1= d_1/d_3 =0.5.

Find the ratio taking value 0.50. Select value of T_1 equal to or just less than this ratio using Table 1. The value of T_1 is 0.510 which is associated with c_2=4, c_1= 0 and s=7. Also
nd_1= 1.876, nd_3=3.678 corresponding to c_2=4, c_1= 0 and s=7. Thus n is calculated. The parameters for the Bayesian Repetitive Group Sampling Plan is (63, 4, 0, 7).

For specified QDR and IQR
Table 1 is used to construct the plans when the QDR and IQR are specified. For any given values of the QDR (d_1) and IQR (d_0), one can find the ratio $T_2=d_1/d_0$ which is a monotonic increasing function. Find the value in Table 1 under the column T_2 which is equal to or just less than the specified ratio. Then the corresponding values of c_1, c_2 and s are noted. From this, one can determine the parameters n, c_1, c_2 and s, for the Bayesian Repetitive Group Sampling Plan.

Example
For a company 3% defects are seen in QDR and 4% defects are seen in IQR.
Then d_1=0.03 and d_0= 0.04, T_2= d_1/d_0 =0.75
Find the ratio taking value 0.75. Select value of T_2 equal to or just less than this ratio using Table 1. The value of T_2 is 0.751 which is associated with c_2=5, c_1= 0 and s=4. Also nd_1= 2.495, nd_0= 3.324 corresponding to c_2=5, c_1= 0 and s=4. Thus n is calculated. The parameters for the Bayesian Repetitive Group Sampling Plan is (83, 5, 0, 4).

Construction of Tables
For any RGS plan, the probability of eventually accepting the lot is given as

$$P_a = \frac{\sum_{k_1=0}^{c_1} \frac{e^{-np}(np)^{k_1}}{k_1!}}{1-\sum_{k_2=c_1+1}^{c_2} \frac{e^{-np}(np)^{k_2}}{k_2!}} \qquad (4.1)$$

Let p has a prior distribution with density function given as

$$w(p) = e^{-pt} p^{s-1} t^s / \Gamma(s), \qquad s,t > 0 \, and \, p > 0 \qquad (4.2)$$

With parameters s and t and mean, $\overline{p} = s/t = \mu(say)$

The APA function is given as

$$\overline{P}((n,0,1)/s,t) = t^s \sum_{k=0}^{\infty} n^{k-1}\Gamma(s+k-1)/(kn+t)^{s+k-1}\Gamma(s) \qquad (4.3)$$

The incoming qualities $n\mu_1$, $n\mu_2$ and $n\mu_0$ are obtained by equating APA function of Bayesian RGS plan $\overline{P}$ given in (2.8) to 0.95, 0.10 and 0.50 respectively.
$n\mu_*$ values are obtained by equating the second derivative of APA function to Zero.

$$\frac{dp^2}{dp}\overline{P}((n,0,1)/s,t) = t^s \sum_{k=0}^{\infty} n^{k-1}\Gamma(s+k-1)/(kn+t)^{s+k-1}\Gamma(s) = 0 \qquad (4.4)$$

Where $\mu = \frac{s}{t}$, is the mean value of the product quality P.

Tables 1 shows the value of c_1, c_2 and s corresponding ranges d_1= nQDR, d_2= nPQR, d_3=nLQR and d_0=nIQR from equation (3.1), (3.2), (3.3) and (3.4),and also represents Operating Characteristic ratio for specified values of c_1, c_2 and s. Table 2 represents the conversion table, which is used to determine other quality characteristics. For different values of c_1, c_2 and c_3, L(p*) is determined from equation. Substituting the appropriate values in equation (3.5), (3.6), (3.7) and (3.8).Using the table it can be noted as c increased d_1, d_2 increases but L(p*) decreases.Table-2 provides the area of triangle ABC, triangle CDE &triangle BFG for different values of c theoperating ratio R_1, R_2, $R_3$and $R_4$for different values of c_1, c_2 and s.

Table 1: Certain Values of QDR, PQR, LQR and IQR & Operating Characteristic ratio for Specified values of c_1, c_2, and s.

s	c_1	c_2	d_1	d_2	area ABC	area CDE	area BFG	R1	R2	R3	R4
	0	0	0.499	1.781	0.057	0.399	0.644	7.037	11.346	1.612	2.588
	0	1	0.579	1.838	0.070	0.383	0.652	5.493	9.337	1.700	2.195
	0	2	0.756	1.868	0.097	0.330	0.647	3.391	6.658	1.963	1.533
1	0	3	0.264	1.012	0.036	0.216	0.342	5.977	9.489	1.588	2.788
	0	4	0.464	1.231	0.070	0.210	0.398	2.988	5.671	1.898	1.696
	0	5	0.600	1.476	0.096	0.232	0.464	2.404	4.817	2.004	1.455
	0	6	0.649	1.654	0.108	0.259	0.509	2.392	4.699	1.965	1.485
	0	0	0.118	1.945	0.020	0.463	0.590	22.808	29.077	1.275	8.029
	0	1	0.27	1.564	0.047	0.323	0.468	6.804	9.872	1.451	3.525
	0	2	0.454	1.787	0.081	0.328	0.529	4.046	6.525	1.613	2.443
2	0	3	0.744	1.806	0.135	0.259	0.530	1.919	3.932	2.049	1.335
	0	4	1.097	2.21	0.201	0.269	0.644	1.336	3.201	2.397	0.985
	0	5	1.329	2.629	0.246	0.312	0.761	1.265	3.091	2.444	0.945
	0	6	1.797	3.337	0.336	0.366	0.961	1.090	2.859	2.622	0.832
	0	0	0.222	2.01	0.042	0.423	0.576	10.107	13.764	1.362	5.080
	0	1	0.356	1.925	0.068	0.367	0.547	5.402	8.043	1.489	3.263
	0	2	0.329	1.736	0.063	0.326	0.490	5.141	7.711	1.500	3.100
3	0	3	1.235	2.104	0.241	0.200	0.588	0.827	2.439	2.948	0.708
	0	4	1.588	2.535	0.312	0.217	0.707	0.695	2.267	3.262	0.604
	0	5	1.997	3.189	0.393	0.272	0.888	0.693	2.261	3.261	0.593
	0	6	2.377	3.438	0.471	0.241	0.951	0.510	2.019	3.955	0.455
	0	0	0.213	2.497	0.042	0.518	0.691	12.252	16.350	1.334	6.287
	0	1	0.297	1.612	0.059	0.298	0.446	5.058	7.568	1.496	3.061
	0	2	0.492	2.13	0.098	0.371	0.589	3.803	6.036	1.587	2.617
4	0	3	1.348	2.445	0.268	0.248	0.676	0.928	2.526	2.721	0.788
	0	4	1.859	3.282	0.370	0.322	0.906	0.869	2.447	2.817	0.740
	0	5	2.495	4.149	0.497	0.373	1.144	0.751	2.300	3.064	0.646
	0	6	3.196	5.013	0.638	0.410	1.381	0.643	2.166	3.371	0.558
	0	1	0.458	1.679	0.093	0.270	0.455	2.893	4.877	1.686	2.081
	0	2	1.364	2.075	0.279	0.157	0.561	0.562	2.011	3.580	0.546
	0	3	1.365	2.464	0.280	0.241	0.664	0.861	2.370	2.752	0.772
5	0	4	1.556	3.126	0.321	0.344	0.840	1.071	2.620	2.446	0.944
	0	5	2.305	4.11	0.477	0.394	1.102	0.825	2.310	2.799	0.750
	0	6	3.964	4.982	0.823	0.221	1.332	0.269	1.617	6.020	0.268
	0	0	0.279	2.073	0.058	0.388	0.553	6.678	9.499	1.422	4.075
	0	1	0.393	2.267	0.082	0.404	0.602	4.917	7.326	1.490	3.385
	0	2	1.577	2.806	0.331	0.264	0.744	0.798	2.245	2.814	0.743
6	0	3	2.195	3.295	0.463	0.236	0.871	0.509	1.881	3.695	0.498
	0	4	2.35	3.93	0.497	0.337	1.035	0.678	2.082	3.070	0.647
	0	5	3.738	4.093	0.794	0.075	1.075	0.095	1.354	14.241	0.141
	0	6	4.129	5.876	0.880	0.370	1.539	0.421	1.749	4.157	0.417
	0	0	0.213	2.445	0.046	0.471	0.638	10.342	14.012	1.355	5.736
	0	1	0.319	2.846	0.068	0.531	0.741	7.761	10.819	1.394	5.090
	0	2	0.269	3.329	0.058	0.641	0.864	11.064	14.909	1.347	6.793
7	0	3	0.632	4.636	0.137	0.836	1.200	6.117	8.779	1.435	4.915
	0	4	1.876	5.554	0.407	0.765	1.433	1.879	3.520	1.873	1.793
	0	5	2.051	6.378	0.447	0.897	1.641	2.007	3.673	1.830	1.940
	0	6	3.152	6.86	0.689	0.766	1.759	1.111	2.554	2.298	1.116
	0	0	0.208	1.999	0.046	0.368	0.511	8.075	11.203	1.387	4.589
	0	1	0.227	2.4	0.050	0.445	0.612	8.912	12.244	1.374	5.255
	0	2	0.779	3.446	0.172	0.544	0.876	3.164	5.090	1.609	2.770
8	0	3	1.082	4.66	0.240	0.728	1.181	3.034	4.923	1.623	2.817
	0	4	2	5.634	0.445	0.736	1.423	1.655	3.199	1.933	1.664
	0	5	2.54	6.046	0.567	0.708	1.522	1.248	2.685	2.152	1.288
	0	6	2.857	6.604	0.640	0.753	1.658	1.177	2.591	2.201	1.232

Table 2: Certain parametric values of Bayesian RGS Plan

s	c_1	c_2	$n\mu_1$	$n\mu_2$	$n\mu_0$	$n\mu^*$	μ_2/μ_1	μ_0/μ_1	μ^*/μ_1
	0	0	0.008	1.789	0.426	-	223.625	53.25	-
	0	1	0.042	1.880	0.856	0.621	44.762	20.381	14.786
	0	2	0.056	1.924	1.028	0.812	34.357	18.357	14.500
1	0	3	0.981	1.993	1.656	1.245	2.032	1.688	1.269
	0	4	1.081	2.312	1.980	1.545	2.139	1.832	1.429
	0	5	1.156	2.632	2.212	1.756	2.277	1.913	1.519
	0	6	1.202	2.856	2.301	1.851	2.376	1.914	1.540
	0	0	0.051	1.996	0.756	-	39.137	14.824	-
	0	1	0.766	2.330	1.382	1.036	3.042	1.804	1.352
	0	2	1.002	2.789	1.881	1.456	2.783	1.877	1.453
2	0	3	1.152	2.958	2.526	1.896	2.568	2.193	1.646
	0	4	1.196	3.406	2.956	2.293	2.848	2.472	1.917
	0	5	1.252	3.881	3.046	2.581	3.100	2.433	2.062
	0	6	1.286	4.623	3.851	3.083	3.595	2.995	2.397
	0	0	0.076	2.086	0.946	-	27.447	12.447	-
	0	1	0.856	2.781	1.546	1.212	3.249	1.806	1.416
	0	2	1.352	3.088	2.086	1.681	2.284	1.543	1.243
3	0	3	1.408	3.512	2.881	2.643	2.494	2.046	1.877
	0	4	1.446	3.981	3.438	3.034	2.753	2.378	2.098
	0	5	1.512	4.701	3.943	3.509	3.109	2.608	2.321
	0	6	1.560	4.998	4.831	3.937	3.204	3.097	2.524
	0	0	0.089	2.586	1.081	-	29.056	12.146	-
	0	1	1.386	2.998	2.042	1.683	2.163	1.473	1.214
	0	2	1.451	3.581	2.986	1.943	2.468	2.058	1.339
4	0	3	1.508	3.953	3.583	2.856	2.621	2.376	1.894
	0	4	1.586	4.868	3.938	3.445	3.069	2.483	2.172
	0	5	1.612	5.761	4.936	4.107	3.574	3.062	2.548
	0	6	1.670	6.683	5.451	4.866	4.002	3.264	2.914
	0	1	1.402	3.081	2.658	1.860	2.198	1.832	1.327
	0	2	1.581	3.656	3.045	2.945	2.312	1.926	1.863
	0	3	1.688	4.152	3.683	3.053	2.460	2.182	1.809
5	0	4	1.730	4.856	4.051	3.286	2.807	2.342	1.899
	0	5	1.851	5.961	5.081	4.156	3.220	2.745	2.245
	0	6	1.899	6.881	6.408	5.863	3.623	3.374	3.087
	0	0	1.013	3.086	1.451	-	3.046	1.432	-
	0	1	1.581	3.848	2.861	1.974	2.434	1.810	1.249
	0	2	1.762	4.568	3.608	3.339	2.593	2.048	1.895
6	0	3	1.888	5.183	4.956	4.083	2.745	2.625	2.163
	0	4	1.936	5.866	5.013	4.286	3.030	2.589	2.214
	0	5	1.948	6.041	5.866	5.686	3.101	3.011	2.919
	0	6	1.956	7.832	6.777	6.085	4.004	3.465	3.111
	0	0	1.111	3.556	1.833		3.201	1.650	
	0	1	1.685	4.531	2.456	2.004	2.689	1.458	1.189
	0	2	1.880	5.209	2.863	2.149	2.771	1.523	1.143
7	0	3	1.912	6.548	3.056	2.544	3.425	1.598	1.331
	0	4	1.983	7.537	4.456	3.859	3.801	2.247	1.946
	0	5	2.005	8.383	5.636	4.056	4.181	2.811	2.023
	0	6	2.096	8.956	6.738	5.248	4.273	3.215	2.504
	0	0	1.887	3.886	1.903	-	2.059	1.008	-
	0	1	1.981	4.381	2.805	2.208	2.212	1.416	1.115
	0	2	2.085	5.531	3.563	2.864	2.653	1.709	1.374
8	0	3	2.186	6.846	4.083	3.268	3.132	1.868	1.495
	0	4	2.222	7.856	4.956	4.222	3.536	2.230	1.900
	0	5	2.386	8.432	5.856	4.926	3.534	2.454	2.065
	0	6	2.451	9.055	6.908	5.308	3.694	2.818	2.166

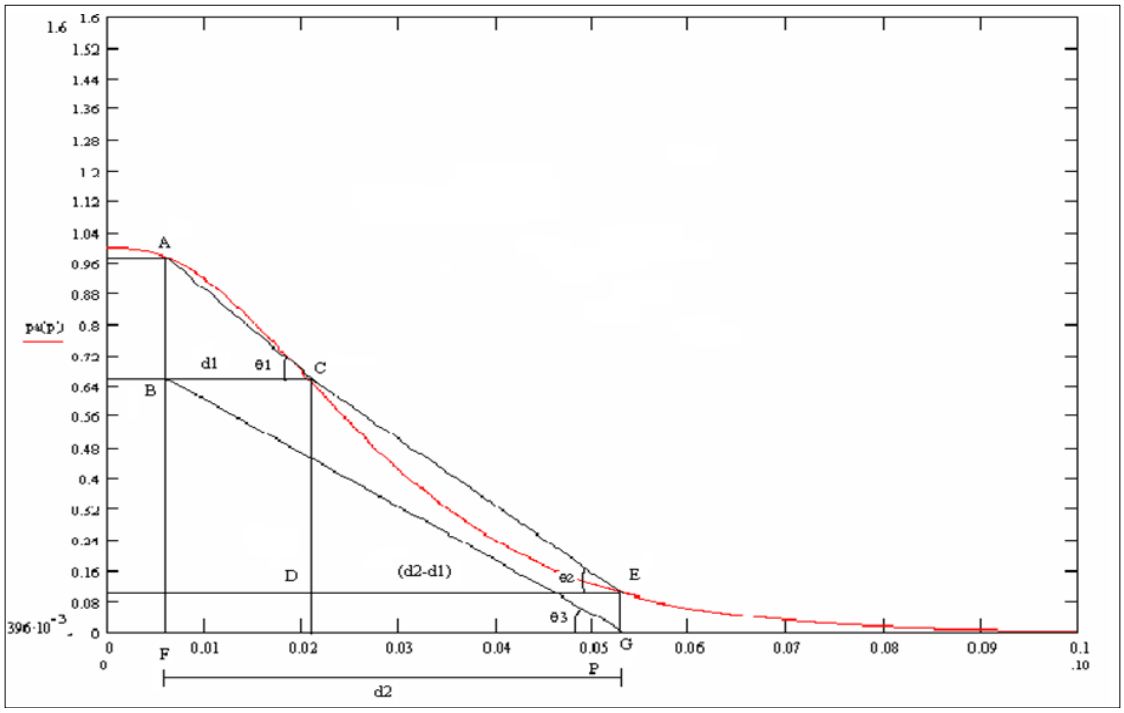

Fig 1: OC Curve for Decision Region (d_1) and Probabilistic Region (d_2) and Tangent Angles

Conclusion

Bayesian Acceptance sampling is the technique, which deals with the procedures in which decision to accept or reject lots or process based on their examination of past history or knowledge of samples. This paper deals with sampling model based on prior distribution and costs, which encompasses most of the existing Bayesian models based on costs. The work is presented in this paper mainly related to construction and selection Bayesian Repetitive Group Sampling Plan for Quality Regions. Quality Interval Sampling (QIS) plan possesses wider potential applicability in industry ensuring higher standard of quality attainment for product or process. Thus Quality Interval Sampling (QIS) plan is a good measure for defining quality and designing any acceptance sampling plan which are readymade use to industrial shop-floor situations.

The Quality Decision Region (QDR) idea is proposed in order to provide higher probability of acceptance compared with (AQL, LQL) indexed plan/scheme/system. Quality Decision Region (QDR) depends on the quality measure MAPD, which is a key measure assessing to what degree the inflection point empowers the OC curve to discriminate between good and bad lots. The present development would be a valuable addition to the literature and a useful device for quality control practitioners.

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