

*National College of Business
Administration and Economics
Lahore*



**AN EWMA MULTIPLE DEPENDENT STATE
AND RESUBMITTED SAMPLING PLAN
USING REGRESSION ESTIMATOR**

BY

UZMA SHAHEEN

**MASTER OF PHILOSOPHY
IN
STATISTICS**

JULY, 2015

NATIONAL COLLEGE OF BUSINESS ADMINISTRATION AND ECONOMICS

AN EWMA MULTIPLE DEPENDENT STATE AND RESUBMITTED SAMPLING PLAN USING REGRESSION ESTIMATOR

BY

UZMA SHAHEEN

**A dissertation submitted to
Faculty of Social Sciences**

**In Partial Fulfillment of the
Requirements for the Degree of**

**MASTER OF PHILOSOPHY
IN
STATISTICS**

July, 2015



*In the name of ALLAH,
The Most Beneficial,
The Most Merciful,*

**NATIONAL COLLEGE OF BUSINESS
ADMINISTRATION AND ECONOMICS
LAHORE**

**AN EWMA MULTIPLE DEPENDENT STATE
AND RESUBMITTED SAMPLING PLAN
USING REGRESSION ESTIMATOR**

**BY
UZMA SHAHEEN**

A dissertation submitted to Faculty of Social Sciences, in partial fulfillment of the requirements for the degree of

**MASTER OF PHILOSOPHY IN
STATISTICS**

Dissertation Committee:

Chairman

Member

Member

Rector

National College of Business
Administration and Economics

DECLARATION

It is to declare that this research work has not been submitted for obtaining similar degree from any other university/college.

UZMA SHAHEEN
July, 2015

DEDICATION

*I would like to
dedicate my thesis to
my Beloved Parents (late)
and my Family Members
(Beloved Brother and Sisters)*

ACKNOWLEDGEMENT

I am at first thankful to my Allah Almighty who bestowed his countless blessings upon me, guided me towards the way of success, and blessed me with courage of facing problems and obstacles that enable me to accomplish this research.

I am highly gratified and obliged to my profound gratitude to Dr. Munir Ahmad, Dr. Abdul Khaliq and Dr. Muhammad Hanif for being helpful in my research formalities.

I am thankful to Dr. Muhammad Aslam for his guidance and support in this course of study. I am also thankful to my teachers for providing me with the knowledge and wisdom to complete this degree.

I highly acknowledge the support of my Supervisor Dr. Muhammad Azam under his continuous and valuable suggestions and directions in every aspect I have been able to complete my thesis in its true sense.

I would like to thanks my family and siblings specially my parents (late) and my brother who has for their cooperation, kind attitude and prayers and morally supported me throughout my research work. I am thankful to Miss Talat Yasmeen for helping me in computational work.

May Allah reward all those who cooperated with me, helped me, guided me, and made it easy for me.

RESEARCH COMPLETION CERTIFICATE

Certified that the research work contained in this thesis entitled **“An EWMA Multiple Dependent State and Resubmitted Sampling Plan Using Regression Estimator”** has been carried out and completed by **Uzma Shaheen** under my supervision during her **M.Phil. Statistics** Programme.

(Dr. Muhammad Azam)
Supervisor

SUMMARY

The development in quality is the central ambition of the companies to continue the statuses in the international market. The company is recognized by the superiority of the product that it produces. Good quality may carry good statuses of the company in the marketplace. Thus the companies are demanding to improve the quality of their produces by expending several statistical methods and tools for inspection. Acceptance sampling plan is a statistical tool that has been commonly used in the manufacturing.

Inspection through the acceptance sampling plan is essential from the raw material to the concluding product. The procedure of sampling plan for the review has various benefits for the manufacturer and customer. It is helpful in accepting a good lot the product and rejecting the bad lot. The usage of the acceptance sampling also provokes the manufacturers to improve the quality level. There are several sampling procedures that have been recycled for different situations in the production.

Here for the quality characteristics an exponential weighted moving average (EWMA) multiple dependent state and resubmitted sampling plan using regression estimator is developed. An exponential weighted moving average statistic is used for the present and past information by giving high weight to the previous data. In this research, a new exponential weighted moving average multiple dependent state and resubmitted sampling plan using regression estimator is proposed. An EWMA multiple dependent state plan is useful in giving intermediate value in terms of sample size efficiency and is more proficient than the resubmitted sampling plan when needed to reach the same decision. It is considered to be more efficient as it reduces the cost of inspection.

Two cases are discussed where the standard deviation of the normal distribution is known and unknown. The plan parameters for the both cases are determined such that the given producer's risk and consumer's risk are satisfied. The relevant plan parameters, n, m, k_a and K_r for the multiple dependent state sampling and n, m, k_a and ASN for the resubmitted sampling plan are tabulated with commonly used α, β .

The tables are created at several levels of smoothing constant λ and ρ , it is identified that for small size of smoothing constant, the value of sample size and k_a are smaller and the value of k_r is increase. Whereas the level of λ is increased the sample size are also identified to be high. Thus it is worthy to

note that small smoothing constant are usually appropriate. Similarly, it is identified that for small size of ρ , the value of sample size k_a are smaller. Whereas the level of ρ is increased the value of sample size k_a are also identified to be high. Thus it is worthy to note that small smoothing constant are usually appropriate for the efficient results. The industrial application of the proposed plan is also explained its efficiency with a simulation study.

LIST OF SYMBOLS AND ABBREVIATIONS

n	=	Sample size
k_a	=	Acceptance number
k_r	=	Rejection number
A	=	Producer's risk
β	=	Consumer's risk
μ	=	Mean of normal distribution
σ	=	standard deviation of normal distribution
ρ	=	Population correlation
m	=	number of proceeding lot
y_i	=	Study variable on the i^{th} unit
x_i	=	Auxiliary variable
Λ	=	Smoothing constant
MDS	=	Multiple dependent state
OC	=	Operating characteristic
AQL	=	Acceptance quality level
LQL	=	Limiting quality level
SPC	=	Statistical process control
SQC	=	Statistical quality control
ASN	=	Average sample number
RGS	=	Repetitive group sampling
EWMA	=	Exponentially weighted moving average

TABLE OF CONTENTS

DECLARATION.....	v
DEDICATION	vi
ACKNOWLEDGEMENT.....	vii
SUMMARY	ix
LIST OF SYMBOLS AND ABBREVIATIONS.....	xi
CHAPTER 1: INTRODUCTION	1
1.1 Statistical Process Control (SPC).....	1
1.2 Acceptance Sampling.....	2
1.3 Acceptance Sampling Plan	2
1.4 Purpose of Acceptance Sampling Plan	2
1.4.1 Cost and Time	3
1.4.2 Destructive Items	3
1.5 Procedure of Acceptance Sampling Plan.....	3
1.6 Types of Acceptance Sampling Plan	3
1.6.1 Single Sampling Plan.....	4
1.6.2 Double Acceptance Sampling.....	4
1.6.3 Repetitive Group Sampling (RGS)	5
1.6.4 Sequential Acceptance Sampling.....	5
1.7 Classification of Acceptance Sampling Plan	6
1.7.1 Attributes Sampling Plan	6
1.7.2 Variable Sampling Plan	6
1.8 Risks in Acceptance Sampling Plan	7
1.8.1 Producer’s Risk.....	7
1.8.2 Consumer’s Risk.....	7
1.9 Well-Organized Plan.....	8
1.10 Efficacy Of Well-Organized Plan.....	8
1.11 Multiple Dependent State Sampling Plan (MDS).....	8
1.12 Exponentially Weighted Moving Average (EWMA).....	9
1.13 Resubmitted Sampling Plan.....	10
1.13.1 Conditions for the Resubmitted Sampling Plan.....	10
1.14 Regression Estimator	10
1.15 Average Sample Number (ASN)	12
1.16 Objectives of the Study	12
CHAPTER 2: LITERATURE REVIEW	13
2.1 Multiple Dependent State (MDS) Sampling Plan.....	13
2.2 Resubmitted Sampling Plan.....	15
2.3 Exponential Weighted Moving Average (EWMA) and Regression Estimator ...	16

CHAPTER 3: DESIGNING OF AN EWMA MULTIPLE DEPENDENT STATE AND RESUBMITTED SAMPLING PLAN USING REGRESSION ESTIMATOR	18
3.1 Proposed Plan of MDS Sampling	19
3.1.1 When Sigma is Known	19
3.1.2 When σ is Unknown	22
3.2 Proposed Resubmitted Sampling Plan Using Regression Estimator	27
3.2.1 When Sigma is Known	27
3.2.2 When Sigma is Unknown	28
CHAPTER 4: RESULTS AND DISCUSSIONS	31
4.1 Results for the Plan Parameters for Proposed MDS Plan When σ is Known....	32
4.1.1 Interpretation of the Table 4.1.1 – 4.1.5	37
4.1.2 Interpretation of the Table 4.1.6 – 4.1.10	43
4.1.3 Interpretation of the Table 4.1.11 – 4.1.15.....	49
4.1.4 Interpretation of the Table 4.1.16 – 4.1.20.....	55
4.2 Results for the Plan Parameters for Proposed MDS Plan when σ is Unknown... 56	
4.2.1 Interpretation of the Table 4.2.1 – 4.2.3	59
4.2.2 Interpretation of the Table 4.2.4 – 4.2.6	63
4.2.3 Interpretation of the Table 4.2.7 – 4.2.9	67
4.2.4 Interpretation of the Table 4.2.10 – 4.2.11.....	70
4.3 Results of Plan Parameters for Proposed Resubmitted Plan when σ is Known 71	
4.3.1 Interpretation of the Table 4.3.1 – 4.3.2	73
4.3.2 Interpretation of the Table 4.3.3 – 4.3.4	76
4.3.3 Interpretation of the Table 4.3.5 – 4.3.6	79
4.4 Results of Plan Parameters for Proposed Resubmitted Plan	
When σ is Unknown	80
4.4.1 Interpretation of the Table 4.4.1	81
4.4.2 Interpretation of the Table 4.4.2	83
4.4.3 Interpretation of the Table 4.4.3	85
4.4.4 Interpretation of the Table 4.4.4	87
4.4.5 Interpretation of the Table 4.4.5	89
4.4.6 Interpretation of the Table 4.4.6	91
4.5 Comparison Tables of Plan Parameters for Proposed MDS Plan	
when σ is Known and Unknown.....	92
4.5.1 Interpretation of Table 4.5.1 and 4.5.2	94
4.6 Comparison Tables of Plan Parameters for Proposed Resubmitted Plan	
when Sigma (σ) is Known And Unknown.....	95
4.7 Comparisons of Sample Size of Proposed MDS and Resubmitted	
Sampling Plan	98
4.7.1 Interpretation of the Table 4.7	99
4.8 Industrial Application	99
4.8.1 Implementation of the MDS Plan	100
4.8.2 Implementation of the Resubmitted Plan.....	101

CHAPTER 5: CONCLUSIONS AND FUTURE RECOMMENDATIONS	102
5.1 Conclusions	102
5.2 Future Recommendation	103
REFERENCES	104
APPENDIX-A: ALGORITHM 1	107
APPENDIX-B: ALGORITHM 2	108
APPENDIX-C: ALGORITHM 3	109
APPENDIX-D: ALGORITHM 4.....	110

LIST OF TABLES

Table No.	Title	Page
4.1.1	Plan parameters for MDS when σ is known, $\rho = 0.25, \lambda = 0.1, 0.2$	32
4.1.2	Plan parameters for MDS when σ is known, $\rho = 0.25, \lambda = 0.3, 0.4$	33
4.1.3	Plan parameters for MDS when σ is known, $\rho = 0.25, \lambda = 0.5, 0.6$	34
4.1.4	Plan parameters for MDS when σ is known, $\rho = 0.25, \lambda = 0.7, 0.8$	35
4.1.5	Plan parameters for MDS when σ is known, $\rho = 0.25, \lambda = 0.9, 1.0$	36
4.1.6	Plan parameters for MDS when σ is known, $\rho = 0.50, \lambda = 0.1, 0.2$	38
4.1.7	Plan parameters for MDS when σ is known, $\rho = 0.50, \lambda = 0.3, 0.4$	39
4.1.8	Plan parameters for MDS when σ is known, $\rho = 0.50, \lambda = 0.5, 0.6$	40
4.1.9	Plan parameters for MDS when σ is known, $\rho = 0.50, \lambda = 0.7, 0.8$	41
4.1.10	Plan parameters for MDS when σ is known, $\rho = 0.50, \lambda = 0.9, 1.0$	42
4.1.11	Plan parameters for MDS when σ is known, $\rho = 0.75, \lambda = 0.1, 0.2$	44
4.1.12	Plan parameters for MDS when σ is known, $\rho = 0.75, \lambda = 0.3, 0.4$	45
4.1.13	Plan parameters for MDS when σ is known, $\rho = 0.75, \lambda = 0.5, 0.6$	46
4.1.14	Plan parameters for MDS when σ is known, $\rho = 0.75, \lambda = 0.7, 0.8$	47
4.1.15	Plan parameters for MDS when σ is known, $\rho = 0.75, \lambda = 0.9, 1.0$	48
4.1.16	Plan parameters for MDS when σ is known, $\rho = 0.95, \lambda = 0.1, 0.2$	50
4.1.17	Plan parameters for MDS when σ is known, $\rho = 0.95, \lambda = 0.3, 0.4$	51
4.1.18	Plan parameters for MDS when σ is known, $\rho = 0.95, \lambda = 0.5, 0.6$	52
4.1.19	Plan parameters for MDS when σ is known, $\rho = 0.95, \lambda = 0.7, 0.8$	53
4.1.20	Plan parameters for MDS when σ is known, $\rho = 0.95, \lambda = 0.9, 1.0$	54
4.2.1	Plan parameters for MDS when σ is unknown, $\rho = 0.25, \lambda = 0.1, 0.3$	56
4.2.2	Plan parameters for MDS when σ is unknown, $\rho = 0.25, \lambda = 0.5, 0.6$	57
4.2.3	Plan parameters for MDS when σ is unknown, $\rho = 0.25, \lambda = 0.7, 0.9$	58

Table No.	Title	Page
4.2.4	Plan parameters for MDS when σ is unknown, $\rho = 0.50$, $\lambda = 0.1, 0.3$	60
4.2.5	Plan parameters for MDS when σ is unknown, $\rho = 0.50$, $\lambda = 0.4, 0.5$	61
4.2.6	Plan parameters for MDS when σ is unknown, $\rho = 0.50$, $\lambda = 0.7, 0.9$	62
4.2.7	Plan parameters for MDS when σ is unknown, $\rho = 0.75$, $\lambda = 0.1, 0.3$	64
4.2.8	Plan parameters for MDS when σ is unknown, $\rho = 0.75$, $\lambda = 0.5, 0.7$	65
4.2.9	Plan parameters for MDS when σ is unknown, $\rho = 0.75$, $\lambda = 0.9, 1.0$	66
4.2.10	Plan parameters for MDS when σ is unknown, $\rho = 0.95$, $\lambda = 0.1, 0.4$	68
4.2.11	Plan parameters for MDS when σ is unknown, $\rho = 0.95$, $\lambda = 0.8, 1.0$	69
4.3.1	Plan parameters for proposed resubmitted plan when σ is known with $\rho = 0.25$ and $\lambda = 0.1$	71
4.3.2	Plan parameters for proposed resubmitted plan when σ is known with $\rho = 0.25$ and $\lambda = 0.2$	72
4.3.3	Plan parameters for proposed resubmitted plan when σ is known with $\rho = 0.50$ and $\lambda = 0.1$	74
4.3.4	Plan parameters for proposed resubmitted plan when σ is known with $\rho = 0.50$ and $\lambda = 0.2$	75
4.3.5	Plan parameters for proposed resubmitted plan when σ is known with $\rho = 0.75$ and $\lambda = 0.1$	77
4.3.6	Plan parameters for proposed resubmitted plan when σ is known with $\rho = 0.75$ and $\lambda = 0.2$	78
4.4.1	Plan parameters for proposed resubmitted plan when σ is unknown with $\rho = 0.25$ and $\lambda = 0.1$	80
4.4.2	Plan parameters for proposed resubmitted plan when σ is unknown with $\rho = 0.25$ and $\lambda = 0.2$	82
4.4.3	Plan parameters for proposed resubmitted plan when σ is unknown with $\rho = 0.50$ and $\lambda = 0.1$	84
4.4.4	Plan parameters for proposed resubmitted plan when σ is unknown with $\rho = 0.50$ and $\lambda = 0.2$	86

Table No.	Title	Page
4.4.5	Plan parameters for proposed resubmitted plan when σ is unknown with $\rho = 0.75$ and $\lambda = 0.1$	88
4.4.6	Plan parameters for proposed resubmitted plan when σ is unknown with $\rho = 0.75$ and $\lambda = 0.2$	90
4.5.1	Plan parameters for proposed MDS plan with $\lambda = 0.1$ When σ is known	92
4.5.2	Plan parameters for proposed MDS plan with $\lambda = 0.1$ When σ is unknown	93
4.6.1	Plan parameters for proposed resubmitted plan with $\lambda = 0.1$ When σ is known	95
4.6.2	Plan parameters for proposed resubmitted plan with $\lambda = 0.1$ When σ is unknown	96
4.7.1	Sample size comparisons of proposed MDS and resubmitted plan with $\lambda = 0.1$ and $\rho = 0.25$	98

CHAPTER 1

INTRODUCTION

1.1 STATISTICAL PROCESS CONTROL (SPC)

The term quality is always connected with an outstanding deal or product that meets the lowest necessity of the consumer. The person who is responsible for quality starts with determining the customer requirements and the production process goes on until the product is acceptable to the customers. From an official point of view, quality is a group of properties or conditions of a product, which together agree to fulfill the requirements of customers (Oakland, 1986). This can be achieved only with certain requirements, standards or specifications.

Quality control is a training which has been known since the early days of production. However, given the up-to-date industrial progress worldwide, the complication of production techniques, the inspection and the testing of many products and services has become a predictable process. For example, deviations from a production plan are very common and have undesirable effects on the product. The main problem is that no one can expect these deviations, as things sometimes may get out of control all of a sudden. Therefore, it has become a requirement that construction techniques should be very closely examined. In order to reach the required capability of the system, official deviations need to be kept at a smallest. This can be attained through the use of statistical process control (SPC), which contains taking the required amounts to help result makers decide whether or not the manufacture process is going as planned.

In 1942 W.A. Stewart, who worked for Bell Telephone Laboratories in the US, established a statistical chart to control the different variables in the production process. This chart established the basis of Statistical Quality Control (SQC). Then later on Dodge and Roming (1959) developed the process of acceptance sampling as an alternative to full inspection technique. SQC establishes one of the branches of quality control procedure, which involves the attainment, analysis and explanation of data to be used in the process of quality control (Oakland, 1986).

1.2 ACCEPTANCE SAMPLING

Acceptance sampling is a statistical procedure which is commonly used to choose whether or not to receive a batch of products that has already been produced. So, it focuses on the quality assurance and discounts the manufacture process. Acceptance sampling for attributes or 'go, no-go inspection is one of the key topics in quality control. It is a sampling based inspection method where an item is classified as defective or non-defective with respect to a stated quality requirement (Montgomery, 2009).

1.3 ACCEPTANCE SAMPLING PLAN

The acceptance sampling plan first applied in the US Military for testing the bullets during World War II. For example, if each and every bullet is tested in advance, no bullet is accessible for load. On the other hand if no bullet is tested, then disaster might occur in the battle field at the crucial time. Dodge (1955) indicated that a sample is randomly taken from a lot and the chance of the product depends on the data attained from this sample. This process is known as acceptance sampling or lot acceptance sampling. Thus the acceptance sampling is used for possible acceptance or rejection of the products but not for assessing the value of the lot.

Schilling (1982) says, "A different sampling plan has much the outcome of a single gunman, while the sampling plan scheme can provide a fusillade in the battle for quality development." Balakrishnan et al. (2007) stated, "Quality is now not only a chance or aim of companies, but necessary for business in an overall market. Thus the quality has become a difference tool between economical enterprises. Two significant tools for approving quality are the statistical quality control and the acceptance sampling." Acceptance sampling plan is a 'middle path' between hundred percent inspections and no inspection at all.

1.4 PURPOSE OF ACCEPTANCE SAMPLING PLAN

The following two factors are important to study an acceptance sampling for testing the superiority of a lot of products.

1.4.1 Cost and Time

The producers are very alert about the value of their products from the raw material to finishing products so that they do not face any struggle when a customer approaches to buy it. At this point, it is not imaginable to check the life time of each and every part (100% inspection) taken from the lot for possible acceptance or rejection which absolutely clues to the high cost and waste of time. Cost and time are very significant issues that provoke the experimenter to use an acceptance sampling plan system. Therefore, an acceptance sampling plan is designed to reach the final decision about the submitted product and to minimize these factors.

1.4.2 Destructive Items

If the products under study are for example, electronic components such as energy saver bulbs, for this experimenter is interested to see the average life of these bulbs, it is not possible to put all the bulbs in a lot on test and wait for the number of failures. The technique is to pick up few bulbs and put them on test and, on the basis of information so achieved, choose about the usual life of produced energy saver. Later for the acceptance or rejection of these critical products, acceptance sampling is a compulsory implement.

1.5 PROCEDURE OF ACCEPTANCE SAMPLING PLAN

The Procedure of acceptance sampling plan is as follows

- A random sample is taken from a large quantity of items and tested or measured relative to the quality characteristic of interest
- If the sample passes the test, the entire quantity of items is accepted.
- If the sample fails the test, either the entire quantity of items is subjected to 100 percent inspection and all defective items repaired or replaced or the entire quantity is returned to the supplier.

1.6 TYPES OF ACCEPTANCE SAMPLING PLAN

There are two major types of acceptance sampling plan

- a. Single sampling plan
- b. Double sampling plan

1.6.1 Single Sampling Plan

The single acceptance sampling is the combination of sample size, acceptance number/ action number, and termination ratio. To test the quality of a product, the null hypothesis is formulated that $\mu \geq \mu_o$ and the alternative hypothesis $< \mu_o$, where μ is the true average or median of a product. These hypotheses are tested through truncated life tests in acceptance sampling. In a single acceptance sampling, a sample size n is selected and put on test. The chance of the product is determined by on the information of this single sample. An experimenter runs an experiment for a pre- planned experiment time. The acceptance number (action number) c is fixed for an experiment, which is truncated if more than c failures are recorded before the end of experiment time or the time of experiment is ended, whichever is earlier. A lot is accepted and realized for consumer's use if no more than c failures are observed during this time and we accept $\mu \geq \mu_o$, otherwise we reject it (Aslam, 2010).

1.6.2 Double Acceptance Sampling

The Double acceptance sampling is used to reduce the producer's risk. This scheme is used when the submitted product is questionable or if the experimenter cannot influence the final judgment about the product on the basis of first sample reserved from it. The double sampling provides additional prospect to accept or reject the submitted lot. Thus, this sampling structure is used to minimize the producer's risk. Duncan (1986) specified that the double acceptance sampling plan is recycled to decrease the sample size or producer's risk in the part of quality control where the normal distribution is frequently accepted. According to Jun et al. (2006) the single and double sampling plans are for the sudden death testing scheme. They achieved the total groups for mutually systems and suggested that the group double sampling is used to reduce the number of groups than the single group sampling system. A double sampling plan established on truncated life tests is considered by $n_1, n_2, c_1, c_2,$ and t/μ_o .

Draw a random sample of size n_1 and test it. Accept the lot if there are no more than c_1 disasters and reject the lot if more than c_2 failures are noted already the finish of experiment time. If the number of disasters are between c_1 and c_2 ($c_1 < c_2$), proceeds a new sample of size n_2 and reject the lot if other than c_2 disasters are happened through the experiment time (Aslam, 2010).

1.6.3 Repetitive Group Sampling (RGS)

Sherman (1965) stated that in repetitive group sampling plan sample is drawn and the number of defectives counted. According to a fix standard, the lot is either accepted or rejected the sample is fully overlooked or one has to create with a fresh sample to judgment a lot. This is nonstop till the permanent standard specifies us to accept or reject the lot. Specifically this pal gives an intermediate value in sample size efficiency between the single sampling and sequential sampling plans. The RGS plan is used to improve the operating characteristics curve when the variable plan holds an insufficient operating characteristics curve connected to that of the zero approval number. To increase the selective power of this curve, one technique is to increase the sample size. A different way is to routine the RGS plan for the attribute inspection.

1.6.4 Sequential Acceptance Sampling

Sequential Acceptance sampling plan is different from the single, double and multiple sampling plans. In Sequential Acceptance sampling plan, first take a sequence of sample size from the product under inspection. If one item is nominated as sequence, then the sampling is called the item-by-item sequential sampling plan. On the other hand, if more than one item is nominated as sequence, then sampling is called group sequential sampling plan. Acceptance sampling plan is to accept or the reject the product on the basis of the information occupied from the lot where sequential acceptance sampling is used to reduce the number of items tested when the initial results show that the lot visibly meets the qualifications or be unsuccessful to reach the indicated average.

According to Sherman (1965) RGS plans are not approximately as capable as sequential sampling plan but they are most competent than the single sampling plans. Balamurli and jun (2006) considered the average sample number of sequential sampling by the estimate given by Schilling (1982). They perceived that the RGS is capable in positions of average sample number than the single and double sampling but not more competent than the sequential sampling pattern.

1.7 CLASSIFICATION OF ACCEPTANCE SAMPLING PLAN

Acceptance sampling plans are classified into two major parts

- i) Attributes sampling plan
- ii) Variables sampling plan

1.7.1 Attributes Sampling Plan

Attributes sampling plan has many claims in selection of techniques. For example, it is recycled to check the received measures to fulfill assured circumstances before they are collected. The completed products need to satisfy the customer's requirement. Three plan parameters say (N, n, c) are used in this sampling, i.e. lot size N , sample size n and acceptance number c . The plan is fulfilled as: select n items from N with the acceptance number, c . If the number of defectives items is greater than c , then reject the lot, otherwise accept it.

The quality level, p , specifies the segment of imperfect items. A quality level $p = 0\%$ means that all the elements in the batch are good and $p = 100\%$ that $p = 0\%$ all the items in the lot are imperfect. If $p = 0\%$ or $p = 100\%$, there is no necessity of acceptance sampling plan. But, if p is between 0% and $p = 100\%$, the acceptance sampling plan is used to accept or reject the whole product on the base of sample information.

1.7.2 Variable Sampling Plan

Producers choice about the normal life of the product is verified over an acceptance sampling arrangement, later, variable acceptance sampling plans are established to accept or reject an acceded lot of products on the base of studied quantifiable class representative; and sample occupied from that lot. To accept or reject the statement of the producer about the products, it is compulsory to identify the probability distribution of variable value representative under assessment. The normal distribution is used for the finishing judgment in this situation. If the disaster time of product under the attention does not survey the normal distribution, then the assembled conclusion on this source would be confusing. So, variable sampling plan is realistic for the extent data when the use of the normal distribution is acceptable to excellence representative.

The key benefit of variable sampling is that the same operating characteristic (OC) curve can be achieved for reduced sample sizes. A second advantage of this sampling plan is that the measurement data offer more material than the attribute data. There are some weaknesses of the variable sampling plan over the attribute sampling plan. The use of sampling plan depends on the hypothesis that the quality characteristic of the objects follows the normal distribution which does not always satisfy in practice.

Collani (1990) evaluated that the attribute sampling plan cannot be recycled if one is absorbed in the fraction non-conforming in external lots. Seidel (1997) verified that the attribute sampling is always ideal. Even though variable sampling is extra profitable than the attribute sampling, however the attribute sampling is usually used in preparation because it is informal to usage and does not depend on the statement of the normality.

1.8 RISKS IN ACCEPTANCE SAMPLING PLAN

There are two types of risks are always present in the acceptance sampling plan.

- i) Producer's risk
- ii) Consumer's risk

1.8.1 Producer's Risk

The decision is taken on the basis of information, gathered from few items which are selected from a lot of the product. There is chance of rejecting the good lots. Therefore, the probability of rejecting a good lot is called the producer's risk. It is denoted by α and it also called the type 1 error.

1.8.2 Consumer's Risk

There is also chance that a corrupt lot is believed on the basis of material attained from the sample. The chance of accepting the corrupt lot is called the consumer's risk. Consumer's risk is denoted by β and it also called the type 11 error.

1.9 WELL-ORGANIZED PLAN

As acceptance sampling plans offer the conclusion nearly the submitted products. There are two possibilities all the time present with these systems. The elimination of a moral percentage is not affordable for manufacturer and tolerant the corrupt percentage is not affordable for customer. For that reason, sampling plans are planned in such a technique that they decrease both risks. A sampling plan which can be used to minimize the producer's risk and consumer's risk is called the well-organized sampling plan.

1.10 EFFICACY OF WELL-ORGANIZED PLAN

Constructor wishes that the probability of lot acceptance should be more than his confidence level $1-\alpha$ at acceptable quality level (AQL) and consumer's wishes that the probability of lot acceptance for bad lot should be smaller than his risk β at limiting quality level (LQL). Then, sampling plans are considered such that the operating characteristics (OC) curve must be passes through two points.

1.11 MULTIPLE DEPENDENT STATE SAMPLING PLAN (MDS)

Baker (1971) first time established a category of sampling plan which is the dependent state attribute acceptance sampling plan. The MDS plan is applicable to a continuous process where lots are submitted for inspection serially in the order of production. In this procedure, acceptance or rejection of a lot is based not only on the sample from lot, but also on sample results from past lots (in the case of dependent state sampling) or from future lots (in the case of deferred state sampling). So, the MDS plan has an advantage over the usual sampling plan in terms of the minimum sample size.

Dean (1971) offered cost models for the dependent state life test plan to see whether the use of dependent state life test plan would moderate the overall test cost. Wortham and Baker (1976) also presented the techniques for the dependent state sampling (MDS) plan. In addition, Wortham and Baker (1976) presented the multiple dependent state (MDS) review in which decision to accept or reject the current submitted lot depends on some sampling test results of other submitted lots. The MDS sampling plan belongs to the group of conditional sampling procedures. In these procedures, in the case of dependent sampling plan acceptance or rejection of a lot is based not only on the sample from that lot, but also on sample results from past lots.

Although the MDS plan is reported to be efficient in terms of required sample size the MDS plan based on regression estimator has not been studied. The following expectations should be effective for presentation of the variables MDS plan.

- i. The purchaser has assurance in the provider and there should be no purpose to accept as true that a precise lot is worse than the earlier lots.
- ii. The quality characteristic of awareness follows a normal distribution.
- iii. Lots are submitted for inspection consecutively in the request of production from a process having a repeated amount non-conforming.

1.12 EXPONENTIALLY WEIGHTED MOVING AVERAGE (EWMA)

The exponentially weighted moving average is a statistic for observing the development that averages the data in a system that provides a reduced amount of weight to data as they are extra indifferent in stage. The exponentially weighted moving average (EWMA) statistic is effective for recognizing a small shift in the technique. For the EWMA control technique, the decision concerning the state of control of the process depends on the EWMA statistic, which is exponentially weighted average of all earlier data, containing the most topical capacity. Roberts (1959) presented the conception of exponentially weighted moving average (EWMA) chart; the exponentially weighted moving average statistic T_i^* is defined as

$$T_i^* = \lambda \bar{Y} + (1 - \lambda) T_{i-1}^*$$

where i is the sample number and λ is smoothing constant which lies between 0 and 1 and the initial value of EWMA statistic is taken as $T_i^* = \mu_o$ the average of random sample of under study quality characteristics. The EWMA statistic is function of normal random variable, which follows the normal distribution with mean $E(T_i^*) = \mu_o$ and variance is

$$V(T_i^*) = \frac{\lambda}{2 - \lambda} \sigma^2 \{1 - (1 - 2\lambda)^{2i}\}$$

For large n variance is

$$V(T_i^*) = \frac{\lambda}{2 - \lambda} \sigma^2.$$

1.13 RESUBMITTED SAMPLING PLAN

The ANSI/ASQC Standard A2 (1987) defined advanced analysis of a lot as the first inspection of a lot which has been resubmitted after previous non accepted lot. A resubmitted lot is defined in the standard as the one which has been considered as not – suitable and which is submitted again for acceptance inspection after having been more tested, organized, reclaimed, etc. if a lot is not acknowledged on original inspection, the manufacturer may test it and may also submit it without arranging or recovering it for resampling.

The resubmitted sampling plan has been introduced by the Govindaraju and Ganesalingam (1997). The resubmitted sampling plan is used in that situation when the producer may reject the outcome of the first sample. Then the second sample is reserved for the review of the product. When the lot is not accepted then the process is repeated m times and reject the lot is reject at the m th resubmission if the lot is not accepted on $(m - 1)^{st}$ resubmission. Resubmitted sampling plan is widely used in food inspection.

1.13.1 Conditions for the Resubmitted Sampling Plan

Govindraja and Ganesalingam (1997) indicated the following condition for the resubmitted sampling plan.

- i) By the establishment of the agreement, the outcomes of original review can be rejected on the non-acceptance of lot.
- ii) Purchaser has assurance in the producer that he or she will not purposefully taking the subsidy of resampling.

1.14 REGRESSION ESTIMATOR

In statistics, the regression estimator defines the relation between the dependent variable and independent variable using performances for displaying and exploring variable. Regression analysis estimates the conditional probability of the dependent variable specified the independent variables. The use of auxiliary information at the estimation stage appears to have started with the work of Cochran (1940). In many theoretical presentations, the superiority of a process is considered by an efficient association between a response variable and one or more auxiliary variable.

The statistical technique used to understand and check the stability of the process profile over time is known as regression estimation.

Regression analysis have been developed using many techniques; such as linear regression and ordinary least square regression. In order to develop the linear regression estimator, suppose y_1, \dots, y_N comprises a population of values such that

$$y_i = \alpha + \beta x_i \quad i = 1, \dots, N$$

where

y_i = study variable on the i^{th} unit;
 x_i = auxiliary variable

The use of auxiliary variable has always been a source of improvement in estimation of certain population characteristics. The auxiliary variables that have sequence correlation with the estimated variable permanently develop the precision of the estimates bring about in reduced standard error of the estimation. The usage of auxiliary variable in survey sampling has very old history.

The past use of the auxiliary variable can be establish in the regression estimator given by Hansen et al. (1953) as

$$\bar{y}_{lr} = \bar{y} + \beta(\bar{X} - \bar{x}).$$

The regression estimator is considered to increase the precision by using an auxiliary variable x_i that is correlated with study variable y_i . The correlation between y_i and x_i should be approximately linear and the regression line does not passes through the origin. This proposes an estimate based on linear regression of y_i on x_i .

The linear regression estimate of \bar{Y}

$$\bar{Y} = \bar{y} + b(\bar{X} - \bar{x})$$

where b is an estimate of change in y due to unit change in x .

The exponentially weighted moving average (EWMA) chart was presented by Roberts (1959). The exponentially weighted moving average is defined as

$$T_i^* = \lambda \bar{Y} + (1 - \lambda)T_{i-1}^*$$

where i is the sample number, λ is a smoothing constant lies between 0 and 1. All sample sizes are equal to n . The quantity T_{i-1}^* represents past information and its initial value (i.e, T_0^*) is taken equal to the average of the preliminary samples.

1.15 AVERAGE SAMPLE NUMBER (ASN)

According to Balamurli et al. (2005), “the average sample number (ASN) means the expected number of sampled units per lot used for making decisions” acceptance or rejection.

The ASN for the resubmitted plan is given as follows

$$ASN(E^*) = \frac{n(1-(1-P_2)^m)}{P_2}.$$

1.16 OBJECTIVES OF THE STUDY

The objectives of the study are as follows:

- i) To design a new multiple dependent state plan based on regression estimator using EWMA statistic.
- ii) To design a new resubmitted plan based on regression estimator using EWMA statistic
- iii) To regulate the parameters of the plan that satisfied the producer and consumers risk.
- iv) To develop the acceptance number to reduce the cost of inspection and save time.
- v) Further the proposed plan will be extension of accessible sampling plan.
- vi) Farther the comparison of the proposed MDS and resubmitted plan will be discussed.

CHAPTER 2

LITERATURE REVIEW

In this chapter we have contains the details of the review of the literature related to our proposed sampling plan based on regression estimator. In section 2.1, we maintained the review of the literature for multiple dependent state sampling plans. In section 2.2, we discussed the literature review of the resubmitted sampling plan. In section 2.3, we discussed the literature review of the EWMA statistic and regression estimator.

2.1 MULTIPLE DEPENDENT STATE (MDS) SAMPLING PLAN

Wortham and Baker (1976) first time established a category of sampling plan which is the dependent state attribute acceptance sampling plan. They presented the multiple dependent state (MDS) plan in which decision to accept or reject a lot is based on not only the quality of current submitted lot but also depends on the quality of some sampling test effects of other submitted lots. This sampling can be used in the case that the lots are submitted in sequence.

Vaerst (1982) has developed the MDS-1 sampling plan as a natural extension lead of chain sampling plan (CHSP-1) of Dodge (1955). He also specified the measures and tables for selecting the MDS and MDS-1 plans for given acceptance quality level, producer's risk (α), consumer's risk (β), and limiting quality level under the situation of binomial model for operating characteristics curve.

Soundararajan and Vijayaraghavan (1990) proposed MDS sampling plan which are associated with correspondent single and double sampling plans using the 'operating ratio' as a source for significant the equality of sampling plans. They offered a table for the structure and collection of corresponding sets of single, double and multiple dependent (or deferred) state sampling plans. This plan displayed that the MDS-plan of type MDS-(0, 1) is useful to the situation including inflated or critical testing and has an equivalent operational technique with the chain sampling plan (CHSP-1) of Dodge (1955). An exploration technique is established to regulate the parameters of the MDS-(0,1) plan for identified desires.

Suresh (1993) has proposed procedures to select multiple deferred state plan of type MDS and MDS-1 indexed through producer and consumer quality levels considering filter and incentive effect. He creates the tables for the MDS plan based on the comparative slopes at the points $(P_1, 1 - \alpha)$ and (P_2, β) considering the encouragement properties for the choice of plans.

Balamurli and Jun (2006) suggested the multiple dependent state sampling plan by the variables for the review of normality spread quality individualities. The MDS plan is based on measurement data. The decision of accepting the lot is based on the situations of the proceeding lots. The probability of accepting the lot is derived and the two point approach to defining the plan parameters is pronounced.

Aslam et al. (2010) proposed the multiple dependent state sampling plan for a failure censored life testing when the lifetime follows a weibull distribution with known shape parameter. In this plan the acceptance or rejection of a lot is based not only the sample from that lot, but also on sample results from past lots or from future lots.

Aslam et al. (2011) proposed the multiple dependent state sampling plan with the process loss consideration to deal with the lot condemning problem. They founded the designed parameters of the proposed plan which are satisfying the producer and consumer risks at various acceptance quality level and limiting quality level. They conclude that the proposed plan is more efficient in term of cost.

Aslam et al. (2013) extends the idea of MDS sampling plans to the situation of using process capability index when the quality characteristic of the product follows the normal distribution. They suggest the plan parameters are determined using the optimization process with least values of sample size so that the indicated producer's risk and consumer's risk should be contented simultaneously for the given values of AQL and LQL in terms of fraction defective away from two specification limits. The plan parameters are resolute under symmetric and asymmetric cases of fraction defectives.

Chien and Yen (2014) proposed the variable MDS sampling plan for two- sided specification limits based on the most commonly used capability index. The operating characteristics curve of the proposed plan is derived based on the exact sampling distribution and the plan parameters are resolute by reducing the sample number necessary for review with two limitations indicated by the producer and the consumer. They further proposed the efficiency of observed sampling plan and also related with the existing

variables single sampling plan in terms of sample size necessary for assessment and deliver for the practical claim.

2.2 RESUBMITTED SAMPLING PLAN

Govindaraju and Ganesalingam (1997) developed a resubmitted sampling scheme by attributes and examined the situation where resampling is permitted on lots not accepted on original inspection. It is assumed that during the course of resubmission, the equality of the lot is not improved by sorting or reprocessing.

Chien et al. (2011) develop a sampling inspection pattern by variable created on process performance index for product acceptance purpose, which surveys the condition where resampling is acceptable on lots not established on original inspection. The equation for the plan parameters, the required sample size and the conforming critical value, are consequent created on the exact sampling distribution slightly than an approximation approach that made the decisions more perfect and reliable. Further they estimate the efficiency of the planned variables resubmitted sampling plan and matched it with the current variables single sampling plan.

Liu et al. (2014) develop a resubmitted sampling design by variables survey for adjusting lot fraction nonconforming when the excellence characteristics follows a normal distribution and has two sided specification limits. Further he purposed the plan parameters definite by the classical two point situation on the OC curve, which fulfilled the quality requirements and acceptable risks by the producer and consumer at once. The proposed sampling plan is argued and related with the predictable single sampling plan by variables. The proposed plan also affords the smaller sample size for inspection with the similar safety to the manufacturer and customer specifically when the superiority of the submitted lot is sufficient. Tables for the proposed plan parameters in the different rate desires are delivered for everyday application and explain with an example.

Aslam et al. (2015) presented three repetitive types of sampling plans using the generalized process capability index of multiple characteristics, which include a repetitive sampling plan, a resubmitted sampling plan and a multiple dependent state repetitive sampling plan. The plan parameters of these sampling schemes are determined through the nonlinear optimization solution. The comparison among these proposed plans is made in terms of the average sample number required.

2.3 EXPONENTIAL WEIGHTED MOVING AVERAGE (EWMA) AND REGRESSION ESTIMATOR

Roberts (1959) first introduced the exponentially weighted moving average control scheme. The planned charting procedure depends upon EWMA statistics. The EWMA statistic is determined by the random variable associated to the quality characteristics under interest with the maximum weight with reducing the weight from latest to last statement. The concept of the proposed methodology is related with the indicators based upon simple moving rule. The qualified results of the planned methodology constructed with the EWMA statistic are more consistent and effective for identifying the small shift in the limitations of the procedure.

Aslam et al. (2013) first introduce the EWMA statistic in the area of an acceptance sampling plan. They proposed a sampling plan of variable type where EWMA statistic is used as quality measure which follows the normal distribution. The parameters of the proposed plan are predictable by satisfy the two connected risks with the producer and consumer's risk. They recognized the sampling plan for known and unknown standard deviation of population and plan parameters are estimated. The comparison and detailed study of proposed and existing procedures are provided to illustrate the procedure and working of the plan.

Yen et al. (2014) proposed a new sampling plan using the EWMA statistic based on the yield index is developed for lot sentencing. The proposed plan reflects the quality of the recent lot as well as the earlier lots over the EWMA statistic. The critical value and the ample size of the proposed plan are resolute by considering the acceptance quality level at the producer's risk and the lot tolerance percent defective at the consumer risk. The plan parameters are arranged allowing to the smoothing constant of the EWMA statistic and several groupings of two risks.

Riaz (2008) introduced the concept of using the auxiliary information at the time of estimating the plotting statistic of a control chart. He proposed a control chart which uses a regression type estimator as the plotting statistic to monitor the variability of the process and showed the dominance of his proposed control chart over the well-known Shewart-type control for the same purpose.

Wajeetha (2014) proposed a plan of repetitive sampling plan based on exponential weighted moving average (EWMA) regression estimator as statistic. The proposed plan reflects the quality of the recent lot as well as the earlier lots over the EWMA statistic using regression estimator. The

parameters of the proposed plan are predictable by satisfy the two connected risks with the producer and consumer's risk. They recognized the sampling plan for known and unknown standard deviation of population and plan parameters are estimated. The comparison and detailed study of proposed and existing procedures are provided to illustrate the procedure and working of the plan.

CHAPTER 3

DESIGNING OF AN EWMA MULTIPLE DEPENDENT STATE AND RESUBMITTED SAMPLING PLAN USING REGRESSION ESTIMATOR

In this chapter a plan for Multiple Dependent State (MDS) sampling and resubmitted sampling based on regression estimator is proposed. In section 3.1, the MDS plan is proposed when sigma is known and unknown. In section 3.2 resubmitted plan is proposed when sigma is known and unknown.

In statistics, the regression estimator defines the relation between the dependent variable and independent variable using performances for displaying and exploring variable. Regression analysis estimates the conditional probability of the dependent variable specified the independent variables. The regression estimator is considered to increase the precision by using an auxiliary variable x_i that is correlated with study variable y_i . The correlation between y_i and x_i should be approximately linear and the regression line does not passes through the origin. This proposes an estimate based on linear regression of y_i on x_i .

The linear regression estimate of \bar{Y}

$$\bar{Y} = \bar{y} + b(\bar{X} - \bar{x})$$

where b is an estimate of change in y due to unit change in x .

The exponentially weighted moving average (EWMA) statistic is specified as

$$T_i^* = \lambda \bar{Y} + (1 - \lambda) T_{i-1}^*$$

where i is the sample number and λ is smoothing constant

$$E^* = \frac{USL - T_i^*}{\sigma}. \quad (1)$$

3.1 PROPOSED PLAN OF MDS SAMPLING

Proposed Plan of MDS Sampling using regression estimator is derived in two cases when standard deviation of population (σ) is known and unknown

3.1.1 When Sigma is Known

The proposed MDS sampling plan is as follows when sigma is known.

Step 1. Take a random sample of size n from the lot and calculate the estimator of E^* as

$$E^* = \frac{USL - T_i^*}{\sigma}$$

Step 2. Accept the lot if $E^* \geq k_a$ and reject the lot if $E^* \leq K_r$ ($k_a \geq K_r$), where K_a is acceptance number and K_r is the rejection number.

If $K_r \leq E^* \leq K_a$ then accept the recent lot provided that the proceeding m lot were accepted on the condition that $E^* \geq k_a$ otherwise reject the lot.

The proposed plan is measured by four parameters n, m, k_a and K_r . The operating characteristic (OC) function of the MDS plan is originally derived by (balamurli and jun, 2007). The OC function of the MDS plan based on E^* indicated by $L_p(p)$ represents the lot acceptance probability is specified as

$$L_p(p) = P(E^* \geq k_a) + P\{K_r \leq E^* \leq K_a\} \cdot [P\{E^* \geq K_a\}]^m \quad (2)$$

Let

$$L_p(p) = P_1(p) + P_2(p) \{P_1(p)\}^m \quad (3)$$

Now we can derived the necessary equations for OC functions of the proposed plan.

$$P_1(p) = P(E^* \geq k_a) \quad (4)$$

$$P_1(p) = P\left(\frac{USL - T_i^*}{\sigma} \geq k_a\right)$$

$$P_1(p) = P(T_i^* + \sigma k_a \leq USL)$$

According to Duncan (1986)

$$T_i^* + \sigma k_a \sim N\left(\mu + \sigma k_a, \frac{\lambda}{2-\lambda} \frac{\sigma^2}{n} (1 - \rho^2)\right) \quad (5)$$

$$P_1(p) = P\left(Z \leq \frac{USL - \mu}{\sigma} - \frac{k_a}{1}\right) \frac{1}{\sigma \sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1 - \rho^2)}}$$

$$P_1(p) = \Phi\left(Z_P - k_a \frac{1}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1 - \rho^2)}}\right)$$

$$P_1(p) = \Phi\left(\frac{Z_P - k_a}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1 - \rho^2)}}\right) \quad (6)$$

Let

$$P_2(p) = P(K_r \leq E^* \leq K_a)$$

$$P(K_r \leq E^* \leq K_a) = P(E^* \geq K_r) - P(E^* \geq K_a)$$

$$P_2(p) = P(E^* \geq K_r) - P(E^* \geq K_a) \quad (7)$$

Let

$$P_a(p) = P(E^* \geq K_r)$$

$$P_a(p) = P\left(\frac{USL - T_i^*}{\sigma} \geq k_r\right)$$

$$P_a(p) = P(T_i^* + \sigma k_r \leq USL)$$

According to Duncan (1986)

$$T_i^* + \sigma k_r \sim N\left(\mu + \sigma k_r, \frac{\lambda}{2-\lambda} \frac{\sigma^2}{n} (1 - \rho^2)\right)$$

$$\begin{aligned}
P_a(p) &= P\left(\frac{(T_i^* + \sigma k_r) - (\mu + \sigma k_r)}{\sqrt{\frac{\lambda}{2-\lambda} \frac{\sigma^2}{n} (1-\rho^2)}} \leq \frac{USL - (\mu + \sigma k_r)}{\sqrt{\frac{\lambda}{2-\lambda} \frac{\sigma^2}{n} (1-\rho^2)}}\right) \\
P_a(p) &= P\left(Z \leq \frac{USL - \mu}{\sigma \sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2)}} - \frac{\sigma k_r}{\sigma \sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2)}}\right) \\
P_a(p) &= P\left(Z \leq \frac{USL - \mu}{\sigma} - \frac{k_r}{1}\right) \frac{1}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2)}} \\
P_a(p) &= \Phi\left(Z_p - k_r \frac{1}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2)}}\right) \\
P_a(p) &= \Phi\left(\frac{Z_p - k_r}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2)}}\right) \tag{8}
\end{aligned}$$

$P(E^* \geq K_a)$ is same as Eq (6)

Putting the results of Eq (6) and Eq (8) in Eq (7)

$$P_2(p) = \Phi\left(\frac{Z_p - k_r}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2)}}\right) - \Phi\left(\frac{Z_p - k_a}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2)}}\right)$$

Now Equation (2) is

$$\begin{aligned}
L_p(p) &= P_1(p) + P_2(p) \{P_1(p)\}^m \\
L_p(p) &= \Phi\left(\frac{Z_p - k_a}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2)}}\right) \\
&+ \left\{ \Phi\left(\frac{Z_p - k_r}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2)}}\right) - \Phi\left(\frac{Z_p - k_a}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2)}}\right) \right\} \\
&\left\{ \Phi\left(\frac{Z_p - k_a}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2)}}\right) \right\}^m \tag{9}
\end{aligned}$$

There are two risks are every time exist in acceptance sampling plans. Producers desire the sampling plan which reduce the probability of denying a worthy lot and customers desires to reduce the probability of accepting a bad lot. Let α be the producer's risk and β be the consumer's risk. Also let P_1 point out acceptable quality level (AQL) and P_2 point out limiting quality level (LQL). We will find the plan parameters of the proposed plan such that the OC curve passes through the two points (α, P_1) and (β, P_2) such that the following two adjusted measures is fulfilled.

Minimize n

Subject to

$$L(P_1) = \Phi \left(\frac{Z_{P_1} - k_a}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1 - \rho^2)}} \right) \geq 1 - \alpha \quad (10)$$

$$L(P_2) = \Phi \left(\frac{Z_{P_2} - k_r}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1 - \rho^2)}} \right) \leq \beta \quad (11)$$

As P_1 point out acceptable quality level (AQL) and P_2 point out limiting quality level (LQL). The values of n , m , k_a and k_r are defined for several groupings of AQL and LQL and several values of λ varies from 0.1 to 1.0 and several values of ρ varies from 0 to 1.

3.1.2 When σ is Unknown

In this case, it can be estimated by the sample standard deviation s . We propose the following sampling plan when sigma is unknown.

Step 1. Take a random sample of size n from the lot and calculate the estimator of E^* as

$$E^* = \frac{USL - T_i^*}{s}$$

Step 2. Accept the lot if $E^* \geq k_a$ and reject the lot if $E^* \leq K_r$ ($k_a \geq K_r$), where K_a is acceptance number and K_r is the rejection number.

If $K_r \leq E^* \leq K_a$ then accept the recent lot provided that the proceeding m lot were accepted on the condition that $E^* \geq k_a$ otherwise reject the lot.

$$\bar{Y} = \bar{y} + b(\bar{X} - \bar{x})$$

$$T_i^* = \lambda \bar{Y} + (1 - \lambda) T_{i-1}^*$$

$$E^* = \frac{USL - T_i^*}{s} \quad (12)$$

$$L_p(p) = P(E^* \geq k_a) + P\{K_r \leq E^* \leq K_a\} \cdot [P\{E^* \geq K_a\}]^m$$

Let

$$L_p(p) = P_1(p) + P_2(p) \{P_1(p)\}^m$$

$$P_1(p) = P(E^* \geq k_a)$$

$$P_1(p) = P\left(\frac{USL - T_i^*}{s} \geq k_a\right)$$

$$P_1(p) = P(T_i^* + sk_a \leq USL)$$

According to Duncan (1986)

$$T_i^* + sk_a \sim N(\mu + k_a E(s), \text{var}(T_i^*) + k_a^2 \text{var}(s)) \quad (13)$$

We know that

$$E(s) = c_4 \sigma \text{ and } \text{var}(s) = \sigma^2(1 - c_4^2)$$

where

$$c_4 = \left(\frac{2}{n-1}\right)^{\frac{1}{2}} \Gamma\left(\frac{n}{2}\right) \Gamma\left(\frac{n-1}{2}\right)$$

$$T_i^* + sk_a \sim N\left(\mu + k_a c_4 \sigma, \frac{\lambda}{2-\lambda} \frac{\sigma^2}{n} (1 - \rho^2) + k_a^2 \sigma^2 (1 - c_4^2)\right)$$

Thus the OC function is

$$\begin{aligned}
P_1(p) &= P(E^* \geq k_a) \\
&= \left(\frac{(T_i^* + sk_a) - (\mu + c_4 k_a \sigma)}{\sqrt{\frac{\lambda}{2-\lambda} \frac{\sigma^2}{n} (1-\rho^2) + k_a^2 \sigma^2 (1-c_4^2)}} \leq \frac{USL - (\mu + c_4 k_a \sigma)}{\sqrt{\frac{\lambda}{2-\lambda} \frac{\sigma^2}{n} (1-\rho^2) + k_a^2 \sigma^2 (1-c_4^2)}} \right) \\
P_1(p) &= P \left(\frac{(T_i^* + sk_a) - (\mu + c_4 k_a \sigma)}{\sigma \sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2) + k_a^2 (1-c_4^2)}} \leq \frac{USL - \mu}{\sigma \sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2) + k_a^2 (1-c_4^2)}} - \right. \\
&\quad \left. \frac{c_4 k_a \sigma}{\sigma \sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2) + k_a^2 (1-c_4^2)}} \right) \\
P_1(p) &= P \left(Z \leq \frac{USL - \mu}{\sigma \sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2) + k_a^2 (1-c_4^2)}} - \frac{c_4 k_a \sigma}{\sigma \sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2) + k_a^2 (1-c_4^2)}} \right) \\
P_1(p) &= P \left[Z \leq \left(\frac{USL - \mu}{\sigma} - \frac{c_4 k_a}{1} \right) \frac{1}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2) + k_a^2 (1-c_4^2)}} \right] \\
P_1(p) &= P \left[Z \leq \left(Z_p - \frac{c_4 k_a}{1} \right) \frac{1}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2) + k_a^2 (1-c_4^2)}} \right] \\
P_1(p) &= \Phi \left(\frac{Z_p - c_4 k_a}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2) + k_a^2 (1-c_4^2)}} \right) \tag{14}
\end{aligned}$$

Let

$$\begin{aligned}
P_2(p) &= P(K_r \leq E^* \leq K_a) \\
P(K_r \leq E^* \leq K_a) &= P(E^* \geq K_r) - P(E^* \geq K_a) \\
P_2(p) &= P(E^* \geq K_r) - P(E^* \geq K_a) \tag{15}
\end{aligned}$$

Let

$$P_a(p) = P(E^* \geq K_r)$$

$$P_a(p) = P\left(\frac{USL - T_i^*}{s} \geq k_r\right)$$

$$P_a(p) = P(T_i^* + sk_r \leq USL)$$

According to Duncan (1986)

$$T_i^* + sk_r \sim N(\mu + k_r E(s), var(T_i^*) + k_r^2 var(s))$$

We know that

$$E(s) = c_4 \sigma \text{ and } var(s) = \sigma^2(1 - c_4^2)$$

where

$$c_4 = \left(\frac{2}{n-1}\right)^{\frac{1}{2}} \Gamma \frac{n}{2} \Gamma \frac{n-1}{2}$$

$$T_i^* + sk_r \sim N\left(\mu + k_r c_4 \sigma, \frac{\lambda}{2-\lambda} \frac{\sigma^2}{n} (1 - \rho^2) + k_r^2 \sigma^2 (1 - c_4^2)\right)$$

Thus the OC function is

$$P_a(p) = P(E^* \geq k_r) = P\left(\frac{(T_i^* + sk_r) - (\mu + c_4 k_r \sigma)}{\sqrt{\frac{\lambda}{2-\lambda} \frac{\sigma^2}{n} (1 - \rho^2) + k_r^2 \sigma^2 (1 - c_4^2)}} \leq \frac{USL - (\mu + c_4 k_r \sigma)}{\sqrt{\frac{\lambda}{2-\lambda} \frac{\sigma^2}{n} (1 - \rho^2) + k_r^2 \sigma^2 (1 - c_4^2)}}\right)$$

$$P_a(p) = P\left(\frac{(T_i^* + sk_r) - (\mu + c_4 k_r \sigma)}{\sigma \sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1 - \rho^2) + k_r^2 (1 - c_4^2)}} \leq \frac{USL - \mu}{\sigma \sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1 - \rho^2) + k_r^2 (1 - c_4^2)}} - \frac{c_4 k_r \sigma}{\sigma \sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1 - \rho^2) + k_r^2 (1 - c_4^2)}}\right)$$

$$P_a(p) = P\left(Z \leq \frac{USL - \mu}{\sigma \sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1 - \rho^2) + k_r^2 (1 - c_4^2)}} - \frac{c_4 k_r \sigma}{\sigma \sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1 - \rho^2) + k_r^2 (1 - c_4^2)}}\right)$$

$$P_a(p) = P \left[Z \leq \frac{(Z_P - c_4 k_r)}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2) + k_r^2 (1-c_4^2)}} \right]$$

$$P_a(p) = \Phi \left(\frac{Z_P - c_4 k_r}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2) + k_r^2 (1-c_4^2)}} \right) \quad (16)$$

Putting the values of Eq (14) and Eq (16) in Eq (15)

$$P_2(p) = P(E^* \geq K_r) - P(E^* \geq K_a)$$

$$P_2(p) = \Phi \left(\frac{Z_P - c_4 k_r}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2) + k_r^2 (1-c_4^2)}} \right) - \Phi \left(\frac{Z_P - c_4 k_a}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2) + k_a^2 (1-c_4^2)}} \right)$$

$$L_p(p) = P_1(p) + P_2(p) \{P_1(p)\}^m$$

$$L_p(p) = \Phi \left(\frac{Z_P - c_4 k_a}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2) + k_a^2 (1-c_4^2)}} \right)$$

$$+ \Phi \left\{ \left(\frac{Z_P - c_4 k_r}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2) + k_r^2 (1-c_4^2)}} \right) - \right.$$

$$\left. \Phi \left(\frac{Z_P - c_4 k_a}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2) + k_a^2 (1-c_4^2)}} \right) \right\} \left\{ \Phi \left(\frac{Z_P - c_4 k_a}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2) + k_a^2 (1-c_4^2)}} \right) \right\}^m \quad (17)$$

We will find the plan parameters when sigma is unknown using the following two adjusted measures is fulfilled.

Minimize n

Subject to

$$L(P_1) = \Phi \left(\frac{Z_{P_1} - c_4 k_a}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2) + k_a^2 (1-c_4^2)}} \right) \geq 1 - \alpha \quad (18)$$

$$L(P_2) = \Phi \left(\frac{Z_{P_2} - c_4 k_r}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2) + k_r^2 (1-c_4^2)}} \right) \leq \beta \quad (19)$$

As P_1 point out acceptable quality level (AQL) and P_2 point out limiting quality level (LQL). The values of n , m , k_a and k_r are defined for several groupings of AQL and LQL and several values of λ range from 0.1 to 1.0 and several values of ρ range from 0 to 1.

3.2 PROPOSED RESUBMITTED SAMPLING PLAN USING REGRESSION ESTIMATOR

Proposed Plan of EWMA resubmitted Sampling using regression estimator is derived in two cases when standard deviation of population (sigma) is known and unknown.

3.2.1 When Sigma is Known

We proposed the following resubmitted sampling plan using regression estimator:

Step 1: draw a random sample of size n from a submitted lot and calculate E^* using r characteristics. Accept the lot if $E^* \geq k_a$

Step 2: If the lot is rejected then apply step 1 m times and reject the lot at the m th resubmission if the lot is not accepted at $(m-1)^{st}$ resubmission.

The proposed plan is based on the three parameters n , m and k_a . The OC function of the plan is as follows:

$$L(p) = 1 - (1 - P_1)^m \quad (20)$$

$$P_2(p) = P(E^* \geq k_a)$$

As derive in equation (4)

$$P_2(p) = \Phi \left(\frac{Z_P - k_a}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2)}} \right)$$

$$L(p) = 1 - \left(1 - \Phi \left(\frac{Z_p - k_a}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1 - \rho^2)}} \right) \right)^m \quad (21)$$

ASN for the resubmitted plan is as follows:

$$ASN(E^*) = \frac{n(1-(1-P_2)^m)}{P_2} \quad (22)$$

$$ASN(E^*) = \frac{n \left(1 - \left(1 - \Phi \left(\frac{Z_{P_2} - k_a}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1 - \rho^2)}} \right) \right)^m \right)}{\Phi \left(\frac{Z_{P_2} - k_a}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1 - \rho^2)}} \right)} \quad (23)$$

We will find the plan parameters when sigma is known using the following two adjusted measures is fulfilled.

Minimize n

Subject to

$$L(P_1) = 1 - \left(1 - \Phi \left(\frac{Z_{P_1} - k_a}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1 - \rho^2)}} \right) \right)^m \geq 1 - \alpha \quad (24)$$

$$L(P_2) = 1 - \left(1 - \Phi \left(\frac{Z_{P_2} - k_a}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1 - \rho^2)}} \right) \right)^m \leq \beta \quad (25)$$

As P_1 point out acceptable quality level (AQL) and P_2 point out limiting quality level (LQL).

3.2.2 When Sigma is Unknown

In this case, it can be estimated by the sample standard deviation s . We propose the following sampling plan when sigma is unknown.

Step 1: draw a random sample of size n from a submitted lot and calculate E^* using r characteristics. Accept the lot if $E^* \geq k_a$

Step 2: If the lot is rejected then apply step 1 m times and reject the lot at the m th resubmission if the lot is not accepted at $(m - 1)^{st}$ resubmission.

The proposed plan is based on the three parameters n , m and k_a . The OC function of the plan is as follows:

$$L(p) = 1 - (1 - P_1)^m$$

$$P_1(p) = P(E^* \geq k_a)$$

As derive in equation (4)

$$L(p) = 1 - \left(1 - \Phi \left(\frac{Z_{p-c_4} k_a}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2) + k_a^2 (1-c_4^2)}} \right) \right)^m \quad (26)$$

ASN for the resubmitted plan is as follows:

$$ASN(E^*) = \frac{n(1-(1-P_2)^m)}{P_2} \quad (27)$$

$$ASN(E^*) = \frac{n \left(1 - \left(1 - \Phi \left(\frac{Z_{P_2-c_4} k_a}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2) + k_a^2 (1-c_4^2)}} \right) \right)^m \right)}{\Phi \left(\frac{Z_{P_2-c_4} k_a}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2) + k_a^2 (1-c_4^2)}} \right)} \quad (28)$$

We will find the plan parameters when sigma is known using the following two adjusted measures is fulfilled.

Minimize n

Subject to

$$P_1(p) = 1 - \left(1 - \Phi \left(\frac{Z_{P_1 - c_4} k_a}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2) + k_a^2 (1-c_4^2)}} \right) \right)^m \geq 1-\alpha \quad (29)$$

$$P_2(p) = 1 - \left(1 - \Phi \left(\frac{Z_{P_2 - c_4} k_a}{\sqrt{\frac{\lambda}{2-\lambda} \frac{1}{n} (1-\rho^2) + k_a^2 (1-c_4^2)}} \right) \right)^m \leq \beta \quad (30)$$

As P_1 point out acceptable quality level (AQL) and P_2 point out limiting quality level (LQL).

CHAPTER 4

RESULTS AND DISCUSSIONS

In this chapter, we discuss the results of the tables which have been made by the proposed plan using the program generated by *R* language. Section 4.1 represents the output of different values of λ with range from 0.1 to 1.0 and ρ which contains the values 0.25 to 0.95 with interval of 0.25 when sigma is known. Similarly Section 4.2 represents the output of different values of λ with range from 0.1 to 1.0 and ρ which contains the values 0.25 to 0.95 with interval of 0.25 when sigma is unknown. Section 4.3 represents the output of the resubmitted plan with λ with 0.1 to 0.2 and ρ which contains the values 0.25 to 0.75 with interval of 0.25 when sigma is known. Section 4.4 represents the output of the resubmitted plan with λ with 0.1 to 0.2 and ρ which contains the values 0.25 to 0.75 with interval of 0.25 when sigma is unknown. Section 4.5 represents the output of the comparison of MDS sampling plan with $\lambda = 0.1$ and $\rho = 0.25$ and $\rho = 0.50$ when sigma is known and unknown. Section 4.6 represents the output of the comparison of resubmitted plan with $m = 1$, and $m = 3, \lambda = 0.1, \rho = 0.25$ and $\rho = 0.50$ when sigma is known and unknown. Section 4.7 represents the output of the comparison of MDS sampling plan with resubmitted plan with $\lambda = 0.1$ and $\rho = 0.25$ when sigma is known and unknown.

Following tables have been created by using the proposed MDS plan using regression estimator. To check the effectiveness of the proposed MDS plan, the values of n , m , k_a and K_r are calculated when sigma is known and unknown. We will observe the behavior of n , m , k_a and K_r due to change in different values of λ and ρ . Interpretation of the tables is given at the end of the every five tables with values of λ range from 0.1 to 1.0 and value of ρ

Similarly the next following tables have been created by using the proposed resubmitted sampling plan using regression estimator. To check the effectiveness of the proposed resubmitted sampling plan, the values of n , k_a and ASN are calculated when sigma is known and unknown with values of m from 1 to 3. We will observe the behavior of n , k_a and ASN due to change in different values of m , λ and ρ . Interpretation of the tables is given at the end of the every two tables with values of λ 0.1 to 0.2, value of ρ and different values of m .

4.1 RESULTS FOR THE PLAN PARAMETERS FOR PROPOSED MDS PLAN WHEN σ IS KNOWN

Table 4.1.1

Plan parameters for proposed MDS plan when σ is known with $\rho = 0.25$

		$\lambda = 0.1$				$\lambda = 0.2$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	6	2	2.9995	0.3320	13	2	2.9972	2.8245
	0.003	3	2	2.9407	2.4982	5	2	2.9401	0.5456
	0.004	2	6	2.8865	0.7162	3	2	2.9058	1.6805
	0.006	2	5	2.8160	1.5617	2	4	2.8214	1.6365
	0.008	2	3	2.7892	0.8412	2	3	2.7804	1.9869
	0.010	2	2	2.8040	2.0527	2	5	2.6528	0.6189
	0.015	2	2	2.3807	0.8922	2	7	2.5136	1.0509
	0.020	2	4	2.5062	2.2058	2	2	2.7406	1.0187
0.0025	0.005	5	2	2.7092	2.4942	11	2	2.7122	0.9047
	0.010	2	10	2.5883	0.6940	3	3	2.5982	0.7896
	0.015	2	3	2.4899	2.0876	2	5	2.4933	1.4924
	0.020	2	5	2.3190	1.0002	2	10	2.3679	0.8764
	0.025	2	9	2.1825	0.8788	2	10	2.3243	1.1739
	0.030	2	3	2.1281	1.5657	2	5	2.4234	2.2011
	0.050	2	5	1.8611	0.6671	2	5	1.9948	0.5244
0.005	0.010	5	3	2.4564	0.5685	10	2	2.4705	0.7951
	0.015	2	5	2.3809	1.8316	4	3	2.3819	1.6339
	0.020	2	9	2.3200	1.0024	3	4	2.3343	1.4146
	0.030	2	4	2.2088	1.1908	2	6	2.1779	0.2175
	0.040	2	4	2.0387	1.3546	2	5	2.1559	0.7319
	0.050	2	4	1.9434	0.9025	2	10	1.9452	1.3059
	0.100	2	3	2.0731	0.1659	2	7	2.2132	1.3479
0.01	0.020	4	3	2.1992	0.3965	8	2	2.2128	1.3038
	0.030	2	3	2.0886	0.0459	3	2	2.1330	0.9052
	0.040	2	6	2.0335	1.9447	2	3	2.0514	0.1836
	0.050	2	2	2.1202	0.4414	2	6	1.9746	1.8041
	0.100	2	4	1.8828	0.9729	2	6	1.7436	1.2236
	0.150	2	10	1.7324	0.5713	2	9	1.5874	0.6454
	0.200	2	3	1.5981	0.6257	2	2	1.4640	0.6815
0.03	0.060	3	2	1.7546	0.7373	6	2	1.7323	0.7241
	0.090	2	6	1.6405	0.4290	2	2	1.6539	0.3187
	0.120	2	2	1.5323	0.2496	2	6	1.5266	0.3253
	0.150	2	6	1.4805	1.1859	2	2	1.5733	0.9546
	0.300	2	5	1.6015	0.9860	2	6	1.0906	0.0749
0.05	0.100	2	2	1.4908	0.1182	5	2	1.4751	0.9861
	0.150	2	5	1.2629	0.6008	2	2	1.4021	0.7699
	0.200	2	2	1.4219	0.8097	2	6	1.2301	0.7928
	0.250	2	4	1.3117	0.4794	2	7	1.2522	0.2873
	0.500	2	7	0.9960	0.8950	2	9	0.4449	0.2472

Table 4.1.2

Plan parameters for proposed MDS plan when σ is known with $\rho = 0.25$

		$\lambda = 0.3$				$\lambda = 0.4$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	21	2	3.0006	0.9692	28	2	2.9991	2.8100
	0.003	8	2	2.9500	1.5136	11	2	2.9416	2.5327
	0.004	5	2	2.9086	2.4952	7	2	2.8988	0.8042
	0.006	3	3	2.8292	1.0984	4	2	2.8470	1.9359
	0.008	2	2	2.8064	1.1685	3	2	2.8169	0.0668
	0.010	2	6	2.7172	0.2231	3	2	2.7454	2.4336
	0.015	2	9	2.6855	2.1367	2	6	2.6190	2.3558
	0.020	2	7	2.5030	1.0480	2	6	2.5406	2.2649
0.0025	0.005	17	2	2.7095	2.4916	24	2	2.7099	1.1216
	0.010	4	2	2.5981	0.3645	6	2	2.5936	1.3339
	0.015	3	7	2.4851	2.0064	4	5	2.4878	2.3171
	0.020	2	2	2.4813	0.4466	3	5	2.4642	0.5782
	0.025	2	2	2.4264	0.6695	2	3	2.4195	0.2354
	0.030	2	2	2.2690	1.4827	2	3	2.3879	1.2307
	0.050	2	10	2.3958	1.0716	2	4	2.1088	0.3304
0.005	0.010	15	2	2.4727	0.0808	21	2	2.4686	0.2727
	0.015	6	2	2.3953	0.4536	8	2	2.3987	1.4700
	0.020	4	2	2.3545	0.3881	5	3	2.3388	0.8614
	0.030	2	2	2.2770	1.0947	3	3	2.2472	1.2416
	0.040	2	3	2.2383	1.8917	2	2	2.2279	0.1873
	0.050	2	2	2.2069	1.0871	2	7	2.0869	1.4179
	0.100	2	8	1.6502	0.9025	2	9	1.7594	0.6755
0.01	0.020	13	3	2.2006	1.9003	17	2	2.2102	0.5045
	0.030	5	2	2.1473	0.4056	7	2	2.1250	0.6607
	0.040	3	2	2.0628	1.7257	4	2	2.0813	1.3842
	0.050	2	2	2.0388	0.0566	3	3	2.0114	0.6386
	0.100	2	4	1.6782	1.1488	2	3	1.7223	1.0379
	0.150	2	6	1.9155	0.0104	2	3	1.5127	0.6451
	0.200	2	2	1.2254	0.7356	2	3	1.3251	0.9115
0.03	0.060	9	2	1.7373	1.0032	12	2	1.7434	0.9713
	0.090	4	3	1.6536	1.2746	5	2	1.6548	0.5362
	0.120	2	3	1.5463	0.1329	3	4	1.5511	0.7106
	0.150	2	2	1.4449	0.2554	2	3	1.5031	0.4731
	0.300	2	4	0.9186	0.4350	2	4	1.2353	0.4672
0.05	0.100	7	2	1.4895	0.1711	10	2	1.4858	0.5073
	0.150	3	2	1.4013	0.0601	4	2	1.3674	0.0707
	0.200	2	4	1.2940	0.8167	2	2	1.3038	0.1012
	0.250	2	4	1.2546	0.7572	2	3	1.1765	0.3145
	0.500	2	3	0.9450	0.2514	2	9	0.4409	0.1518

Table 4.1.3

Plan parameters for proposed MDS plan when σ is known with $\rho = 0.25$

		$\lambda = 0.5$				$\lambda = 0.6$				
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r	
0.001	0.002	39	2	3.0030	1.7859	48	2	2.9996	2.6111	
	0.003	15	2	2.9416	2.6713	19	2	2.9460	1.1100	
	0.004	9	2	2.9033	1.1106	12	2	2.9080	0.6984	
	0.006	6	2	2.8334	0.8960	7	2	2.8479	0.8729	
	0.008	4	3	2.7829	1.5802	5	2	2.8038	1.1971	
	0.010	3	2	2.7666	1.2417	4	2	2.7516	1.1026	
	0.015	2	2	2.7038	0.9269	3	3	2.6864	0.7571	
	0.020	2	5	2.6076	1.2544	3	4	2.5340	0.1731	
	0.0025	0.005	33	2	2.7070	0.7241	40	2	2.7090	0.1681
		0.010	8	2	2.6081	0.5492	10	2	2.5942	0.4308
0.015		5	3	2.5094	1.1931	6	2	2.5296	0.6539	
0.020		3	2	2.4844	0.1626	4	2	2.4892	0.4589	
0.025		3	3	2.4402	0.5709	3	2	2.4475	0.8534	
0.030		2	2	2.4111	1.6661	3	3	2.3777	0.1953	
0.050		2	4	2.2681	1.1611	2	3	2.2959	0.9229	
0.005		0.010	28	2	2.4725	1.3496	36	2	2.4712	1.7155
		0.015	11	3	2.3909	0.2869	13	2	2.4035	1.1030
		0.020	7	3	2.3390	1.4685	8	2	2.3532	1.1421
	0.030	4	2	2.2642	1.8320	5	2	2.2794	1.9144	
	0.040	3	2	2.2242	1.3145	4	4	2.2051	0.2339	
	0.050	2	2	2.1665	1.4713	3	3	2.1314	0.0097	
	0.100	2	6	1.8367	0.0908	2	8	1.9081	0.8929	
	0.01	0.020	23	2	2.2127	1.7158	29	2	2.2101	1.3470
		0.030	9	2	2.1375	0.5823	12	2	2.1317	1.1066
		0.040	6	2	2.0698	1.3617	7	3	2.0659	0.6073
0.050		4	2	2.0270	0.1450	5	3	2.0130	0.2416	
0.100		2	3	1.8819	0.4420	2	2	1.8716	1.2118	
0.150		2	6	1.6983	1.2957	2	2	1.7532	1.2719	
0.200		2	7	1.5437	1.1939	2	2	1.4516	0.4368	
0.03		0.060	16	2	1.7447	0.1964	21	2	1.7425	0.6250
		0.090	6	2	1.6451	0.0745	8	2	1.6461	0.4378
		0.120	4	3	1.5575	1.1865	5	2	1.6037	0.0632
	0.150	3	3	1.4577	0.2649	3	2	1.5229	0.1277	
	0.300	2	6	1.2553	0.6906	2	10	1.1635	0.4033	
0.05	0.100	13	2	1.4925	0.4168	17	2	1.4912	0.4609	
	0.150	5	2	1.3960	0.6103	6	2	1.3900	0.3897	
	0.200	3	2	1.2957	0.1070	4	3	1.2701	0.0080	
	0.250	2	2	1.2383	0.4723	3	4	1.1754	0.0909	
	0.500	2	10	0.5349	0.1605	2	6	0.5837	0.5429	

Table 4.1.4

Plan parameters for proposed MDS plan when σ is known with $\rho = 0.25$

		$\lambda = 0.7$				$\lambda = 0.8$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	60	2	3.0009	0.8784	76	2	3.0004	2.5942
	0.003	23	2	2.9457	0.5204	29	2	2.9429	2.3197
	0.004	14	2	2.9046	2.3275	18	2	2.9007	1.4366
	0.006	9	2	2.8583	1.7382	11	2	2.8480	0.8407
	0.008	6	2	2.8060	0.0326	8	2	2.7892	1.7595
	0.010	5	2	2.7486	1.6836	6	2	2.7575	1.9021
	0.015	4	3	2.6527	1.6424	4	2	2.7009	1.5481
	0.020	3	2	2.6024	0.3567	4	4	2.6253	0.0862
0.0025	0.005	51	2	2.7079	0.3431	65	2	2.7110	2.2019
	0.010	12	2	2.6032	2.0927	16	2	2.5898	0.7330
	0.015	7	2	2.5397	0.6273	9	2	2.5275	0.6333
	0.020	5	2	2.4781	0.4206	6	2	2.4886	0.1403
	0.025	4	2	2.4427	0.1796	5	2	2.4587	0.5384
	0.030	4	2	2.4171	0.7261	4	2	2.4138	0.5019
	0.050	2	2	2.3029	1.5228	3	3	2.3085	0.6687
0.005	0.010	45	2	2.4725	0.5965	54	2	2.4700	0.3378
	0.015	17	2	2.4004	2.0410	21	2	2.4032	0.5358
	0.020	10	2	2.3529	1.3963	13	2	2.3533	1.5918
	0.030	6	2	2.2826	1.5104	7	2	2.2809	1.6796
	0.040	4	2	2.2227	1.2070	5	2	2.2306	0.0578
	0.050	4	6	2.1141	0.2093	4	2	2.1762	1.4748
	0.100	2	2	1.9988	0.9378	2	2	2.0273	0.0846
0.01	0.020	37	2	2.2119	0.0135	46	2	2.2124	1.3458
	0.030	14	2	2.1413	0.2261	17	2	2.1368	1.1355
	0.040	9	2	2.0845	1.4680	11	2	2.0738	0.9881
	0.050	6	2	2.0365	0.5797	8	2	2.0332	1.3469
	0.100	3	2	1.8206	1.2266	4	5	1.7949	0.5935
	0.150	2	2	1.8155	0.7054	3	3	1.7960	1.2989
	0.200	2	3	1.6363	0.3469	2	9	1.5591	0.8888
0.03	0.060	26	2	1.7412	0.2744	32	2	1.7434	1.4315
	0.090	10	2	1.6519	0.2787	12	2	1.6548	0.0180
	0.120	6	3	1.5559	0.9282	7	2	1.5780	0.8494
	0.150	4	2	1.5181	0.9943	5	2	1.5128	0.6326
	0.300	2	9	1.1865	0.3480	2	3	1.2648	0.0283
0.05	0.100	22	2	1.4916	0.2723	26	2	1.4895	1.2309
	0.150	8	2	1.3741	0.2643	9	2	1.3871	0.8096
	0.200	5	2	1.2827	0.3321	6	2	1.2897	0.2851
	0.250	3	2	1.2375	0.1178	4	2	1.2102	0.2639
	0.500	2	7	0.6817	0.6314	2	6	0.7993	0.0436

Table 4.1.5
Plan parameters for proposed MDS plan when σ is known with $\rho = 0.25$

		$\lambda = 0.9$				$\lambda = 1.0$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	91	2	3.0002	2.1072	111	2	3.0005	1.3760
	0.003	35	2	2.9453	2.2631	43	2	2.9442	2.6620
	0.004	22	2	2.9006	0.0811	26	2	2.9050	1.5761
	0.006	13	2	2.8428	0.2569	15	2	2.8443	1.6173
	0.008	9	2	2.7978	0.9706	11	2	2.7976	0.1547
	0.010	7	2	2.7668	0.0209	9	2	2.7624	1.5069
	0.015	5	2	2.6854	2.1569	6	2	2.7009	1.4087
	0.020	4	2	2.6320	1.6278	5	2	2.6297	0.6893
0.0025	0.005	78	2	2.7070	2.4919	95	2	2.7097	1.3605
	0.010	18	2	2.6038	1.2733	22	2	2.6024	0.0683
	0.015	11	2	2.5369	0.9015	13	2	2.5436	0.6282
	0.020	8	3	2.4598	2.0288	9	2	2.4846	1.2006
	0.025	6	2	2.4356	1.9960	7	2	2.4491	0.6062
	0.030	5	2	2.4036	0.7286	6	2	2.4097	0.1677
	0.050	4	2	2.3175	0.8365	4	2	2.3038	0.3624
0.005	0.010	67	2	2.4685	0.7957	80	2	2.4702	1.7686
	0.015	25	2	2.4026	1.4088	31	2	2.4037	1.8110
	0.020	16	2	2.3623	0.6621	19	2	2.3517	0.3749
	0.030	9	3	2.2574	0.7742	11	2	2.2900	1.5533
	0.040	7	3	2.2090	1.5839	8	2	2.2304	0.8148
	0.050	5	2	2.1729	0.4025	6	2	2.1779	1.5606
	0.100	3	3	2.0201	0.6533	3	2	2.0288	0.1582
0.01	0.020	55	2	2.2106	1.5707	68	2	2.2108	1.3611
	0.030	21	2	2.1374	1.7710	26	2	2.1348	1.1750
	0.040	13	2	2.0793	0.9593	16	2	2.0767	1.1355
	0.050	9	2	2.0345	0.9032	11	2	2.0348	0.5962
	0.100	4	2	1.8970	0.8056	5	2	1.8968	1.0123
	0.150	3	2	1.7822	1.1625	3	2	1.7735	0.5759
	0.200	2	2	1.6512	0.9476	3	4	1.6015	0.5542
0.03	0.060	39	2	1.7412	1.2502	47	2	1.7415	1.4556
	0.090	15	2	1.6469	0.0072	18	2	1.6530	0.0600
	0.120	9	2	1.5897	0.4872	11	3	1.5576	0.2978
	0.150	6	2	1.5257	0.8736	7	2	1.5229	0.1107
	0.300	3	2	1.2700	0.7934	3	3	1.2698	0.0382
0.05	0.100	31	2	1.4903	0.5308	38	2	1.4902	0.9496
	0.150	11	2	1.3864	0.7743	14	2	1.3888	0.5368
	0.200	7	2	1.2865	0.3630	8	2	1.2953	0.2786
	0.250	5	2	1.2045	0.7557	6	2	1.2079	0.4301
	0.500	2	4	0.8293	0.1475	2	2	0.8961	0.0676

4.1.1 Interpretation of the Table 4.1.1 – 4.1.5

These tables contains the computed values of n , m , k_a and K_r when sigma is known with ρ is 0.25 and λ ranging from 0.1 to 1.0 and various values of risk probabilities (P_1 and P_2). Table 4.1.1 contains the $\lambda = 0.1$ and $\lambda = 0.2$, Table 4.1.2 contains the $\lambda = 0.3$ and $\lambda = 0.4$, Table 4.1.3 contains the $\lambda = 0.5$ and $\lambda = 0.6$, Table 4.1.4 contains the $\lambda = 0.7$ and $\lambda = 0.8$ and Table 4.1.5 contains the $\lambda = 0.9$ and $\lambda = 1.0$ with same value of ρ at ρ is 0.25.

In Table 4.1.1, We note that for the same value of P_1 , as the P_2 changes from 0.002 to 0.020. When $P_1 = 0.001$ and $P_2 = 0.002$, the values of $n = 6$, $m = 2$, $k_a = 2.9995$ and $K_r = 0.3320$ at $\lambda = 0.1$. As the value of $P_2 = 0.020$, the values of $n = 2$, $m = 4$, $k_a = 2.5062$ and $K_r = 2.5258$. So, it conclude that for the same value of P_1 , the sample size n decreases as P_2 increases at ρ is 0.25.

As $\lambda = 0.2$, the values of $n = 13$, $m = 2$, $k_a = 2.9972$ and $K_r = 2.8245$. Now we see all Tables 4.1.2 to 4.1.5, when $P_1 = 0.001$ and $P_2 = 0.002$, the values of n increases and k_a decrease and the value of m start mostly 2. Similarly at $\lambda = 0.3$, the values of $n = 21$, $m = 2$, $k_a = 3.006$ and $K_r = 0.9692$ and at $\lambda = 0.4$, the values of $n = 28$, $m = 2$, $k_a = 2.9991$ and $K_r = 2.8100$. Similarly when $\lambda = 0.9$, the values of $n = 91$, $m = 2$, $k_a = 3.0002$ and $K_r = 2.1072$ and at $\lambda = 1.0$, the values of $n = 111$, $m = 2$, $k_a = 3.0005$ and $K_r = 1.3760$. So we conclude that keeping $P_1 = 0.001$ and $P_2 = 0.002$ constant as the value of λ increases then the value of n increases and the value of k_a decreases at ρ is 0.25.

Table 4.1.6
Plan parameters for proposed MDS plan when σ is known with $\rho = 0.50$

		$\lambda = 0.1$				$\lambda = 0.2$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	5	3	2.9932	1.4904	10	2	2.9998	1.5991
	0.003	2	2	2.9514	0.0424	4	2	2.9404	1.4270
	0.004	2	4	2.8466	2.2305	3	2	2.8802	0.2053
	0.006	2	2	2.7489	0.0573	2	2	2.8613	1.5651
	0.008	2	8	2.5984	1.7722	2	4	2.7820	0.9380
	0.010	2	3	2.5219	2.1846	2	5	2.8303	0.8724
	0.015	2	4	2.5114	2.2993	2	10	2.6542	1.6361
	0.020	2	9	2.5120	2.4833	2	10	2.3897	1.4756
0.0025	0.005	4	2	2.7094	0.5880	9	3	2.7023	1.4500
	0.010	2	7	2.5255	2.3381	2	2	2.6032	2.1949
	0.015	2	8	2.6142	0.9205	2	4	2.4662	1.0840
	0.020	2	2	2.6299	2.2438	2	7	2.3207	0.5214
	0.025	2	7	2.1592	0.1182	2	8	2.2564	1.0843
	0.030	2	4	2.1250	1.2726	2	5	2.1688	0.5027
	0.050	2	5	2.1212	1.8837	2	4	2.5407	1.3297
0.005	0.010	4	2	2.4737	1.6953	8	2	2.4637	0.9495
	0.015	2	8	2.3756	1.0701	3	2	2.4116	0.7592
	0.020	2	8	2.3524	0.2465	2	5	2.3268	1.4350
	0.030	2	2	2.2577	1.3225	2	5	2.2662	0.3720
	0.040	2	10	2.0326	1.4497	2	4	2.2414	2.0293
	0.050	2	10	1.8521	0.6324	2	10	2.0741	1.1812
	0.100	2	8	1.7232	1.6066	2	6	2.0680	1.9620
0.01	0.020	3	2	2.2069	0.5795	7	3	2.1986	2.0042
	0.030	2	6	2.1190	1.4730	3	3	2.1365	1.5100
	0.040	2	3	2.0099	0.8406	2	5	2.0266	0.1036
	0.050	2	5	1.9504	0.1019	2	2	1.9913	0.0847
	0.100	2	3	1.8490	0.5188	2	5	1.8556	0.3033
	0.150	2	10	1.6749	0.1977	2	2	1.8724	1.6729
	0.200	2	5	2.0933	1.6793	2	8	1.1442	1.0086
0.03	0.060	2	2	1.7429	0.6094	5	2	1.7330	0.0067
	0.090	2	5	1.6479	1.0549	2	7	1.6151	0.7237
	0.120	2	7	1.5314	0.0276	2	3	1.4636	1.2736
	0.150	2	4	1.4774	0.7128	2	7	1.3071	0.4368
	0.300	2	10	1.6777	0.7840	2	4	1.3070	0.7202
0.05	0.100	2	2	1.4763	1.3190	4	3	1.4726	0.2521
	0.150	2	2	1.4372	0.4319	2	2	1.3642	1.0113
	0.200	2	10	1.3504	0.2981	2	5	1.2828	0.9212
	0.250	2	5	1.2541	0.6303	2	8	1.0935	0.2535
	0.500	2	2	0.6431	0.3447	2	4	0.9018	0.8916

Table 4.1.7

Plan parameters for proposed MDS plan when σ is known with $\rho = 0.50$

		$\lambda = 0.3$				$\lambda = 0.4$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	16	2	2.9989	2.2661	23	2	3.0012	0.0645
	0.003	6	2	2.9449	1.4777	9	2	2.9420	0.2447
	0.004	4	2	2.8994	1.7501	6	2	2.8988	2.6790
	0.006	3	5	2.8223	0.5481	3	2	2.8439	1.9980
	0.008	2	2	2.8110	1.7000	3	2	2.8013	2.1491
	0.010	2	5	2.7281	2.0883	2	2	2.7444	1.1466
	0.015	2	7	2.6177	2.5098	2	4	2.6557	1.6431
	0.020	2	7	2.6527	1.4126	2	9	2.4681	0.8202
0.0025	0.005	14	2	2.7069	1.6423	19	2	2.7087	0.7789
	0.010	4	4	2.5737	1.8893	5	3	2.5856	1.4185
	0.015	2	2	2.5492	0.9765	3	5	2.4957	2.1471
	0.020	2	6	2.4378	0.3425	2	2	2.4950	0.5557
	0.025	2	6	2.4618	0.7105	2	6	2.4174	0.1099
	0.030	2	9	2.2843	1.6714	2	7	2.3319	0.1666
	0.050	2	6	2.2230	1.1124	2	5	2.1515	0.8754
0.005	0.010	12	2	2.4665	0.7682	17	2	2.4684	0.6157
	0.015	5	2	2.3869	0.6627	7	2	2.3981	0.9524
	0.020	3	2	2.3671	1.6454	4	2	2.3432	0.3444
	0.030	2	5	2.2258	0.9162	3	4	2.2364	1.7325
	0.040	2	10	2.1376	1.3635	2	4	2.1454	0.4909
	0.050	2	7	2.1010	0.8495	2	5	2.0493	1.8134
	0.100	2	7	1.9082	0.5686	2	2	1.8847	0.0463
0.01	0.020	10	2	2.2072	0.2532	14	2	2.2133	0.4518
	0.030	4	3	2.1159	0.6642	6	3	2.1087	1.3025
	0.040	3	2	2.0511	0.5092	3	2	2.0827	0.8373
	0.050	2	2	2.0063	1.1757	3	2	2.0690	0.8012
	0.100	2	3	1.8132	1.5532	2	6	1.7637	1.0578
	0.150	2	6	1.5428	0.5317	2	3	1.9499	1.1606
	0.200	2	2	1.3805	1.2221	2	8	1.8462	1.5596
0.03	0.060	7	2	1.7424	1.5178	10	2	1.7471	1.2771
	0.090	3	3	1.6435	1.2144	4	4	1.6268	0.9437
	0.120	2	4	1.5546	0.5230	3	2	1.5348	0.4583
	0.150	2	6	1.3876	0.3044	2	4	1.4665	0.3819
	0.300	2	9	0.8817	0.7302	2	2	1.2486	0.5135
0.05	0.100	6	3	1.4749	1.1097	8	2	1.4873	0.8474
	0.150	2	2	1.3790	0.6595	3	3	1.3612	0.0628
	0.200	2	2	1.2936	0.2207	2	5	1.2470	0.1446
	0.250	2	4	1.2227	0.8969	2	6	1.1827	1.0559
	0.500	2	5	1.1194	0.7115	2	7	1.1233	0.1876

Table 4.1.8

Plan parameters for proposed MDS plan when σ is known with $\rho = 0.50$

		$\lambda = 0.5$				$\lambda = 0.6$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	31	2	3.0011	1.0274	38	2	3.0002	2.4449
	0.003	12	2	2.9452	0.0654	15	2	2.9421	0.5416
	0.004	7	2	2.9034	1.6361	9	2	2.9043	0.6436
	0.006	4	2	2.8461	1.2369	6	2	2.8504	1.1409
	0.008	3	2	2.7938	1.3718	4	2	2.8022	0.2399
	0.010	3	2	2.7124	1.2843	3	2	2.7635	0.5089
	0.015	2	5	2.6390	0.1587	3	9	2.6225	1.5243
0.0025	0.020	2	3	2.5438	1.4541	2	4	2.5748	1.0925
	0.005	25	2	2.7092	0.8700	33	2	2.7100	0.3998
	0.010	6	2	2.6058	1.7383	8	2	2.6050	1.9750
	0.015	4	2	2.5443	1.0192	5	3	2.5221	1.1836
	0.020	3	5	2.4317	1.3310	4	3	2.4371	0.6249
	0.025	2	3	2.4198	1.5287	3	5	2.3880	0.9545
	0.030	2	5	2.3639	0.6571	2	2	2.4133	0.3745
0.005	0.050	2	10	2.2055	0.4619	2	4	2.2674	1.2509
	0.010	22	2	2.4702	0.2631	28	2	2.4693	0.0857
	0.015	9	2	2.4020	1.2205	11	2	2.4091	0.3763
	0.020	5	2	2.3574	1.4178	7	3	2.3399	1.7575
	0.030	3	2	2.2767	1.8957	4	2	2.2647	0.3969
	0.040	2	2	2.2291	0.7784	3	2	2.2004	1.5940
	0.050	2	2	2.1436	0.2144	2	2	2.1813	1.2129
0.01	0.100	2	5	1.7488	1.2211	2	2	1.9340	0.3561
	0.020	18	2	2.2116	1.2101	23	2	2.2109	1.4908
	0.030	7	2	2.1398	0.5296	9	2	2.1338	0.8660
	0.040	5	5	2.0537	0.3872	6	2	2.0768	0.6948
	0.050	3	2	2.0287	1.4158	4	2	2.0203	1.6415
	0.100	2	5	1.8040	1.3572	2	5	1.7979	0.9819
	0.150	2	9	1.5542	1.0689	2	4	1.5520	0.2040
0.03	0.200	2	3	1.8968	1.2519	2	5	1.6674	1.1119
	0.060	13	2	1.7431	0.7678	17	2	1.7457	0.0367
	0.090	5	3	1.6298	1.1875	6	2	1.6550	0.5938
	0.120	3	2	1.5840	0.8445	4	3	1.5436	0.6096
	0.150	2	2	1.5276	0.2499	3	5	1.4656	0.5577
0.05	0.300	2	5	1.1161	0.0718	2	10	1.2955	0.5551
	0.100	11	2	1.4840	0.9068	13	2	1.4883	1.1929
	0.150	4	3	1.3606	1.0228	5	2	1.3881	0.4325
	0.200	3	3	1.3118	0.3578	3	3	1.2885	0.3790
	0.250	2	10	1.1364	0.4163	2	2	1.2442	0.3276
	0.500	2	2	1.0936	0.0061	2	10	0.7452	0.0654

Table 4.1.9

Plan parameters for proposed MDS plan when σ is known with $\rho = 0.50$

		$\lambda = 0.7$				$\lambda = 0.8$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	48	2	3.0007	1.5545	60	2	3.0002	1.1323
	0.003	19	2	2.9477	1.5598	23	2	2.9458	2.6237
	0.004	12	2	2.9059	1.0290	14	2	2.9056	2.4011
	0.006	7	2	2.8299	2.4556	8	2	2.8458	0.1004
	0.008	5	2	2.8069	1.6727	6	2	2.8007	0.7471
	0.010	4	2	2.7526	1.3585	5	2	2.7501	1.9267
	0.015	3	2	2.7067	0.4291	4	4	2.6397	0.8308
	0.020	2	2	2.6506	1.1084	3	3	2.6260	0.3848
	0.0025	0.005	41	2	2.7093	0.2806	50	2	2.7087
0.010		10	2	2.6008	2.0951	12	2	2.6008	1.0139
0.015		6	2	2.5237	1.3070	7	2	2.5350	1.6353
0.020		4	2	2.4819	1.9360	5	2	2.4836	1.5308
0.025		3	2	2.4485	1.1036	4	2	2.4470	1.1166
0.030		3	3	2.3536	1.6910	4	3	2.4204	0.9354
0.050		2	4	2.2560	0.3124	2	2	2.3083	0.7149
0.005	0.010	35	2	2.4696	1.9017	43	2	2.4697	1.4439
	0.015	14	2	2.4021	1.9820	17	2	2.4027	1.2300
	0.020	8	2	2.3488	1.9490	10	2	2.3540	0.0152
	0.030	5	2	2.2637	1.9615	6	2	2.2663	0.4291
	0.040	4	5	2.1633	1.6682	4	2	2.2267	1.5801
	0.050	3	2	2.2015	0.3341	4	2	2.1735	1.1401
	0.100	2	6	1.9824	1.5548	2	3	2.0134	0.1064
	0.01	0.020	29	2	2.2111	0.9803	36	2	2.2103
0.030		11	2	2.1372	0.7433	14	2	2.1378	0.9914
0.040		7	2	2.0851	1.2721	8	2	2.0823	1.2184
0.050		5	2	2.0472	0.6316	6	2	2.0345	0.6866
0.100		2	2	1.8817	0.0901	3	4	1.8117	0.1548
0.150		2	6	1.7122	0.5721	2	5	1.6939	0.2885
0.200		2	2	1.5673	0.0092	2	10	1.6096	0.6742
0.03		0.060	21	2	1.7396	1.4618	26	2	1.7403
	0.090	8	2	1.6436	1.0385	10	2	1.6442	0.8138
	0.120	5	2	1.5436	1.2671	6	2	1.5926	0.4873
	0.150	3	2	1.5210	0.7554	4	2	1.5322	0.7934
	0.300	2	6	1.2738	0.1963	2	3	1.1672	0.9086
0.05	0.100	17	2	1.4901	0.7183	21	2	1.4864	0.9593
	0.150	6	2	1.3816	0.7681	8	2	1.3999	0.1121
	0.200	4	2	1.3320	0.5831	5	3	1.2654	0.7168
	0.250	3	2	1.2407	0.1228	3	2	1.2172	0.5381
	0.500	2	2	0.7416	0.2999	2	3	0.8586	0.3664

Table 4.1.10

Plan parameters for proposed MDS plan when σ is known with $\rho = 0.50$

		$\lambda = 0.9$				$\lambda = 1.0$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	74	2	3.0011	1.6721	90	2	2.9999	1.3083
	0.003	28	2	2.9446	0.3991	35	2	2.9461	1.4118
	0.004	17	2	2.9049	1.6789	21	2	2.9038	2.0792
	0.006	10	2	2.8424	0.3777	12	2	2.8454	2.2506
	0.008	8	3	2.7801	0.4820	9	2	2.8023	1.4363
	0.010	6	2	2.7647	0.4874	7	2	2.7706	0.6081
	0.015	4	2	2.7050	0.6912	5	2	2.6874	1.4375
	0.020	4	3	2.6499	2.1253	4	3	2.6172	1.3235
0.0025	0.005	61	2	2.7091	0.0132	75	2	2.7093	1.4460
	0.010	15	2	2.6083	0.2878	18	2	2.6054	2.1437
	0.015	9	3	2.5147	0.1017	10	2	2.5306	1.9807
	0.020	6	2	2.4902	0.3072	8	2	2.4871	0.9335
	0.025	5	2	2.4434	1.9481	6	2	2.4349	0.2941
	0.030	4	2	2.4219	1.6282	5	2	2.3904	1.6676
	0.050	3	2	2.2331	1.7841	3	2	2.3088	0.5060
0.005	0.010	53	2	2.4698	0.5936	65	2	2.4702	1.5526
	0.015	20	2	2.4031	0.8251	25	2	2.4016	0.3689
	0.020	12	2	2.3547	1.3373	15	2	2.3507	1.4021
	0.030	7	2	2.2834	1.2862	9	2	2.2823	1.2580
	0.040	5	2	2.2211	0.8891	6	2	2.2224	0.3449
	0.050	4	2	2.1877	0.5940	5	2	2.1894	0.3279
	0.100	2	2	2.0175	0.6183	3	3	1.9483	0.3385
0.01	0.020	45	2	2.2126	0.1108	54	2	2.2113	0.3751
	0.030	17	2	2.1330	1.0033	21	2	2.1359	0.8587
	0.040	10	2	2.0806	1.1713	12	2	2.0826	0.5633
	0.050	7	2	2.0353	1.4525	9	2	2.0414	1.2607
	0.100	3	2	1.8856	0.1047	4	2	1.8676	0.3094
	0.150	2	2	1.7675	0.8534	3	2	1.7088	1.4118
	0.200	2	4	1.6666	0.4956	2	2	1.6613	0.1962
0.03	0.060	31	2	1.7410	1.3562	39	2	1.7399	0.5669
	0.090	12	2	1.6448	1.1483	14	2	1.6517	0.0830
	0.120	7	2	1.5600	1.2219	8	2	1.5811	0.8832
	0.150	5	2	1.5214	0.5711	6	2	1.5347	0.1777
	0.300	2	2	1.2552	0.6415	3	2	1.1817	0.2764
0.05	0.100	25	2	1.4895	0.2767	31	2	1.4885	0.8964
	0.150	9	2	1.3891	0.7839	11	2	1.3876	0.3262
	0.200	6	4	1.2650	0.5497	7	2	1.3026	0.6931
	0.250	4	2	1.2174	0.4314	5	2	1.2033	0.1218
	0.500	2	4	0.8928	0.3402	2	3	0.8679	0.2427

4.1.2 Interpretation of the Table 4.1.6 – 4.1.10

These tables contains the computed values of n , m , k_a and K_r when sigma is known with ρ is 0.50 and λ ranging from 0.1 to 1.0 and various values of risk probabilities (P_1 and P_2). Table 4.1.6 contains the $\lambda = 0.1$ and $\lambda = 0.2$, Table 4.1.7 contains the $\lambda = 0.3$ and $\lambda = 0.4$, Table 4.1.8 contains the $\lambda = 0.5$ and $\lambda = 0.6$, Table 4.1.9 contains the $\lambda = 0.7$ and $\lambda = 0.8$ and Table 4.1.10 contains the $\lambda = 0.9$ and $\lambda = 1.0$ with same value of ρ which is 0.50.

In Table 4.1.6, We note that for the same value of P_1 , as the P_2 changes from 0.002 to 0.020. When $P_1 = 0.001$ and $P_2 = 0.002$, the values of $n = 5$, $m = 3$, $k_a = 2.9932$ and $K_r = 1.4904$ at $\lambda = 0.1$ As the value of $P_2 = 0.020$, the values of $n = 2$, $m = 9$, $k_a = 2.5120$ and $K_r = 2.4833$. So, it conclude that for the same value of P_1 , the sample size n decreases as P_2 increases at ρ is 0.50.

As $\lambda = 0.2$, the values of $n = 10$, $m = 2$, $k_a = 2.9998$ and $K_r = 1.5991$. Now we see all Tables 4.1.2 to 4.1.5, when $P_1 = 0.001$ and $P_2 = 0.002$, the values of n increases and k_a decrease and the value of m start mostly 2. Similarly at $\lambda = 0.3$, the values of $n = 16$, $m = 2$, $k_a = 2.9989$ and $K_r = 2.2661$ and at $\lambda = 0.4$, the values of $n = 23$, $m = 2$, $k_a = 3.0012$ and $K_r = 0.0645$. Similarly when $\lambda = 0.9$, the values of $n = 74$, $m = 2$, $k_a = 3.0011$ and $K_r = 1.7621$ and at $\lambda = 1.0$, the values of $n = 90$, $m = 2$, $k_a = 2.9999$ and $K_r = 1.3083$. So we conclude that keeping $P_1 = 0.001$ and $P_2 = 0.002$ constant as the value of λ increases then the value of n increases and the value of k_a decreases at ρ is 0.50.

Table 4.1.11
Plan parameters for proposed MDS plan when σ is known with $\rho = 0.75$

		$\lambda = 0.1$				$\lambda = 0.2$				
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r	
0.001	0.002	3	2	3.0012	2.5725	6	2	2.9991	2.5372	
	0.003	2	3	2.9266	0.2315	3	5	2.9233	0.9297	
	0.004	2	8	2.8248	1.2866	2	8	2.8599	1.9729	
	0.006	2	6	2.9471	0.0043	2	8	2.8399	2.8111	
	0.008	2	6	2.6257	0.3289	2	3	2.6190	1.8952	
	0.010	2	2	2.6735	1.2082	2	2	2.6967	0.5741	
	0.015	2	2	2.9808	0.9935	2	6	2.5239	2.1266	
	0.020	2	10	2.2057	1.7197	2	2	2.4552	1.2368	
	0.002 5	0.005	3	3	2.7021	0.9377	5	2	2.7096	0.4119
0.010		2	8	2.4956	0.7389	2	6	2.5566	1.1137	
0.015		2	2	2.4100	0.0210	2	3	2.5835	1.6846	
0.020		2	8	2.4220	0.3586	2	6	2.5218	0.7699	
0.025		2	8	2.4383	2.3571	2	8	2.3939	1.5494	
0.030		2	8	2.4908	2.1032	2	8	2.2033	1.8185	
0.050		2	3	2.0816	1.5517	2	9	2.1019	1.7226	
0.005		0.010	2	2	2.4697	2.0984	5	3	2.4605	2.2884
		0.015	2	7	2.3573	0.2637	2	5	2.3837	1.1113
	0.020	2	10	2.2131	1.3295	2	5	2.3540	1.2846	
	0.030	2	5	2.1591	1.3232	2	10	2.1541	1.1996	
	0.040	2	2	2.4186	0.3945	2	2	2.2543	0.5997	
	0.050	2	3	2.2843	1.8919	2	6	1.9082	1.0208	
	0.100	2	5	1.6768	1.3874	2	10	2.1789	0.1020	
	0.01	0.020	2	4	2.1988	1.1708	4	2	2.2161	1.7959
		0.030	2	5	2.0923	0.6626	2	7	2.1124	1.1587
0.040		2	2	1.9455	1.2823	2	8	2.0564	1.3742	
0.050		2	7	1.8308	0.6994	2	7	2.0443	1.0198	
0.100		2	8	1.9655	0.8274	2	6	1.6294	0.0472	
0.150		2	6	1.5375	0.9871	2	6	2.0933	0.8519	
0.200		2	4	1.3978	0.4558	2	8	1.1072	0.8666	
0.03		0.060	2	7	1.7372	0.5088	3	5	1.7212	0.5069
		0.090	2	7	1.5681	0.3516	2	3	1.7086	0.6342
	0.120	2	2	1.6234	1.0146	2	2	1.4316	1.3303	
	0.150	2	8	1.7295	1.4957	2	5	1.5236	1.2638	
	0.300	2	6	1.6261	0.2455	2	3	1.4754	0.4626	
	0.05	0.100	2	9	1.4394	0.7117	2	2	1.4903	0.1355
0.150		2	7	1.3215	0.4233	2	7	1.2594	0.2906	
0.200		2	4	1.2802	0.9717	2	2	1.1428	1.1255	
0.250		2	4	1.0709	0.9153	2	2	1.3796	0.0334	
0.500		2	4	0.4439	0.0108	2	2	1.4392	1.1714	

Table 4.1.12

Plan parameters for proposed MDS plan when σ is known with $\rho = 0.75$

		$\lambda = 0.3$				$\lambda = 0.4$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	10	2	3.0031	0.6419	14	2	3.0029	2.8461
	0.003	4	3	2.9267	1.0740	5	2	2.9446	0.1277
	0.004	3	4	2.8746	1.0596	4	4	2.8765	1.9553
	0.006	2	7	2.7834	1.1392	2	2	2.8262	1.7827
	0.008	2	4	2.8548	2.6197	2	7	2.7613	0.9958
	0.010	2	9	2.7767	1.6901	2	10	2.7044	0.5461
	0.015	2	9	2.7199	1.8532	2	5	2.6132	1.0014
	0.020	2	5	2.6329	1.8135	2	5	2.7512	1.4779
0.0025	0.005	8	2	2.7110	0.0141	11	2	2.7092	2.3360
	0.010	2	3	2.5867	1.8040	3	3	2.5737	0.0301
	0.015	2	9	2.4748	2.2337	2	8	2.4725	1.1409
	0.020	2	7	2.3520	0.8827	2	8	2.4224	1.9850
	0.025	2	10	2.3606	1.4627	2	6	2.3873	2.3217
	0.030	2	5	2.3756	1.1436	2	5	2.3850	1.2650
	0.050	2	8	2.1642	2.1514	2	3	2.5310	0.6303
0.005	0.010	7	2	2.4735	2.0690	10	2	2.4715	1.8521
	0.015	3	3	2.3835	1.5524	4	2	2.4120	2.0325
	0.020	2	2	2.3786	0.6325	3	6	2.3102	1.5560
	0.030	2	5	2.2741	1.7389	2	5	2.1912	1.8057
	0.040	2	3	2.3594	1.3976	2	3	2.3177	0.0876
	0.050	2	4	2.0878	1.4470	2	10	2.2547	0.7280
	0.100	2	5	2.0775	0.8427	2	4	2.1332	1.6922
0.01	0.020	6	3	2.2021	0.7528	8	2	2.2098	1.8195
	0.030	3	3	2.1354	0.8354	3	2	2.1385	1.6498
	0.040	2	9	2.0155	1.0351	2	2	2.0808	1.6997
	0.050	2	3	2.0869	0.0482	2	7	1.9879	0.8647
	0.100	2	2	1.7622	0.7923	2	3	2.0259	1.4193
	0.150	2	9	1.4141	0.1330	2	6	1.9344	0.8106
	0.200	2	4	1.4505	0.0237	2	2	1.3209	0.7338
0.03	0.060	4	2	1.7405	0.4834	6	2	1.7455	0.6291
	0.090	2	4	1.6276	1.4568	2	2	1.6518	0.7583
	0.120	2	7	1.5831	0.1654	2	3	1.5278	1.3527
	0.150	2	9	1.3803	1.0239	2	4	1.6015	0.1259
	0.300	2	10	1.3016	1.0226	2	3	0.9357	0.6902
0.05	0.100	4	3	1.4904	0.6448	5	4	1.4715	0.3976
	0.150	2	5	1.2943	1.2057	2	5	1.3429	0.1398
	0.200	2	4	1.3059	0.2453	2	5	1.1920	1.1363
	0.250	2	7	1.0011	0.3265	2	2	1.0806	0.5963
	0.500	2	10	1.0572	0.7889	2	8	0.7791	0.1934

Table 4.1.13

Plan parameters for proposed MDS plan when σ is known with $\rho = 0.75$

		$\lambda = 0.5$				$\lambda = 0.6$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	18	2	3.0023	1.8747	23	2	3.0015	1.9879
	0.003	7	2	2.9450	2.0230	9	2	2.9443	0.4263
	0.004	5	5	2.8823	1.3941	6	2	2.9103	1.0406
	0.006	3	4	2.8138	0.1067	3	2	2.8449	2.0799
	0.008	2	3	2.7932	0.0295	3	3	2.7592	2.5244
	0.010	2	10	2.7137	1.5152	2	3	2.7203	1.6554
	0.015	2	9	2.6904	0.7683	2	4	2.5734	2.0438
	0.020	2	9	2.4569	0.2584	2	10	2.5744	1.7564
0.0025	0.005	15	2	2.7070	0.1541	19	2	2.7099	1.5234
	0.010	4	3	2.5818	0.3928	5	4	2.5794	1.9916
	0.015	2	2	2.5415	0.7025	3	3	2.5063	2.0885
	0.020	2	9	2.4166	0.8646	2	2	2.4772	1.7931
	0.025	2	5	2.3094	1.5273	2	4	2.3889	0.5625
	0.030	2	7	2.2315	0.3375	2	8	2.3942	1.0199
	0.050	2	8	2.2101	2.1353	2	6	2.1758	0.0718
0.005	0.010	13	2	2.4699	2.0882	17	2	2.4679	1.7866
	0.015	5	2	2.4015	1.8359	7	3	2.3837	1.1334
	0.020	3	2	2.3553	1.1790	4	2	2.3538	1.4674
	0.030	2	3	2.2550	1.9152	3	4	2.2759	1.3126
	0.040	2	6	2.1287	1.5803	2	4	2.1447	1.7130
	0.050	2	4	2.0365	1.0706	2	7	2.0550	0.4163
	0.100	2	4	2.1782	0.3925	2	7	2.0136	0.3634
0.01	0.020	11	2	2.2140	1.0651	14	2	2.2121	1.5159
	0.030	4	2	2.1399	1.1727	6	4	2.1128	0.9185
	0.040	3	3	2.0443	0.9980	4	3	2.0444	0.6484
	0.050	2	2	2.0491	0.9115	3	5	1.9870	1.5227
	0.100	2	2	1.6678	0.7986	2	7	1.7982	1.2597
	0.150	2	9	1.4909	1.4520	2	6	1.8321	1.6875
	0.200	2	3	1.5818	1.0416	2	8	1.5529	1.0096
0.03	0.060	8	2	1.7468	1.0463	10	2	1.7416	0.4925
	0.090	3	2	1.6488	0.5512	4	2	1.6356	0.8805
	0.120	2	4	1.5327	0.4798	2	2	1.5815	0.3854
	0.150	2	6	1.3995	0.0560	2	2	1.5295	0.9680
	0.300	2	2	0.9482	0.0280	2	5	1.1102	0.1020
0.05	0.100	6	2	1.4914	1.1923	8	2	1.4914	0.8055
	0.150	3	8	1.3466	0.7543	3	2	1.3820	0.8184
	0.200	2	9	1.1889	0.6315	2	8	1.2370	0.4559
	0.250	2	6	1.2725	0.9308	2	4	1.1329	0.8652
	0.500	2	4	0.8222	0.1799	2	4	0.3941	0.2089

Table 4.1.14

Plan parameters for proposed MDS plan when σ is known with $\rho = 0.75$

		$\lambda = 0.7$				$\lambda = 0.8$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	29	2	2.9985	1.0228	36	2	2.9999	1.5709
	0.003	11	2	2.9463	0.7238	14	2	2.9435	0.3479
	0.004	7	2	2.9092	0.9962	9	2	2.9148	1.4630
	0.006	4	2	2.8373	1.6660	5	2	2.8338	2.1035
	0.008	3	3	2.7770	1.8456	4	3	2.7721	0.3834
	0.010	3	3	2.7594	1.9183	3	2	2.7776	0.4881
	0.015	2	6	2.6310	1.4744	2	3	2.6710	1.1532
	0.020	2	4	2.6408	1.9155	2	2	2.6883	1.7900
0.0025	0.005	24	2	2.7088	1.0432	29	2	2.7092	2.3956
	0.010	6	3	2.5842	1.5046	7	2	2.6067	0.4579
	0.015	4	6	2.4987	0.8132	4	2	2.5383	0.8804
	0.020	3	2	2.4932	0.6433	3	2	2.4945	1.0358
	0.025	2	2	2.4658	0.5224	3	4	2.3930	0.6251
	0.030	2	4	2.3729	0.6579	2	2	2.3873	1.7524
	0.050	2	3	2.3810	1.8880	2	9	2.1355	1.8687
0.005	0.010	21	2	2.4674	2.2543	25	2	2.4701	0.5980
	0.015	8	2	2.4061	2.0746	10	2	2.4041	1.5999
	0.020	5	3	2.3382	0.2553	6	2	2.3500	1.8003
	0.030	3	2	2.2646	1.8207	4	2	2.2493	1.8796
	0.040	2	2	2.2391	1.0889	3	2	2.2084	0.7562
	0.050	2	3	2.1455	0.9106	2	3	2.1369	1.1917
	0.100	2	2	2.0852	1.0604	2	7	1.9399	1.0098
0.01	0.020	18	2	2.2079	0.4775	22	2	2.2140	0.9953
	0.030	7	3	2.1267	1.5660	8	2	2.1347	0.1834
	0.040	4	2	2.0796	1.2861	5	2	2.0768	0.1298
	0.050	3	2	2.0239	1.6159	4	2	2.0086	0.3995
	0.100	2	6	1.7292	1.5474	2	5	1.7716	1.0176
	0.150	2	9	1.5961	0.8890	2	7	1.6379	1.1712
	0.200	2	2	1.3285	0.3161	2	2	1.4190	0.2755
0.03	0.060	12	2	1.7409	1.0486	15	2	1.7410	1.4968
	0.090	5	3	1.6276	1.0473	6	3	1.6331	0.5370
	0.120	3	3	1.5531	0.8512	4	6	1.5378	0.6216
	0.150	2	3	1.4906	0.9895	3	5	1.4880	0.9037
	0.300	2	10	1.2391	0.9913	2	2	1.1348	0.4710
0.05	0.100	10	2	1.4857	0.2686	12	2	1.4912	0.1203
	0.150	4	2	1.3694	0.0342	5	3	1.3665	1.0252
	0.200	2	2	1.3070	0.0538	3	2	1.3405	0.0136
	0.250	2	3	1.1956	0.6748	2	4	1.1756	0.0692
	0.500	2	7	1.1167	0.3879	2	5	1.0035	0.4225

Table 4.1.15

Plan parameters for proposed MDS plan when σ is known with $\rho = 0.75$

		$\lambda = 0.9$				$\lambda = 1.0$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	45	2	3.0009	1.8323	53	2	3.0009	2.7530
	0.003	17	2	2.9434	1.6030	21	2	2.9475	1.6917
	0.004	10	2	2.9052	2.2894	13	3	2.8884	2.5515
	0.006	6	2	2.8432	1.3978	7	2	2.8444	2.1742
	0.008	5	2	2.7901	1.1179	6	2	2.7860	1.9948
	0.010	4	2	2.7959	1.5711	5	3	2.7558	0.5278
	0.015	3	3	2.6804	0.5886	3	2	2.7097	0.0399
	0.020	2	2	2.6449	1.9939	3	2	2.6894	0.4171
0.0025	0.005	37	2	2.7089	0.7772	45	2	2.7085	0.8683
	0.010	9	3	2.5843	2.1644	10	2	2.6027	2.0798
	0.015	5	2	2.5355	1.6632	6	2	2.5434	0.0925
	0.020	4	4	2.4561	1.1802	5	2	2.4838	1.0251
	0.025	3	2	2.4267	1.3077	4	2	2.4181	1.6068
	0.030	3	10	2.3255	0.9496	3	3	2.3827	1.1649
	0.050	2	2	2.2867	1.6932	2	3	2.2454	1.7119
0.005	0.010	31	2	2.4708	1.4219	38	2	2.4695	2.1538
	0.015	12	2	2.4031	0.5665	15	2	2.4057	1.4961
	0.020	7	2	2.3548	1.4619	9	2	2.3484	0.5650
	0.030	4	2	2.2788	0.5966	5	2	2.2707	1.8897
	0.040	3	2	2.2287	0.5432	4	2	2.2294	0.0119
	0.050	3	6	2.1169	1.0244	3	2	2.1934	0.0576
	0.100	2	9	1.8276	0.4169	2	10	1.9081	0.7391
0.01	0.020	27	2	2.2104	1.6407	32	2	2.2091	0.6806
	0.030	10	2	2.1417	1.6125	12	2	2.1394	1.0542
	0.040	6	2	2.0840	0.7505	8	2	2.0974	0.1130
	0.050	5	2	2.0488	0.2083	6	4	2.0122	1.3579
	0.100	2	3	1.8436	0.9371	3	8	1.7741	1.2340
	0.150	2	2	1.6676	1.5628	2	3	1.6976	1.3577
	0.200	2	4	1.4038	1.0612	2	4	1.6458	1.4667
0.03	0.060	19	2	1.7448	0.4449	22	2	1.7421	0.1833
	0.090	7	2	1.6431	0.9723	9	2	1.6553	0.955
	0.120	4	2	1.5787	0.6760	5	2	1.5682	0.4627
	0.150	3	3	1.5019	0.2034	4	5	1.4768	0.7601
	0.300	2	3	1.3981	0.6030	2	4	1.1275	0.6646
0.05	0.100	15	2	1.4900	1.1401	18	2	1.4905	0.4787
	0.150	6	3	1.3730	0.1358	7	2	1.3850	0.1343
	0.200	3	2	1.3019	0.4670	4	2	1.3136	0.6861
	0.250	3	6	1.1196	0.9963	3	2	1.2229	0.7967
	0.500	2	6	0.8350	0.2652	2	5	0.6233	0.2778

4.1.3 Interpretation of the Table 4.1.11 – 4.1.15

These tables contains the computed values of n , m , k_a and K_r when sigma is known with ρ is 0.75 and λ ranging from 0.1 to 1.0 and various values of risk probabilities(P_1 and P_2). Table 4.1.11 contains the $\lambda = 0.1$ and $\lambda = 0.2$, Table 4.1.12 contains the $\lambda = 0.3$ and $\lambda = 0.4$, Table 4.1.13 contains the $\lambda = 0.5$ and $\lambda = 0.6$, Table 4.1.14 contains the $\lambda = 0.7$ and $\lambda = 0.8$ and Table 4.1.15 contains the $\lambda = 0.9$ and $\lambda = 1.0$ with same value of ρ which is 0.75.

In Table 4.1.11, We note that for the same value of P_1 , as the P_2 changes from 0.002 to 0.020. When $P_1 = 0.001$ and $P_2 = 0.002$, the values of $n = 3$, $m = 2$, $k_a = 3.0012$ and $K_r = 2.5725$ at $\lambda = 0.1$. As the value of $P_2 = 0.020$, the values of $n = 2$, $m = 10$, $k_a = 2.6735$ and $K_r = 1.2082$. So, it conclude that for the same value of P_1 , the sample size n decreases as P_2 increases at ρ is 0.75.

As $\lambda = 0.2$, the values of $n = 6$, $m = 2$, $k_a = 2.9991$ and $K_r = 2.5372$. Now we see all Tables 4.1.12 to 4.1.15, when $P_1 = 0.001$ and $P_2 = 0.002$, the values of n increases and k_a decrease and the value of m start mostly 2. Similarly at $\lambda = 0.3$, the values of $n = 10$, $m = 2$, $k_a = 3.0031$ and $K_r = 0.6419$ and at $\lambda = 0.4$, the values of $n = 14$, $m = 2$, $k_a = 3.0029$ and $K_r = 2.8461$. Similarly when $\lambda = 0.9$, the values of $n = 45$, $m = 2$, $k_a = 3.0009$ and $K_r = 1.8323$ and at $\lambda = 1.0$, the values of $n = 53$, $m = 2$, $k_a = 3.0009$ and $K_r = 2.7530$. So we conclude that keeping $P_1 = 0.001$ and $P_2 = 0.002$ constant as the value of λ increases then the value of n increases and the value of k_a decreases at ρ is 0.75.

Table 4.1.16

Plan parameters for proposed MDS plan when σ is known with $\rho = 0.95$

		$\lambda = 0.1$				$\lambda = 0.2$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	2	2	3.0299	1.7909	2	8	2.9888	2.2141
	0.003	2	4	2.9165	2.5924	2	7	2.9168	0.6736
	0.004	2	3	2.8107	2.0158	2	8	2.8750	2.5009
	0.006	2	4	2.7151	1.4156	2	9	2.9626	2.7342
	0.008	2	6	3.0066	1.6680	2	9	2.6731	0.7901
	0.010	2	3	2.6712	0.4452	2	8	2.6141	1.1499
	0.015	2	5	2.5768	0.4339	2	2	2.3583	1.1854
	0.020	2	8	2.9148	0.9905	2	6	2.4804	1.9025
0.0025	0.005	2	8	2.7368	1.3549	2	2	2.6806	2.6765
	0.010	2	4	2.7438	0.5162	2	10	2.6770	1.3667
	0.015	2	7	2.4574	0.2487	2	7	2.6194	0.6330
	0.020	2	4	2.5982	0.1126	2	5	2.3999	0.7545
	0.025	2	7	2.3055	0.3095	2	9	2.3981	1.5394
	0.030	2	3	2.6523	2.1503	2	8	2.3874	0.2465
	0.050	2	4	2.0190	1.9182	2	10	2.0618	0.9677
0.005	0.010	2	7	2.3981	2.1930	2	10	2.4543	1.3716
	0.015	2	2	2.4121	1.2639	2	5	2.2718	0.6007
	0.020	2	9	2.3811	1.9670	2	3	2.1601	0.6029
	0.030	2	4	2.0575	0.5852	2	8	2.2934	1.4234
	0.040	2	7	2.1397	0.5595	2	7	1.9253	1.0663
	0.050	2	9	2.1047	1.4705	2	10	2.0101	0.0646
	0.100	2	10	1.4513	0.5996	2	8	2.3861	0.9831
0.01	0.020	2	4	2.1665	0.7944	2	3	2.1711	0.7974
	0.030	2	6	2.0418	0.1733	2	6	2.1916	0.7456
	0.040	2	5	2.0732	0.9424	2	4	1.9503	1.2760
	0.050	2	5	1.8842	0.4284	2	4	2.0658	0.9708
	0.100	2	2	2.2738	1.8613	2	8	1.7619	0.0735
	0.150	2	4	1.4091	0.5580	2	3	2.1705	1.4364
	0.200	2	8	1.7725	0.6103	2	10	1.9497	0.6192
0.03	0.060	2	10	1.8020	0.4875	2	4	1.6987	1.2640
	0.090	2	9	1.8097	1.2125	2	3	1.6229	0.1065
	0.120	2	5	1.6625	1.0757	2	10	1.7771	0.3849
	0.150	2	5	1.1423	0.7215	2	5	1.2533	0.7074
	0.300	2	4	1.2843	0.4770	2	10	1.4618	0.1180
0.05	0.100	2	5	1.4099	1.1645	2	4	1.4741	0.7531
	0.150	2	5	1.4870	0.8901	2	10	1.5050	0.6971
	0.200	2	5	1.0145	0.8235	2	6	1.3886	0.1612
	0.250	2	4	0.8450	0.5872	2	4	1.5552	0.7291
	0.500	2	7	1.5468	0.8350	2	3	0.8032	0.2340

Table 4.1.17

Plan parameters for proposed MDS plan when σ is known with $\rho = 0.95$

		$\lambda = 0.3$				$\lambda = 0.4$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	3	3	3.0041	1.7802	3	2	3.0022	0.8481
	0.003	2	8	2.8675	1.4182	2	8	2.8923	1.4420
	0.004	2	9	2.8887	0.3305	2	6	2.8274	2.5122
	0.006	2	10	2.7849	0.4536	2	6	2.6938	0.1339
	0.008	2	10	2.8554	0.7356	2	6	2.6194	2.1109
	0.010	2	9	2.7552	1.7581	2	9	2.7901	2.3461
	0.015	2	6	2.5537	1.7298	2	4	2.4847	2.4502
	0.020	2	3	2.2145	0.5255	2	6	2.4009	1.7577
0.0025	0.005	2	4	2.6974	0.0993	3	2	2.7106	0.9709
	0.010	2	2	2.6768	0.9021	2	6	2.6231	1.3862
	0.015	2	9	2.5543	2.1708	2	7	2.3348	0.2489
	0.020	2	4	2.2848	0.1674	2	7	2.3956	2.3844
	0.025	2	2	2.4546	0.3531	2	2	2.3293	0.3403
	0.030	2	7	2.2690	0.9013	2	3	2.2152	1.4008
	0.050	2	9	2.1606	0.5208	2	2	2.1451	2.0921
0.005	0.010	2	10	2.4482	0.2714	3	9	2.4495	0.1708
	0.015	2	2	2.3083	1.3078	2	9	2.3672	0.4157
	0.020	2	6	2.3448	1.1605	2	5	2.3986	1.7013
	0.030	2	10	2.1304	1.1737	2	5	2.0340	0.7277
	0.040	2	9	1.9811	1.6204	2	10	2.2584	1.5095
	0.050	2	4	2.1927	1.6441	2	8	2.2925	0.8535
	0.100	2	9	1.7768	1.4208	2	3	1.6039	1.0739
0.01	0.020	2	4	2.2128	1.8641	2	2	2.2177	1.8691
	0.030	2	10	2.0735	0.9585	2	3	2.1986	1.7796
	0.040	2	3	2.0435	1.0244	2	3	2.0199	0.6663
	0.050	2	2	1.8131	1.7763	2	2	1.9255	1.0620
	0.100	2	2	2.0931	0.1726	2	5	2.0064	1.5847
	0.150	2	2	2.0409	1.7749	2	7	2.1632	0.6967
	0.200	2	7	2.1235	0.6027	2	10	1.9875	1.6275
0.03	0.060	2	8	1.7458	0.2246	2	10	1.7107	1.1825
	0.090	2	9	1.4958	0.6667	2	9	1.4985	1.3417
	0.120	2	3	1.5780	1.3989	2	3	1.4070	0.0103
	0.150	2	3	1.7725	0.8283	2	10	1.4694	0.2422
	0.300	2	10	0.6720	0.4049	2	2	1.3023	1.1695
0.05	0.100	2	3	1.4313	1.1884	2	3	1.4683	1.4622
	0.150	2	3	1.2833	0.5583	2	2	1.5247	0.5388
	0.200	2	10	1.3919	0.9670	2	2	1.4226	0.6668
	0.250	2	4	1.4885	1.0170	2	7	1.1824	0.5657
	0.500	2	10	0.7992	0.3765	2	4	1.4281	1.3567

Table 4.1.18

Plan parameters for proposed MDS plan when σ is known with $\rho = 0.95$

		$\lambda = 0.5$				$\lambda = 0.6$				
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r	
0.001	0.002	4	2	2.9999	2.5171	5	2	3.0005	2.1737	
	0.003	2	4	2.9381	1.9320	2	2	2.9432	2.7133	
	0.004	2	8	2.8185	0.9652	2	6	2.8567	0.9166	
	0.006	2	7	2.8172	0.2666	2	10	2.7365	2.0916	
	0.008	2	10	2.9064	1.3173	2	8	2.6041	1.6963	
	0.010	2	8	2.5424	0.7486	2	8	2.5470	1.0448	
	0.015	2	4	2.7137	1.7378	2	6	2.6717	1.9593	
	0.020	2	10	2.9143	2.4497	2	10	2.3486	1.1964	
0.0025	0.005	4	3	2.6936	2.3281	5	4	2.6954	1.3659	
	0.010	2	8	2.5714	0.0571	2	9	2.5216	2.0219	
	0.015	2	7	2.3510	0.6016	2	4	2.4237	1.9223	
	0.020	2	9	2.4052	1.6539	2	6	2.3428	1.8916	
	0.025	2	8	2.6037	0.1707	2	9	2.1855	0.3812	
	0.030	2	2	2.6579	1.3192	2	7	2.4221	2.1988	
	0.050	2	9	2.4959	1.1637	2	10	2.3895	1.9818	
	0.005	0.010	3	2	2.4715	2.1963	4	2	2.4634	0.9054
0.005	0.015	2	3	2.3361	0.2496	2	8	2.3607	0.3766	
	0.020	2	6	2.2947	2.0352	2	9	2.3248	1.6055	
	0.030	2	5	2.0525	0.2051	2	10	2.3692	0.8887	
	0.040	2	9	2.1523	0.4788	2	8	2.1925	2.0353	
	0.050	2	7	1.9199	1.5980	2	8	2.3416	0.2893	
	0.100	2	10	1.7907	0.4071	2	5	2.0003	0.6210	
	0.01	0.020	3	3	2.2116	1.1895	4	9	2.1859	0.5568
	0.01	0.030	2	6	2.0943	0.1811	2	2	2.1801	0.8254
0.040		2	3	2.1556	1.7880	2	2	2.1718	0.8505	
0.050		2	10	1.9331	1.2793	2	7	2.1272	1.9771	
0.100		2	2	1.9529	0.7180	2	7	1.5895	1.0541	
0.150		2	6	1.7395	0.5319	2	6	1.8845	1.6837	
0.200		2	8	1.5720	1.5389	2	5	1.3663	1.0384	
0.03		0.060	2	2	1.7511	0.3318	3	4	1.7178	0.4929
0.03		0.090	2	6	1.6160	1.5193	2	9	1.5730	1.0107
	0.120	2	5	1.6212	0.3956	2	9	1.4612	0.5407	
	0.150	2	6	1.6502	1.2690	2	9	1.6229	1.3729	
	0.300	2	7	0.9340	0.7625	2	5	1.2168	0.2774	
	0.05	0.100	2	9	1.4609	1.0543	2	3	1.4722	1.3468
	0.05	0.150	2	6	1.2052	1.0898	2	2	1.3562	0.5318
		0.200	2	8	1.0146	0.6243	2	8	1.1541	0.8184
		0.250	2	4	0.9228	0.8671	2	5	1.2162	0.2675
0.500		0.500	2	4	0.5470	0.4302	2	3	0.5220	0.3965

Table 4.1.19

Plan parameters for proposed MDS plan when σ is known with $\rho = 0.95$

		$\lambda = 0.7$				$\lambda = 0.8$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	7	2	2.9988	2.7259	8	2	3.0009	2.6614
	0.003	3	2	2.9570	2.2421	3	2	2.9467	0.1229
	0.004	2	5	2.8814	1.3478	2	3	2.8905	0.1713
	0.006	2	4	2.8348	2.3621	2	8	2.7586	2.1250
	0.008	2	5	2.8665	1.9686	2	8	2.7968	0.6024
	0.010	2	8	2.7738	1.6281	2	2	2.8600	0.1792
	0.015	2	4	2.6848	0.2635	2	7	2.8172	0.0274
	0.020	2	7	2.5925	0.0005	2	5	2.7257	1.5493
0.0025	0.005	6	2	2.7052	0.0174	7	2	2.7061	0.5925
	0.010	2	7	2.5703	0.7066	2	3	2.6066	1.6245
	0.015	2	7	2.5235	1.0376	2	8	2.5385	1.5849
	0.020	2	10	2.4922	2.1165	2	10	2.3980	0.5856
	0.025	2	2	2.4000	1.3213	2	3	2.6111	0.8981
	0.030	2	6	2.5811	0.0877	2	3	2.2774	1.0656
	0.050	2	4	2.2412	1.2604	2	6	2.1817	1.9174
	0.005	0.010	5	3	2.4587	0.8207	6	3	2.4626
0.015		2	2	2.3908	0.8204	3	4	2.3983	0.0219
0.020		2	9	2.3090	0.6142	2	3	2.3307	0.2968
0.030		2	2	2.3761	1.8461	2	6	2.1630	1.7497
0.040		2	2	1.9831	0.5341	2	7	2.2237	0.0674
0.050		2	2	1.9084	1.6803	2	3	1.9255	1.2726
0.100		2	7	1.8459	0.0176	2	9	2.2402	0.5699
0.01		0.020	4	2	2.2095	1.0506	5	2	2.2040
	0.030	2	8	2.1053	1.4291	2	4	2.1149	1.5037
	0.040	2	4	2.0006	0.2476	2	7	2.0256	0.8769
	0.050	2	9	2.0239	1.3019	2	5	1.9570	0.4037
	0.100	2	9	1.9978	0.2952	2	10	1.6977	0.6938
	0.150	2	2	1.4870	0.2310	2	3	1.5143	0.2871
	0.200	2	6	1.5849	0.9858	2	3	1.1621	0.7693
	0.03	0.060	3	3	1.7369	0.8561	4	3	1.7201
0.090		2	6	1.5650	1.4272	2	7	1.6171	1.3126
0.120		2	8	1.4418	0.9191	2	4	1.5031	0.6841
0.150		2	6	1.5389	0.6388	2	4	1.5824	0.1442
0.300		2	2	1.0534	0.7821	2	7	1.0854	0.0049
0.05	0.100	3	7	1.4565	0.5962	3	2	1.4779	0.8997
	0.150	2	9	1.3871	0.3558	2	10	1.3440	0.9516
	0.200	2	6	1.3367	0.6575	2	5	1.2157	0.8116
	0.250	2	3	1.1413	0.2976	2	5	1.0212	0.9785
	0.500	2	9	1.1881	0.3298	2	10	0.7235	0.7106

Table 4.1.20

Plan parameters for proposed MDS plan when σ is known with $\rho = 0.95$

		$\lambda = 0.9$				$\lambda = 1.0$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	10	2	3.0028	2.2627	12	2	3.0011	2.4065
	0.003	4	2	2.9519	1.1994	5	3	2.9324	2.3204
	0.004	3	8	2.8713	1.6582	3	2	2.9058	1.3413
	0.006	2	5	2.7963	1.4033	2	3	2.8015	0.4715
	0.008	2	9	2.8115	1.4121	2	5	2.8030	0.6645
	0.010	2	8	2.7003	0.4002	2	6	2.6241	0.0134
	0.015	2	6	2.6394	2.1372	2	3	2.7309	1.5739
	0.020	2	7	2.4315	1.6593	2	10	2.7746	0.8880
0.0025	0.005	9	2	2.7008	1.4562	10	2	2.7086	2.4592
	0.010	2	3	2.5861	0.4653	3	2	2.6008	1.4348
	0.015	2	4	2.5735	2.0168	2	6	2.4747	0.8108
	0.020	2	4	2.3366	0.6951	2	2	2.3972	1.2072
	0.025	2	6	2.3969	0.7629	2	5	2.5271	0.8056
	0.030	2	10	2.2295	0.1276	2	3	2.3692	0.6669
	0.050	2	10	1.9810	1.6202	2	5	2.5108	1.3233
0.005	0.010	7	2	2.4700	1.3052	9	2	2.4712	1.3880
	0.015	3	4	2.3811	1.2001	4	3	2.3830	0.3379
	0.020	2	2	2.3597	1.6743	2	2	2.3567	1.0966
	0.030	2	2	2.3450	0.8635	2	6	2.2114	0.3687
	0.040	2	10	2.2008	0.0076	2	2	2.1530	0.0866
	0.050	2	9	1.9582	0.1402	2	9	2.1229	1.3355
	0.100	2	5	1.7729	1.5690	2	6	1.8282	1.6675
0.01	0.020	6	2	2.2074	0.0011	7	2	2.2112	1.2579
	0.030	3	10	2.1017	1.4174	3	2	2.1341	0.5686
	0.040	2	4	2.0116	0.2683	2	2	2.0609	1.7877
	0.050	2	6	2.0477	0.2921	2	3	2.0071	1.1390
	0.100	2	7	1.8301	1.3496	2	7	1.7202	1.3074
	0.150	2	4	1.6332	1.1124	2	6	2.0123	0.8378
	0.200	2	5	1.2399	0.6775	2	7	1.5725	0.7683
0.03	0.060	4	2	1.7422	1.0731	5	2	1.7440	1.3453
	0.090	2	3	1.6361	1.2709	2	3	1.6367	0.0582
	0.120	2	8	1.4461	0.1027	2	7	1.4991	0.2960
	0.150	2	7	1.3281	0.6113	2	2	1.5681	1.2304
	0.300	2	3	1.1852	0.0208	2	6	0.9928	0.0168
0.05	0.100	4	2	1.4841	0.2641	4	2	1.4908	0.5551
	0.150	2	2	1.3592	0.5529	2	3	1.3682	0.3447
	0.200	2	2	1.2873	0.5928	2	4	1.2237	0.1391
	0.250	2	10	1.0600	1.0386	2	10	1.2368	0.9123
	0.500	2	5	0.9090	0.0900	2	10	0.8313	0.1211

4.1.4 Interpretation of the Table 4. 1. 16 – 4. 1. 20

These tables contains the computed values of n , m , k_a and K_r when sigma is known with ρ is 0.95 and λ ranging from 0.1 to 1.0 and various values of risk probabilities (P_1 and P_2). Table 4.1.16 contains the $\lambda = 0.1$ and $\lambda = 0.2$, Table 4.1.17 contains the $\lambda = 0.3$ and $\lambda = 0.4$, Table 4.1.18 contains the $\lambda = 0.5$ and $\lambda = 0.6$, Table 4.1.19 contains the $\lambda = 0.7$ and $\lambda = 0.8$ and Table 4.1.20 contains the $\lambda = 0.9$ and $\lambda = 1.0$ with same value of ρ which is 0.95.

In Table 4.1.16, We note that for the same value of P_1 , as the P_2 changes from 0.002 to 0.020. When $P_1 = 0.001$ and $P_2 = 0.002$, the values of $n = 2$, $m = 2$, $k_a = 3.0299$ and $K_r = 1.7909$ at $\lambda = 0.1$. As the value of $P_2 = 0.020$, the values of $n = 2$, $m = 8$, $k_a = 2.9148$ and $K_r = 0.9905$. So, it conclude that for the same value of P_1 , the sample size n decreases as P_2 increases at ρ is 0.95.

As $\lambda = 0.2$, the values of $n = 2$, $m = 8$, $k_a = 2.9888$ and $K_r = 2.2141$. Now we see all Tables 4.1.17 to 4.1.20, when $P_1 = 0.001$ and $P_2 = 0.002$, the values of n increases and k_a decrease and the value of m increases. Similarly at $\lambda = 0.3$, the values of $n = 3$, $m = 3$, $k_a = 3.0041$ and $K_r = 1.7802$ and at $\lambda = 0.4$, the values of $n = 3$, $m = 2$, $k_a = 3.0022$ and $K_r = 0.8481$. Similarly when $\lambda = 0.9$, the values of $n = 10$, $m = 2$, $k_a = 3.0028$ and $K_r = 2.2627$ and at $\lambda = 1.0$, the values of $n = 12$, $m = 2$, $k_a = 3.0011$ and $K_r = 2.4065$. So we conclude that keeping $P_1 = 0.001$ and $P_2 = 0.002$ constant as the value of λ increases then the value of n increases and the value of k_a decreases at ρ is 0.95.

4.2 RESULTS FOR THE PLAN PARAMETERS FOR PROPOSED MDS PLAN WHEN σ IS UNKNOWN

Table 4. 2. 1

Plan parameters for proposed MDS plan when σ is unknown with $\rho = 0.25$

		$\lambda = 0.1$				$\lambda = 0.3$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	-	-	-	-	-	-	-	-
	0.003	202	2	2.9480	1.0989	205	2	2.9487	0.5456
	0.004	121	2	2.9098	1.5099	124	2	2.9111	1.6805
	0.006	67	2	2.8546	1.8504	68	2	2.855	1.6365
	0.008	47	2	2.8163	0.9867	48	2	2.8114	1.9869
	0.010	37	2	2.7817	1.9674	38	2	2.7869	0.6189
	0.015	25	2	2.7271	2.2027	25	2	2.7254	1.0509
	0.020	19	2	2.6892	1.3136	20	2	2.6808	1.0187
0.0025	0.005	-	-	-	-	-	-	-	-
	0.010	82	2	2.6093	1.0359	83	2	2.6113	0.7896
	0.015	44	2	2.5521	0.4217	46	2	2.5477	1.4924
	0.020	31	2	2.5022	2.0456	32	2	2.5092	0.8764
	0.025	24	2	2.4717	1.7713	25	2	2.468	1.1739
	0.030	20	2	2.4413	0.3517	21	2	2.4382	2.2011
	0.050	12	2	2.3638	1.5569	13	2	2.3367	0.5244
0.005	0.010	-	-	-	-	-	-	-	-
	0.015	97	2	2.4104	1.9446	100	2	2.4104	0.0673
	0.020	57	2	2.3627	0.8756	58	2	2.3624	2.0188
	0.030	31	2	2.296	1.6974	32	2	2.2968	1.417
	0.040	21	2	2.2536	0.4215	22	2	2.25	0.2098
	0.050	17	3	2.1821	0.251	17	2	2.2151	0.9308
	0.100	8	3	2.0555	1.311	9	2	2.108	1.4966
0.01	0.020	180	2	2.2142	0.0898	189	2	2.2131	0.2582
	0.030	64	2	2.1455	1.0319	67	2	2.1459	0.8741
	0.040	37	2	2.0927	1.7857	39	2	2.0954	0.1343
	0.050	26	2	2.0548	1.008	27	2	2.0453	1.7026
	0.100	10	2	1.9246	1.3282	11	3	1.8921	0.5694
	0.150	7	5	1.7508	1.4513	7	3	1.7964	0.2043
	0.200	5	2	1.7146	1.0871	5	2	1.7877	0.7671
0.03	0.060	82	2	1.748	0.3604	86	2	1.7479	0.2225
	0.090	28	2	1.6609	0.5123	29	2	1.6671	0.6818
	0.120	16	2	1.5821	1.3002	17	2	1.603	0.4762
	0.150	11	4	1.5096	0.8175	11	2	1.5588	0.9539
	0.300	4	3	1.347	0.8207	4	2	1.4153	0.1023
0.05	0.100	48	2	1.4985	0.1298	53	2	1.4986	0.2666
	0.150	16	2	1.4062	0.0202	18	2	1.4006	0.4731
	0.200	9	3	1.3121	0.3081	10	2	1.3317	0.6221
	0.250	6	2	1.2936	0.9402	7	5	1.2217	0.3
	0.500	2	4	1.0804	0.1046	3	9	0.8276	0.6251

Table 4.2.2

Plan parameters for proposed MDS plan when σ is unknown with $\rho = 0.25$

		$\lambda = 0.5$				$\lambda = 0.6$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	-	-	-	-	-	-	-	-
	0.003	211	2	2.9481	1.0989	216	2	2.9484	2.1528
	0.004	127	2	2.9097	1.5099	129	2	2.9105	0.5749
	0.006	71	2	2.8569	1.8504	72	2	2.8557	1.8331
	0.008	50	2	2.8174	0.9867	51	2	2.8161	1.4248
	0.010	39	2	2.7815	1.9674	40	2	2.7825	0.8722
	0.015	26	2	2.7277	2.2027	27	2	2.7181	2.0437
	0.020	20	2	2.6825	1.3136	21	2	2.6889	0.8447
0.0025	0.005	-	-	-	-	-	-	-	-
	0.010	87	2	2.6104	1.0359	88	2	2.6105	2.1572
	0.015	48	2	2.5506	0.4217	49	2	2.5486	0.0909
	0.020	33	2	2.5079	2.0456	34	2	2.5057	0.0012
	0.025	26	2	2.4685	1.7713	27	2	2.4658	0.4154
	0.030	21	2	2.4379	0.3517	22	2	2.4471	0.0536
	0.050	13	2	2.3601	1.5569	13	2	2.3555	1.6519
0.005	0.010	-	-	-	-	-	-	-	-
	0.015	104	2	2.4086	2.1111	107	2	2.4097	0.937
	0.020	61	2	2.3614	2.0184	63	2	2.3638	1.7514
	0.030	33	2	2.2953	1.7723	34	2	2.2983	1.6286
	0.040	23	2	2.2478	1.4379	24	2	2.2537	0.5629
	0.050	18	2	2.2113	1.0336	18	2	2.2047	1.6846
	0.100	9	2	2.0613	0.7974	9	2	2.0905	1.0589
0.01	0.020	198	2	2.2137	1.648	205	2	2.2135	0.6807
	0.030	71	2	2.1456	0.4749	74	2	2.1426	1.6567
	0.040	41	2	2.0959	0.2122	42	2	2.0899	1.754
	0.050	29	2	2.0566	0.9282	30	2	2.0519	1.0912
	0.100	11	2	1.9224	1.3824	12	2	1.9107	0.8077
	0.150	7	2	1.8443	1.2092	8	3	1.7624	0.3801
	0.200	6	2	1.7187	0.1208	6	6	1.667	0.4473
0.03	0.060	93	2	1.7473	0.946	98	2	1.7463	0.3514
	0.090	32	2	1.6669	0.1953	33	2	1.6619	1.2613
	0.120	18	2	1.6067	1.145	19	2	1.6068	0.7334
	0.150	12	2	1.5554	0.7674	13	2	1.5609	0.9093
	0.300	5	3	1.2847	1.0751	5	5	1.2773	0.8278
0.05	0.100	59	2	1.4958	0.1676	62	2	1.4967	0.7472
	0.150	20	2	1.4059	0.6389	21	2	1.4082	0.0185
	0.200	11	2	1.3429	0.7601	12	2	1.3076	0.7077
	0.250	7	2	1.2829	0.1897	8	2	1.2922	0.5216
	0.500	3	10	0.7619	0.3475	3	2	1.1238	0.2105

Table 4. 2. 3

Plan parameters for proposed MDS plan when σ is unknown with $\rho = 0.25$

		$\lambda = 0.7$				$\lambda = 0.9$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	-	-	-	-	-	-	-	-
	0.003	221	2	2.9483	1.7132	232	2	2.9483	2.5505
	0.004	132	2	2.9102	0.2142	139	2	2.9097	0.7591
	0.006	74	2	2.8528	2.3067	77	2	2.8526	2.4328
	0.008	52	2	2.8139	2.1139	55	2	2.8113	2.2436
	0.010	41	2	2.785	2.0261	43	2	2.783	1.7889
	0.015	28	2	2.7227	1.0966	29	2	2.7225	0.5654
	0.020	21	2	2.6855	0.1109	23	2	2.6756	0.1683
0.0025	0.005	-	-	-	-	-	-	-	-
	0.010	90	2	2.6091	2.2304	97	2	2.6098	2.0012
	0.015	50	2	2.5498	2.0121	54	2	2.5463	0.4142
	0.020	35	2	2.5078	1.2251	38	2	2.5042	1.6318
	0.025	27	2	2.4712	1.5055	29	2	2.4691	1.425
	0.030	23	2	2.4358	1.6886	24	2	2.4313	1.8778
	0.050	14	2	2.3348	1.7569	15	2	2.3542	0.2068
0.005	0.010	-	-	-	-	-	-	-	-
	0.015	111	2	2.4066	2.114	119	2	2.4086	2.0796
	0.020	65	2	2.3644	0.613	70	2	2.3624	1.8308
	0.030	35	2	2.293	1.8879	38	2	2.296	1.7042
	0.040	25	2	2.2395	1.5758	27	2	2.2469	1.6461
	0.050	19	2	2.2139	0.0454	21	2	2.2141	0.7666
	0.100	10	2	2.0416	0.1959	10	2	2.0845	0.8206
0.01	0.020	212	2	2.2137	0.9828	221	2	2.2132	1.3371
	0.030	76	2	2.1448	1.0694	83	2	2.1438	1.508
	0.040	44	2	2.0936	0.6319	48	2	2.093	1.4712
	0.050	31	2	2.0564	0.3029	34	2	2.0504	0.4036
	0.100	12	2	1.9265	0.986	14	2	1.9083	1.2578
	0.150	8	2	1.8382	1.1059	9	3	1.7903	0.9467
	0.200	6	2	1.771	0.8493	7	2	1.7038	0.4076
0.03	0.060	102	2	1.7471	0.8009	115	2	1.7465	0.3202
	0.090	35	2	1.6644	0.8384	40	2	1.66	1.24
	0.120	20	2	1.6029	0.4923	22	2	1.5978	1.124
	0.150	14	2	1.5608	0.1428	15	2	1.5434	0.9978
	0.300	5	2	1.4038	0.5788	6	5	1.2894	0.6476
0.05	0.100	67	2	1.4962	0.3418	77	2	1.4954	0.092
	0.150	22	2	1.4018	0.981	26	2	1.4031	0.9255
	0.200	12	2	1.3316	0.741	14	2	1.3235	0.8717
	0.250	8	2	1.2761	0.3117	10	3	1.2402	0.6894
	0.500	3	5	0.8007	0.485	3	2	1.0082	0.3092

4.2.1 Interpretation of the Table 4.2.1 – 4.2.3

These tables contains the computed values of n , m , k_a and K_r when sigma is unknown with ρ is 0.25 and λ ranging from 0.1 to 1.0 and various values of risk probabilities (P_1 and P_2). Table 4.2.1 contains the $\lambda = 0.1$ and $\lambda = 0.3$, Table 4.2.2 contains the $\lambda = 0.5$ and $\lambda = 0.6$, Table 4.2.3 contains the $\lambda = 0.7$ and $\lambda = 0.90$ with same value of ρ at ρ is 0.25.

In Table 4.2.1, We note that the plan parameters for the same value of P_1 , as the P_2 changes from 0.002 to 0.020. When $P_1 = 0.001$ and $P_2 = 0.002$, the plan parameters does not exist for all values of λ . When $P_1 = 0.001$ and $P_2 = 0.003$, the values of $n = 202$, $m = 2$, $k_a = 2.9480$ and $K_r = 1.0989$ at $\lambda = 0.1$. As the same value of P_1 with value of $P_2 = 0.020$, the values of $n = 19$, $m = 2$, $k_a = 2.6892$ and $K_r = 1.3136$. So, it conclude that for the same value of P_1 , the sample size n decreases as P_2 increases at ρ is 0.25.

As $\lambda = 0.3$, When $P_1 = 0.001$ and $P_2 = 0.002$, the plan parameters does not exist When $P_1 = 0.001$ and $P_2 = 0.003$, the values of $n = 205$, $m = 2$, $k_a = 2.9487$ and $K_r = 2.5456$. Now we see in Tables 4.1.2 and 4.1.3, when $P_1 = 0.001$ and $P_2 = 0.003$, the values of n increases and k_a decrease and the value of m is mostly 2. Similarly at $\lambda = 0.7$, the values of $n = 221$, $m = 2$, $k_a = 2.9483$ and $K_r = 1.7132$ and at $\lambda = 0.9$, the values of $n = 232$, $m = 2$, $k_a = 2.9483$ and $K_r = 2.5505$. So we conclude that keeping $P_1 = 0.001$ and $P_2 = 0.002$ constant as the value of λ increases then the value of n increases and the value of k_a and k_r are decreases at ρ is 0.25.

Table 4.2.4
Plan parameters for proposed MDS plan when σ is unknown with $\rho = 0.50$

		$\lambda = 0.1$				$\lambda = 0.3$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	-	-	-	-	-	-	-	-
	0.003	200	2	2.9491	1.1700	204	2	2.9488	0.5050
	0.004	121	2	2.9119	1.5281	123	2	2.9084	2.4208
	0.006	68	2	2.8592	1.3615	68	2	2.8525	2.3630
	0.008	47	2	2.8163	1.1593	48	2	2.8164	0.2639
	0.010	37	2	2.7811	1.9920	38	2	2.7805	2.0287
	0.015	25	2	2.7337	1.5666	25	2	2.7269	1.4766
	0.020	19	2	2.6789	2.0013	20	2	2.6854	0.2190
0.0025	0.005	-	-	-	-	-	-	-	-
	0.010	81	2	2.6081	2.2981	84	2	2.6054	2.3099
	0.015	45	2	2.5486	1.2284	45	2	2.5499	2.0547
	0.020	31	2	2.5061	2.0480	32	2	2.5064	1.3786
	0.025	24	2	2.4774	0.1195	24	2	2.4702	1.9651
	0.030	20	2	2.4394	0.9716	20	2	2.4426	1.7284
	0.050	12	2	2.3636	0.1411	13	2	2.3330	1.6902
0.005	0.010	-	-	-	-	-	-	-	-
	0.015	96	2	2.4106	0.3111	99	2	2.4104	0.6121
	0.020	56	2	2.3658	1.2080	58	2	2.3651	0.3658
	0.030	31	2	2.2989	1.8040	32	2	2.2952	1.7724
	0.040	21	2	2.2547	0.5340	22	2	2.2458	1.5844
	0.050	17	2	2.1950	0.3649	17	2	2.1973	1.7750
	0.100	8	2	2.0705	1.3186	8	2	2.0936	1.2776
0.01	0.020	182	2	2.2121	1.9301	186	2	2.2143	1.3253
	0.030	64	2	2.1458	0.9896	66	2	2.1459	1.2366
	0.040	37	2	2.0961	0.1032	39	2	2.0962	0.0133
	0.050	26	2	2.0580	1.1486	27	2	2.0516	1.6255
	0.100	10	2	1.9268	1.4417	11	2	1.9349	1.4169
	0.150	7	2	1.8745	0.0299	7	3	1.8056	0.3923
	0.200	5	4	1.7350	0.3771	5	3	1.7503	0.6037
0.03	0.060	80	2	1.7478	1.3032	84	2	1.7478	0.1493
	0.090	27	2	1.6688	0.2489	29	2	1.6650	0.5803
	0.120	15	2	1.6107	0.2495	16	2	1.6095	0.2789
	0.150	11	3	1.5152	0.6179	11	2	1.5562	0.4725
	0.300	4	7	1.3065	0.3844	4	2	1.4197	0.7012
0.05	0.100	48	2	1.4997	0.0494	52	2	1.4982	0.8605
	0.150	16	2	1.4111	0.1923	17	2	1.4071	0.3128
	0.200	9	2	1.3392	0.9825	10	4	1.3029	0.9196
	0.250	6	4	1.2347	0.5859	6	2	1.2862	0.8088
	0.500	2	2	1.0084	0.4890	3	10	0.7914	0.4733

Table 4.2.5
Plan parameters for proposed MDS plan when σ is unknown with $\rho = 0.50$

		$\lambda = 0.4$				$\lambda = 0.5$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	-	-	-	-	-	-	-	-
	0.003	207	2	2.9482	0.0885	213	2	2.9482	2.1528
	0.004	123	2	2.9105	1.9737	127	2	2.9105	0.5749
	0.006	69	2	2.8566	0.4785	71	2	2.8563	1.8331
	0.008	48	2	2.8151	2.1833	50	2	2.8151	1.4248
	0.010	38	2	2.7866	0.7320	39	2	2.7808	0.8722
	0.015	26	2	2.7312	0.7069	26	2	2.7250	2.0437
	0.020	20	2	2.6701	2.1521	20	2	2.6848	0.8447
0.0025	0.005	-	-	-	-	-	-	-	-
	0.010	84	2	2.6109	0.2704	87	2	2.6111	2.1406
	0.015	46	2	2.5510	0.2289	48	2	2.5511	0.8211
	0.020	32	2	2.5087	0.1608	33	2	2.5072	0.272
	0.025	25	2	2.4724	0.6947	26	2	2.4741	1.6048
	0.030	21	2	2.4470	0.5512	22	2	2.4424	1.8452
	0.050	13	2	2.3435	1.7146	13	2	2.3587	1.6226
0.005	0.010	-	-	-	-	-	-	-	-
	0.015	101	2	2.4096	1.4733	105	2	2.4101	1.4276
	0.020	59	2	2.3640	1.2138	61	2	2.3631	1.9855
	0.030	32	2	2.3001	0.5050	34	2	2.2953	1.6895
	0.040	22	2	2.2522	1.5311	23	2	2.2446	1.7376
	0.050	17	2	2.2135	1.0029	18	2	2.2137	0.5195
	0.100	9	3	2.0648	1.3678	9	3	2.0459	1.0843
0.01	0.020	191	2	2.2145	1.0146	199	2	2.2135	0.8192
	0.030	68	2	2.1453	1.3308	71	2	2.1454	0.4474
	0.040	39	2	2.0933	1.6820	41	2	2.0954	1.2663
	0.050	27	2	2.0572	0.0634	29	2	2.0583	0.7751
	0.100	11	2	1.9219	0.5255	12	2	1.9112	0.9832
	0.150	7	2	1.8490	0.3915	7	2	1.8439	1.2051
	0.200	5	2	1.7731	1.2398	6	3	1.7314	1.2804
0.03	0.060	87	2	1.7476	0.5413	93	2	1.7466	1.4283
	0.090	30	2	1.6687	0.0053	32	2	1.6663	0.3899
	0.120	17	2	1.6082	0.5558	18	2	1.5992	1.1262
	0.150	11	2	1.5601	0.9385	12	2	1.5471	1.1156
	0.300	4	2	1.3901	0.7079	5	6	1.2648	0.9403
0.05	0.100	53	2	1.4945	1.2843	58	2	1.4963	1.2259
	0.150	18	2	1.4110	0.4511	20	2	1.3999	0.8895
	0.200	10	3	1.3121	0.1950	11	2	1.3415	0.8561
	0.250	7	3	1.2613	0.3334	7	2	1.2822	0.6662
	0.500	7	2	1.2645	0.8658	3	3	0.8500	0.7709

Table 4.2.6

Plan parameters for proposed MDS plan when σ is unknown with $\rho = 0.50$

		$\lambda = 0.7$				$\lambda = 0.9$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	-	-	-	-	-	-	-	-
	0.003	215	2	2.9479	2.6537	226	2	2.9484	2.1550
	0.004	130	2	2.9102	2.0099	135	2	2.9096	0.5674
	0.006	73	2	2.8558	0.9314	76	2	2.8505	2.4838
	0.008	51	2	2.8135	1.9629	53	2	2.8150	0.2275
	0.010	40	2	2.7834	1.9723	42	2	2.7833	0.5347
	0.015	27	2	2.7248	1.6232	28	2	2.7278	0.9778
	0.020	21	2	2.6819	2.1223	22	2	2.6801	1.9622
0.0025	0.005	-	-	-	-	-	-	-	-
	0.010	89	2	2.6111	1.3810	93	2	2.6100	2.2330
	0.015	48	2	2.5470	2.1296	52	2	2.5485	1.1218
	0.020	34	2	2.5060	1.3183	36	2	2.5064	1.1339
	0.025	26	2	2.4714	1.7845	28	2	2.4693	0.9915
	0.030	22	2	2.4365	1.4240	23	2	2.4413	0.9815
	0.050	14	2	2.3365	0.5876	14	2	2.3591	1.3694
0.005	0.010	-	-	-	-	-	-	-	-
	0.015	63	2	2.3644	0.5033	114	2	2.4085	2.0063
	0.020	35	2	2.2945	1.5164	67	2	2.3637	0.4136
	0.030	24	2	2.2543	0.0683	37	2	2.2959	1.1697
	0.040	19	2	2.1977	1.7012	26	2	2.2391	0.3486
	0.050	9	2	2.0937	0.2832	19	2	2.2070	1.6220
	0.100	206	2	2.2140	0.2708	10	2	2.0817	0.4226
0.01	0.020	73	2	2.1449	1.0193	219	2	2.2135	0.7906
	0.030	43	2	2.0928	1.1726	79	2	2.1443	0.2221
	0.040	30	2	2.0540	1.2678	46	2	2.0938	0.5581
	0.050	12	3	1.8918	0.5216	32	2	2.0502	1.5040
	0.100	8	2	1.7875	1.1178	13	2	1.9176	0.8498
	0.150	6	3	1.7505	0.8459	8	2	1.8424	0.9090
	0.200	99	2	1.7479	1.3649	6	2	1.7739	1.0860
0.03	0.060	33	2	1.6639	1.2345	108	2	1.7466	1.4284
	0.090	19	2	1.6023	0.5850	37	2	1.6627	0.2699
	0.120	13	2	1.5480	0.9280	21	2	1.6030	1.0127
	0.150	5	2	1.3568	0.5683	14	2	1.5464	0.9224
	0.300	62	2	1.4967	0.1162	5	2	1.3835	0.3502
0.05	0.100	21	2	1.3987	1.0187	71	2	1.4964	1.0153
	0.150	12	3	1.2993	0.4883	24	2	1.4045	0.0627
	0.200	8	2	1.2906	0.2108	13	2	1.3281	0.1961
	0.250	3	6	0.7290	0.0760	9	2	1.2684	0.5176
	0.500	2	2	0.7416	0.2999	3	5	0.8817	0.2844

4.2.2 Interpretation of the Table 4.2.4 – 4.2.6

These tables contains the computed values of n , m , k_a and K_r when sigma is unknown with ρ is 0.50 and λ ranging from 0.1 to 1.0 and various values of risk probabilities (P_1 and P_2). Table 4.2.4 contains the $\lambda = 0.1$ and $\lambda = 0.3$, Table 4.2.5 contains the $\lambda = 0.4$ and $\lambda = 0.5$, Table 4.2.6 contains the $\lambda = 0.7$ and $\lambda = 0.9$ with same value of ρ at ρ is 0.50.

In Table 4.2.4, We note that the plan parameters for the same value of P_1 , as the P_2 changes from 0.002 to 0.020. When $P_1 = 0.001$ and $P_2 = 0.002$, the plan parameters does not exist for all values of λ . When $P_1 = 0.001$ and $P_2 = 0.003$, the values of $n = 200$, $m = 2$, $k_a = 2.9491$ and $K_r = 1.1700$ at $\lambda = 0.1$. As the same value of P_1 with value of $P_2 = 0.020$, the values of $n = 19$, $m = 2$, $k_a = 2.6889$ and $K_r = 1.5666$. So, it conclude that for the same value of P_1 , the sample size n decreases as P_2 increases at ρ is 0.50.

As $\lambda = 0.3$, When $P_1 = 0.001$ and $P_2 = 0.002$, the plan parameters does not exist When $P_1 = 0.001$ and $P_2 = 0.003$, the values of $n = 204$, $m = 2$, $k_a = 2.9488$ and $K_r = 2.5050$. Now we see in Tables 4.2.5 and 4.2.6, when $P_1 = 0.001$ and $P_2 = 0.003$, the values of n increases and k_a decrease and the value of m is mostly 2. Similarly at $\lambda = 0.7$, the values of $n = 215$, $m = 2$, $k_a = 2.9479$ and $K_r = 1.6537$ and at $\lambda = 0.9$, the values of $n = 226$, $m = 2$, $k_a = 2.9484$ and $K_r = 2.1550$. So we conclude that keeping $P_1 = 0.001$ and $P_2 = 0.002$ constant as the value of λ increases then the value of n increases and the value of k_a and k_r are decreases at ρ is 0.50.

Table 4.2.7

Plan parameters for proposed MDS plan when σ is unknown with $\rho = 0.75$

		$\lambda = 0.1$				$\lambda = 0.3$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	-	-	-	-	-	-	-	-
	0.003	199	2	2.9490	2.5793	203	2	2.9485	0.5069
	0.004	119	2	2.9112	0.0589	122	2	2.9040	2.6341
	0.006	67	2	2.8542	1.7751	67	2	2.8554	1.1731
	0.008	47	2	2.8138	1.3997	48	2	2.8123	1.0169
	0.010	37	2	2.7892	0.3547	38	2	2.7780	2.0923
	0.015	24	2	2.7233	2.1278	25	2	2.7125	2.1251
	0.020	19	2	2.6821	1.4795	19	2	2.6889	0.5212
0.0025	0.005	-	-	-	-	-	-	-	-
	0.010	80	2	2.6122	0.7641	81	2	2.6117	1.6786
	0.015	44	2	2.5527	1.0587	45	2	2.5503	0.2400
	0.020	31	2	2.5042	1.7989	31	2	2.5067	1.8833
	0.025	24	2	2.4700	0.0967	24	2	2.4750	1.8540
	0.030	20	2	2.4432	0.9000	20	2	2.4347	1.8997
	0.050	12	2	2.3709	0.3778	12	2	2.3647	1.6413
0.005	0.010	-	-	-	-	-	-	-	-
	0.015	96	2	2.4092	1.4387	97	2	2.4098	0.6206
	0.020	56	2	2.3652	0.1691	57	2	2.3658	1.2945
	0.030	31	2	2.3039	0.7693	31	2	2.3003	0.1007
	0.040	21	2	2.2511	1.7812	22	2	2.2495	0.2099
	0.050	16	2	2.2169	1.4911	17	2	2.2015	1.1142
	0.100	8	3	2.0540	0.4495	8	2	2.0811	1.5037
0.01	0.020	180	2	2.2146	0.4265	183	2	2.2138	1.6072
	0.030	64	2	2.1436	0.8486	65	2	2.1464	0.8417
	0.040	37	2	2.0947	0.0387	37	2	2.0917	1.7520
	0.050	26	2	2.0401	1.7461	26	2	2.0591	0.6416
	0.100	10	2	1.9343	1.1909	11	3	1.8775	0.8011
	0.150	7	2	1.7834	0.8812	7	3	1.7808	0.7798
	0.200	5	3	1.6898	0.9923	5	3	1.7631	0.2032
0.03	0.060	79	2	1.7488	0.6120	81	2	1.7479	0.1201
	0.090	27	2	1.6639	1.2213	28	2	1.6688	0.2049
	0.120	15	2	1.6122	0.0359	16	2	1.6043	0.7047
	0.150	10	2	1.5551	1.1566	11	2	1.5393	1.2323
	0.300	4	2	1.3655	0.3585	4	6	1.3010	0.1456
0.05	0.100	48	2	1.4928	1.3189	50	2	1.4968	1.2200
	0.150	16	2	1.4017	0.8528	16	2	1.4026	1.0934
	0.200	9	2	1.3567	0.6285	9	2	1.3462	0.7088
	0.250	6	2	1.2781	0.2232	6	3	1.2498	0.8966
	0.500	2	2	1.1126	0.7584	3	2	0.5934	0.0704

Table 4. 2. 8

Plan parameters for proposed MDS plan when σ is unknown with $\rho = 0.75$

		$\lambda = 0.5$				$\lambda = 0.7$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	-	-	-	-	-	-	-	-
	0.003	205	2	2.9482	1.6201	208	2	2.9488	2.3980
	0.004	122	2	2.9103	1.5870	126	2	2.9110	1.7689
	0.006	68	2	2.8557	2.3659	70	2	2.8565	0.0492
	0.008	48	2	2.8156	0.4688	49	2	2.8149	0.0894
	0.010	38	2	2.7800	2.0327	39	2	2.7872	0.0800
	0.015	25	2	2.7284	0.9141	26	2	2.7142	2.2516
	0.020	20	2	2.6751	0.6573	20	2	2.6849	1.4233
0.0025	0.005	-	-	-	-	-	-	-	-
	0.010	83	2	2.6118	1.4259	85	2	2.6102	0.9463
	0.015	46	2	2.5492	0.5318	47	2	2.5515	2.0613
	0.020	32	2	2.5005	2.1072	32	2	2.5018	2.0630
	0.025	25	2	2.4722	0.9302	25	2	2.4671	1.8929
	0.030	21	2	2.4303	0.4778	21	2	2.4419	1.6570
	0.050	13	2	2.3368	0.1553	13	2	2.3677	1.3354
0.005	0.010	-	-	-	-	-	-	-	-
	0.015	99	2	2.4086	2.1104	103	2	2.4094	0.1875
	0.020	59	2	2.3659	1.2684	60	2	2.3640	1.2128
	0.030	32	2	2.3010	0.8929	33	2	2.2919	1.6613
	0.040	22	2	2.2370	1.8701	23	2	2.2433	1.4985
	0.050	17	2	2.2042	1.6991	18	3	2.1814	0.6606
	0.100	8	2	2.0883	1.5118	9	4	2.0102	0.0021
0.01	0.020	186	2	2.2138	0.3414	193	2	2.2141	0.2460
	0.030	66	2	2.1456	1.7644	70	2	2.1476	0.1427
	0.040	38	2	2.0913	1.7609	40	2	2.0950	1.0998
	0.050	27	2	2.0421	1.7545	28	2	2.0526	0.9686
	0.100	11	2	1.9044	1.5276	11	2	1.9191	1.4448
	0.150	7	2	1.8349	1.0117	7	2	1.8442	0.5614
	0.200	5	3	1.7497	0.5508	5	2	1.7831	1.2158
0.03	0.060	84	2	1.7447	1.5479	90	2	1.7457	1.3762
	0.090	29	2	1.6663	0.2074	31	2	1.6609	0.9443
	0.120	16	2	1.6081	1.1439	17	2	1.6064	0.8132
	0.150	11	2	1.5618	0.3311	12	2	1.5305	1.0570
	0.300	4	3	1.3595	0.4819	5	2	1.2907	0.5886
0.05	0.100	52	2	1.4978	0.6126	56	2	1.4964	0.4415
	0.150	17	2	1.4008	1.0533	19	2	1.3967	0.6145
	0.200	10	2	1.3042	0.8124	10	2	1.3296	0.9417
	0.250	7	7	1.2103	0.7336	7	3	1.2425	0.4357
	0.500	3	2	0.8638	0.6049	3	5	0.7828	0.3368

Table 4.2.9

Plan parameters for proposed MDS plan when σ is unknown with $\rho = 0.75$

		$\lambda = 0.9$				$\lambda = 1.0$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	-	-	-	-	-	-	-	-
	0.003	214	2	2.9486	1.8278	219	2	2.9491	1.5400
	0.004	128	2	2.9098	2.4051	130	2	2.9103	2.1729
	0.006	71	2	2.8547	2.3988	73	2	2.8541	1.3439
	0.008	50	2	2.8155	2.0686	51	2	2.8152	2.1206
	0.010	39	2	2.7804	2.2483	40	2	2.7845	0.6580
	0.015	26	2	2.7246	2.1306	27	2	2.7280	1.0432
	0.020	20	2	2.6798	2.0450	21	2	2.6842	0.1895
0.0025	0.005	-	-	-	-	-	-	-	-
	0.010	88	2	2.6101	0.0133	89	2	2.6107	1.4493
	0.015	48	2	2.5501	0.0906	49	2	2.5457	2.0648
	0.020	34	2	2.5017	1.5951	35	2	2.5015	0.0673
	0.025	26	2	2.4674	1.7809	27	2	2.4707	1.8128
	0.030	22	2	2.4332	0.4471	22	2	2.4429	0.7799
	0.050	13	2	2.3579	1.6069	14	2	2.3278	1.7333
0.005	0.010	-	-	-	-	-	-	-	-
	0.015	106	2	2.4095	1.1460	108	2	2.4090	2.0654
	0.020	62	2	2.3626	1.9239	64	2	2.3641	0.4751
	0.030	34	2	2.2967	0.7278	35	2	2.2983	0.7855
	0.040	23	2	2.2487	1.6308	24	2	2.2397	1.7506
	0.050	18	2	2.2159	0.2885	19	3	2.1795	1.2983
	0.100	9	2	2.0643	1.3345	9	2	2.0912	0.8394
0.01	0.020	201	2	2.2133	1.9508	208	2	2.2138	1.4602
	0.030	72	2	2.1435	1.7958	74	2	2.1439	1.6396
	0.040	42	2	2.0857	1.8157	43	2	2.0955	1.3064
	0.050	29	2	2.0551	0.5819	30	2	2.0563	1.1082
	0.100	12	2	1.9272	0.6235	12	2	1.9209	0.4468
	0.150	8	3	1.7665	1.4946	8	2	1.8099	1.0324
	0.200	6	4	1.6479	0.7198	6	2	1.8070	0.5954
0.03	0.060	96	2	1.7462	0.1239	99	2	1.7470	0.1813
	0.090	33	2	1.6675	1.1284	34	2	1.6613	1.3146
	0.120	19	2	1.5935	0.6658	19	2	1.6034	0.5136
	0.150	13	2	1.5553	0.1647	13	2	1.5551	0.6427
	0.300	5	4	1.3193	0.5103	5	2	1.3417	0.8213
0.05	0.100	60	2	1.4948	1.2439	64	2	1.4970	0.0195
	0.150	20	2	1.4045	0.8324	21	2	1.4034	0.7459
	0.200	11	2	1.3337	0.3405	12	3	1.3079	0.8107
	0.250	8	5	1.2168	0.4497	8	2	1.2500	0.6601
	0.500	3	3	0.7155	0.3412	3	5	0.7693	0.5027

4.2.3 Interpretation of the Table 4.2.7 – 4.2.9

These tables contains the computed values of n , m , k_a and K_r when sigma is unknown with ρ is 0.75 and λ ranging from 0.1 to 1.0 and various values of risk probabilities (P_1 and P_2). Table 4.2.7 contains the $\lambda = 0.1$ and $\lambda = 0.3$, Table 4.2.8 contains the $\lambda = 0.5$ and $\lambda = 0.7$, Table 4.2.6 contains the $\lambda = 0.9$ and $\lambda = 1.0$ with same value of ρ at ρ is 0.75.

In Table 4.2.7, We note that the plan parameters for the same value of P_1 , as the P_2 changes from 0.002 to 0.020. When $P_1 = 0.001$ and $P_2 = 0.002$, the plan parameters does not exist for all values of λ . When $P_1 = 0.001$ and $P_2 = 0.003$, the values of $n = 199$, $m = 2$, $k_a = 2.9490$ and $K_r = 1.5793$ at $\lambda = 0.1$. As the same value of P_1 with value of $P_2 = 0.020$, the values of $n = 19$, $m = 2$, $k_a = 2.6821$ and $K_r = 1.4795$. So, it conclude that for the same value of P_1 , the sample size n decreases as P_2 increases at ρ is 0.75.

As $\lambda = 0.3$, When $P_1 = 0.001$ and $P_2 = 0.002$, the plan parameters does not exist When $P_1 = 0.001$ and $P_2 = 0.003$, the values of $n = 203$, $m = 2$, $k_a = 2.9485$ and $K_r = 2.5069$. Now we see in Tables 4.2.8 and 4.2.9, when $P_1 = 0.001$ and $P_2 = 0.003$, the values of n increases and k_a decrease and the value of m is mostly 2. Similarly at $\lambda = 0.5$, the values of $n = 205$, $m = 2$, $k_a = 2.9482$ and $K_r = 1.6201$ and at $\lambda = 0.7$, the values of $n = 208$, $m = 2$, $k_a = 2.9488$ and $K_r = 2.3980$. So we conclude that keeping $P_1 = 0.001$ and $P_2 = 0.002$ constant as the value of λ increases then the value of n increases and the value of k_a and k_r are decreases at ρ is 0.75.

Table 4. 2. 10

Plan parameters for proposed MDS plan when σ is unknown with $\rho = 0.95$

		$\lambda = 0.1$				$\lambda = 0.4$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	-	-	-	-	-	-	-	-
	0.003	198	2	2.9486	1.9869	200	2	2.9483	2.4055
	0.004	119	2	2.9117	1.6942	119	2	2.9109	1.8533
	0.006	66	2	2.8568	0.3323	66	2	2.8563	2.3861
	0.008	47	2	2.8182	1.8740	47	2	2.8186	2.2858
	0.010	37	2	2.7807	1.4219	37	2	2.7860	1.5574
	0.015	24	2	2.7290	1.8658	25	2	2.7254	0.7716
	0.020	19	2	2.6652	2.2137	19	2	2.6872	0.2563
0.0025	0.005	-	-	-	-	-	-	-	-
	0.010	80	2	2.6105	1.1079	80	2	2.6110	1.1227
	0.015	44	2	2.5496	0.9294	44	2	2.5506	0.6316
	0.020	31	2	2.5024	0.6743	31	2	2.5073	2.0045
	0.025	24	2	2.4727	1.2485	24	2	2.4610	2.0586
	0.030	20	2	2.4459	1.1539	20	2	2.4412	1.4257
	0.050	12	2	2.3577	1.5596	12	2	2.3677	0.2427
0.005	0.010	-	-	-	-	-	-	-	-
	0.015	96	2	2.4095	1.4202	96	2	2.4094	1.4692
	0.020	56	2	2.3640	0.0640	56	2	2.3638	1.9304
	0.030	30	2	2.3000	0.2266	30	2	2.3002	1.6670
	0.040	21	2	2.2524	0.5938	21	2	2.2569	0.4016
	0.050	16	2	2.2181	1.5329	16	2	2.2192	0.4362
	0.100	8	2	2.0769	1.6505	8	2	2.0604	1.5038
0.01	0.020	176	2	2.2142	1.6689	178	2	2.2136	1.6054
	0.030	63	2	2.1431	1.7727	63	2	2.1464	1.5810
	0.040	37	2	2.0964	0.6684	37	2	2.0944	1.2855
	0.050	26	2	2.0505	0.5347	26	2	2.0464	1.5132
	0.100	10	2	1.9346	1.1969	10	2	1.9359	1.0603
	0.150	7	8	1.7370	1.1959	7	2	1.7901	0.5708
	0.200	5	3	1.6816	1.4634	5	2	1.7098	1.3343
0.03	0.060	78	2	1.7479	0.6573	79	2	1.7471	0.6113
	0.090	27	2	1.6687	0.9423	27	2	1.6684	1.2109
	0.120	15	2	1.6041	0.1958	15	2	1.6098	0.4096
	0.150	10	2	1.5623	0.7435	10	2	1.5598	1.1490
	0.300	4	7	1.2731	0.0019	4	4	1.3384	0.1590
0.05	0.100	47	2	1.4988	0.4084	47	2	1.4946	1.3057
	0.150	16	3	1.3856	0.2794	16	2	1.4109	0.3808
	0.200	9	2	1.3389	0.8913	9	2	1.3403	0.0069
	0.250	6	3	1.2220	0.9630	6	2	1.3005	0.7367
	0.500	2	8	0.5891	0.1621	6	2	1.2300	1.0061

Table 4. 2. 11

Plan parameters for proposed MDS plan when σ is unknown with $\rho = 0.95$

		$\lambda = 0.8$				$\lambda = 1.0$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	-	-	-	-	-	-	-	-
	0.003	201	2	2.9493	0.5104	203	2	2.9492	0.1913
	0.004	120	2	2.9111	2.3356	122	2	2.9100	2.0142
	0.006	67	2	2.8517	2.4291	67	2	2.8560	2.3297
	0.008	47	2	2.8168	0.4863	47	2	2.8096	2.4401
	0.010	37	2	2.7853	1.5012	38	2	2.7826	0.7882
	0.015	25	2	2.7302	0.8670	25	2	2.7276	1.5356
	0.020	19	2	2.6888	0.0919	19	2	2.6789	2.0446
0.0025	0.005	-	-	-	-	-	-	-	-
	0.010	81	2	2.6109	2.1612	82	2	2.6079	2.2012
	0.015	45	2	2.5518	1.6046	45	2	2.5494	0.4387
	0.020	31	2	2.5036	2.0945	31	2	2.5059	1.8375
	0.025	24	2	2.4723	1.9769	24	2	2.4666	1.9900
	0.030	20	2	2.4470	0.0423	20	2	2.4396	1.6935
	0.050	12	2	2.3584	1.5201	12	2	2.3665	1.4276
0.005	0.010	-	-	-	-	-	-	-	-
	0.015	97	2	2.4101	0.0905	98	2	2.4098	2.1019
	0.020	57	2	2.3628	2.0548	58	2	2.3639	0.7066
	0.030	31	2	2.2985	1.2753	31	2	2.3010	0.8902
	0.040	21	2	2.2492	1.7945	21	2	2.2510	1.7150
	0.050	17	2	2.2040	0.6958	17	2	2.2147	0.0304
	0.100	8	2	2.1032	1.1794	8	2	2.0917	1.1546
0.01	0.020	182	2	2.2138	0.9816	183	2	2.2132	1.9994
	0.030	64	2	2.1461	0.1099	65	2	2.1458	0.3256
	0.040	37	2	2.0939	1.6204	38	2	2.0947	0.4974
	0.050	26	2	2.0543	1.4182	27	2	2.0540	0.3677
	0.100	10	2	1.9252	1.3891	11	3	1.8831	0.0297
	0.150	7	2	1.8074	0.9402	7	2	1.7854	1.4066
	0.200	5	2	1.7820	1.1840	5	2	1.7397	1.0414
0.03	0.060	81	2	1.7483	0.0084	83	2	1.7485	0.2827
	0.090	28	2	1.6631	0.0899	28	2	1.6669	0.2169
	0.120	16	2	1.5891	1.0786	16	2	1.6093	0.0628
	0.150	11	2	1.5698	0.1672	11	2	1.5646	0.1850
	0.300	4	4	1.3450	0.3802	4	2	1.3924	0.0734
0.05	0.100	49	2	1.4973	0.4365	50	2	1.4979	0.7162
	0.150	16	2	1.4055	0.8919	17	2	1.4009	0.7392
	0.200	9	3	1.3205	0.3242	9	2	1.3335	0.8007
	0.250	6	3	1.2608	0.7738	6	2	1.2725	0.9073
	0.500	3	7	0.7493	0.7418	3	2	0.8185	0.0266

4.2.4 Interpretation of the Table 4.2.10 – 4.2.11

These tables contains the computed values of n , m , k_a and K_r when sigma is unknown with ρ is 0.95 and λ ranging from 0.1 to 1.0 and various values of risk probabilities (P_1 and P_2). Table 4.2.10 contains the $\lambda = 0.1$ and $\lambda = 0.4$, Table 4.2.11 contains the $\lambda = 0.8$ and $\lambda = 1.0$, with same value of ρ at ρ is 0.95.

In Table 4.2.10, We note that the plan parameters for the same value of P_1 , as the P_2 changes from 0.002 to 0.020. When $P_1 = 0.001$ and $P_2 = 0.002$, the plan parameters does not exist for all values of λ . When $P_1 = 0.001$ and $P_2 = 0.003$, the values of $n = 198$, $m = 2$, $k_a = 2.9486$ and $K_r = 1.9869$ at $\lambda = 0.1$. As the same value of P_1 with value of $P_2 = 0.020$, the values of $n = 19$, $m = 2$, $k_a = 2.6652$ and $K_r = 2.2137$. So, it conclude that for the same value of P_1 , the sample size n decreases as P_2 increases at ρ is 0.95.

As $\lambda = 0.4$, When $P_1 = 0.001$ and $P_2 = 0.002$, the plan parameters does not exist When $P_1 = 0.001$ and $P_2 = 0.003$, the values of $n = 200$, $m = 2$, $k_a = 2.9483$ and $K_r = 2.4055$. Now we see in Tables 4.2.11 when $P_1 = 0.001$ and $P_2 = 0.003$, the values of n increases and k_a decrease and the value of m is mostly 2, at $\lambda = 0.8$, the values of $n = 201$, $m = 2$, $k_a = 2.9493$ and $K_r = 0.5104$ and at $\lambda = 1.0$, the values of $n = 203$, $m = 2$, $k_a = 2.9492$ and $K_r = 0.1913$. So we conclude that keeping $P_1 = 0.001$ and $P_2 = 0.002$ constant as the value of λ increases then the value of n increases and the value of k_a and k_r are decreases at ρ is 0.95.

4.3 RESULTS OF PLAN PARAMETERS FOR PROPOSED RESUBMITTED PLAN WHEN σ IS KNOWN

Table 4.3.1
Plan parameters for proposed resubmitted plan when σ is known
with $\rho = 0.25$ and $\lambda = 0.1$

p_1	p_2	$m = 1$			$m = 2$			$m = 3$			
		n	k_a	ASN	n	k_a	ASN	n	k_a	ASN	
0.001	0.002	10	2.9741	10.00	7	3.0158	13.65	6	3.0434	17.39	
	0.003	4	2.9075	4.00	3	2.9571	5.85	2	3.0336	5.80	
	0.004	3	2.8690	3.00	2	2.9087	3.90	2	2.9378	5.80	
	0.006	2	2.8313	2.00	2	2.7685	3.90	2	2.7978	5.80	
	0.008	2	2.8298	2.00	2	2.6658	3.90	2	2.6946	5.80	
	0.010	2	2.8314	2.00	2	2.5830	3.90	2	2.6126	5.80	
	0.015	2	2.8301	2.00	2	2.4270	3.90	2	2.4559	5.80	
	0.020	2	2.8283	2.00	2	2.3102	3.90	2	2.3394	5.80	
0.0025	0.005	8	2.6776	8.00	6	2.7242	11.69	5	2.7571	14.50	
	0.010	2	2.5394	2.00	2	2.5832	3.90	2	2.6123	5.80	
	0.015	2	2.5471	2.00	2	2.4267	3.90	2	2.4558	5.80	
	0.020	2	2.5484	2.00	2	2.3104	3.90	2	2.3396	5.80	
	0.025	2	2.5473	2.00	2	2.2167	3.90	2	2.2457	5.80	
	0.030	2	2.5424	2.00	2	2.1373	3.90	2	2.1667	5.80	
	0.050	2	2.5484	2.00	2	1.9015	3.90	2	1.9305	5.80	
	0.005	0.010	7	2.4361	7.00	5	2.4886	9.74	4	2.5287	11.59
0.005	0.015	3	2.3648	3.00	2	2.4268	3.90	2	2.4558	5.80	
	0.020	2	2.3119	2.00	2	2.3102	3.90	2	2.3394	5.80	
	0.030	2	2.3157	2.00	2	2.1373	3.90	2	2.1666	5.80	
	0.040	2	2.3128	2.00	2	2.0077	3.90	2	2.0372	5.80	
	0.050	2	2.3168	2.00	2	1.9014	3.90	2	1.9308	5.80	
	0.100	2	2.3170	2.00	2	1.5380	3.90	2	2.5226	5.78	
	0.01	0.020	6	2.1749	6.00	4	2.2353	7.80	4	2.2557	11.59
	0.01	0.030	3	2.1089	3.00	2	2.1373	3.90	2	2.1666	5.80
0.040		2	2.0623	2.00	2	2.0074	3.90	2	2.0367	5.80	
0.050		2	2.0601	2.00	2	1.9013	3.90	2	1.9305	5.80	
0.100		2	2.0664	2.00	2	1.5381	3.90	2	1.5672	5.80	
0.150		2	2.0669	2.00	2	1.2928	3.90	2	1.3221	5.80	
0.200		2	2.0678	1.97	2	2.1238	2.72	2	2.1238	4.07	
0.03		0.060	4	1.6972	4.00	3	1.7645	5.85	3	1.7886	8.70
0.03		0.090	2	1.6166	2.00	2	1.5974	3.90	2	1.6265	5.80
	0.120	2	1.6112	2.00	2	1.4320	3.90	2	1.4606	5.80	
	0.150	2	1.6201	2.00	2	1.2930	3.90	2	1.3220	5.80	
	0.300	2	1.6219	2.00	2	1.7599	3.89	2	1.8064	4.04	
	0.05	0.100	4	1.4564	4.00	3	1.4913	5.85	2	1.5674	5.80
0.05	0.150	2	1.3847	2.00	2	1.2928	3.90	2	1.3225	5.80	
	0.200	2	1.3835	2.00	2	1.0981	3.90	2	1.1275	5.80	
	0.250	2	1.3856	2.00	2	0.9312	3.90	2	0.9601	5.80	
	0.500	4	1.4588	4.00	2	1.2825	2.76	2	1.2824	4.12	

Table 4.3.2
Plan parameters for proposed resubmitted plan when σ is known
with $\rho = 0.25$ and $\lambda = 0.2$

		$m = 1$			$m = 2$			$m = 3$		
p_1	p_2	n	k_a	ASN	n	k_a	ASN	n	k_a	ASN
0.001	0.002	20	2.9710	20	14	3.0190	27.28	11	3.0552	31.88
	0.003	8	2.9009	8	6	2.9629	11.69	5	3.0106	14.49
	0.004	5	2.8511	5	4	2.9156	7.80	3	2.9910	8.69
	0.006	3	2.7797	3	2	2.8847	3.90	2	2.9271	5.80
	0.008	2	2.7140	2	2	2.7819	3.90	2	2.8243	5.80
	0.010	2	2.7119	2	2	2.6989	3.90	2	2.7416	5.80
	0.015	2	2.7143	2	2	2.5430	3.90	2	2.5852	5.80
	0.020	2	2.7012	2	2	2.4264	3.90	2	2.4697	5.80
0.0025	0.005	17	2.6770	17	12	2.7281	23.39	10	2.7615	28.98
	0.010	4	2.5364	4	3	2.6309	5.85	3	2.6652	8.69
	0.015	3	2.4953	3	2	2.5433	3.90	2	2.5851	5.80
	0.020	2	2.4260	2	2	2.4265	3.90	2	2.4687	5.80
	0.025	2	2.4300	2	2	2.3325	3.90	2	2.3754	5.80
	0.030	2	2.4255	2	2	2.2534	3.90	2	2.2960	5.80
	0.050	2	2.4256	2	2	2.0174	3.90	2	2.0599	5.80
0.005	0.010	15	2.4370	15	10	2.4930	19.49	8	2.5339	23.18
	0.015	6	2.3543	6	4	2.4339	7.80	3	2.5092	8.69
	0.020	4	2.3087	4	3	2.3581	5.85	2	2.4690	5.80
	0.030	2	2.1978	2	2	2.2536	3.90	2	2.2958	5.80
	0.040	2	2.1984	2	2	2.1233	3.90	2	2.1657	5.80
	0.050	2	2.1967	2	2	2.0175	3.90	2	2.0603	5.80
	0.100	2	2.1997	2	2	1.6544	3.90	2	1.6967	5.80
0.01	0.020	13	2.1766	13	9	2.2294	17.54	7	2.2758	20.29
	0.030	5	2.0775	5	4	2.1447	7.80	3	2.2198	8.69
	0.040	3	2.0108	3	2	2.1238	3.90	2	2.1662	5.80
	0.050	2	1.9488	2	2	2.0177	3.90	2	2.0601	5.80
	0.100	2	1.9455	2	2	1.6541	3.90	2	1.6965	5.80
	0.150	2	1.9466	2	2	1.4095	3.90	2	1.4517	5.80
	0.200	2	1.9472	2	2	1.2142	3.90	2	1.2571	5.80
0.03	0.060	9	1.7014	9	6	1.7700	11.69	5	1.8173	14.49
	0.090	4	1.6099	4	3	1.6451	5.85	2	1.7561	5.80
	0.120	2	1.4832	2	2	1.5475	3.90	2	1.5904	5.80
	0.150	2	1.5051	2	2	1.4091	3.90	2	1.4517	5.80
	0.300	2	1.5030	2	2	0.8974	3.90	2	0.9398	5.80
0.05	0.100	7	1.4437	7	5	1.5172	9.74	4	1.5750	11.59
	0.150	3	1.3363	3	2	1.4089	3.90	2	1.4516	5.80
	0.200	2	1.2650	2	2	1.2142	3.90	2	1.2567	5.80
	0.250	2	1.2693	2	2	1.0473	3.90	2	1.0896	5.80
	0.500	2	1.2627	2	2	0.5001	3.97	2	0.5001	5.92

4.3.1 Interpretation of the Table 4.3.1 – 4.3.2

These tables contains the computed values of n , m , k_a and ASN when sigma is known with ρ is 0.25 and λ 0.1 and 0.2 and various values of risk probabilities (P_1 and P_2). Table 4.1.1 contains the $\lambda = 0.1$ and Table 4.1.2 contains with same value of ρ at ρ is 0.25 and m varying from 1 to 3.

In Table 4.3.1, We note that for the same value of P_1 , as the P_2 changes from 0.002 to 0.020. When $P_1 = 0.001$ and $P_2 = 0.002$, the values of $n = 10$, $k_a = 2.9741$ and $ASN = 10.00$ at $\lambda = 0.1$ and $m = 1$. As the value of $P_2 = 0.020$, and same value of P_1 the values of $n = 2$, $k_a = 2.8283$ $ASN = 2.00$. So, it conclude that for the same value of P_1 , the sample size n and ASN are decreases as P_2 increases at ρ is 0.25. At $\lambda = 0.1$ and $m = 2$ the values of $n = 7$, $k_a = 3.0158$ and $ASN = 13.65$ When $P_1 = 0.001$ and $P_2 = 0.002$, similarly at $\lambda = 0.1$ and $m = 3$ the values of $n = 6$, $k_a = 3.0434$ and $ASN = 17.39$ for same values of P_1 and P_2 .

Now in the Table 4.3.2, at $\lambda = 0.2$ and $m = 1$ when $P_1 = 0.001$ and $P_2 = 0.002$, he values of $n = 20$, $k_a = 2.9710$ and $ASN = 20.00$. As the value of $P_2 = 0.020$, and same value of P_1 the values of $n = 2$, $k_a = 2.7012$ $ASN = 2.00$. So, it conclude that for the same value of P_1 , the sample size n and ASN are decreases as P_2 increases at ρ is 0.25. At $\lambda = 0.2$.

At $\lambda = 0.2$ and $m = 2$ the values of $n = 20.00$, $k_a = 3.0190$ and $ASN = 27.28$ when $P_1 = 0.001$ and $P_2 = 0.002$, similarly at $\lambda = 0.2$ and $m = 3$ the values of $n = 11$, $k_a = 3.0522$ and $ASN = 31.88$ for same values of P_1 and P_2 . So we conclude that in both tables keeping $P_1 = 0.001$ and $P_2 = 0.002$ constant as the value of m and λ increases then the value of n and ASN increases and the value of k_a decreases at ρ is 0.25.

Table 4.3.3
Plan parameters for proposed resubmitted plan when σ is known
with $\rho = 0.50$ and $\lambda = 0.1$

		$m = 1$			$m = 2$			$m = 3$		
p_1	p_2	n	k_a	ASN	n	k_a	ASN	n	k_a	ASN
0.001	0.002	8	2.9688	8.00	6	3.0106	11.69	5	3.0400	14.49
	0.003	3	2.8980	3.00	2	2.9772	3.90	2	3.0035	5.80
	0.004	2	2.8551	2.00	2	2.8818	3.90	2	2.9078	5.80
	0.006	2	2.8517	2.00	2	2.7415	3.90	2	2.7678	5.80
	0.008	2	2.8569	2.00	2	2.6383	3.90	2	2.6647	5.80
	0.010	2	2.8512	2.00	2	2.5557	3.90	2	2.5819	5.80
	0.015	2	2.8563	2.00	2	2.3999	3.90	2	2.4255	5.80
	0.020	2	2.8546	2.00	2	2.2833	3.90	2	2.3092	5.80
0.0025	0.005	7	2.6786	7.00	5	2.7213	9.75	4	2.7575	11.60
	0.010	2	2.5735	2.00	2	2.5557	3.90	2	2.5819	5.80
	0.015	2	2.5748	2.00	2	2.3996	3.90	2	2.4257	5.80
	0.020	2	2.5739	2.00	2	2.2835	3.90	2	2.3099	5.80
	0.025	2	2.5720	2.00	2	2.1897	3.90	2	2.2156	5.80
	0.030	2	2.5720	2.00	2	2.1102	3.90	2	2.1364	5.80
	0.050	2	2.5700	2.00	2	1.8748	3.90	2	2.7580	5.78
0.005	0.010	6	2.4388	6.00	4	2.4893	7.80	3	2.5350	8.69
	0.015	3	2.3825	3.00	2	2.3998	3.90	2	2.4257	5.80
	0.020	2	2.3441	2.00	2	2.2831	3.90	2	2.3092	5.80
	0.030	2	2.3424	2.00	2	2.1102	3.90	2	2.1363	5.80
	0.040	2	2.3421	2.00	2	1.9805	3.90	2	2.0061	5.80
	0.050	2	2.3396	2.00	2	1.8746	3.90	2	1.9005	5.80
	0.100	2	2.3434	1.99	2	2.4287	2.77	2	2.4286	4.14
0.01	0.020	5	2.1788	5.00	4	2.2161	7.80	3	2.2625	8.69
	0.030	2	2.0924	2.00	2	2.1101	3.90	2	2.1363	5.80
	0.040	2	2.0821	2.00	2	1.9802	3.90	2	2.0062	5.80
	0.050	2	2.0952	2.00	2	1.8743	3.90	2	1.9006	5.80
	0.100	2	2.0895	2.00	2	1.5109	3.90	2	1.5371	5.80
	0.150	2	2.0938	2.00	2	2.1835	2.76	2	2.1830	4.02
	0.200	2	1.9882	1.34	2	1.9884	2.72	2	1.9882	4.02
0.03	0.060	4	1.7079	4.00	3	1.7421	5.85	2	1.8103	5.80
	0.090	2	1.6451	2.00	2	1.5702	3.90	2	1.5962	5.80
	0.120	2	1.6492	2.00	2	1.4046	3.90	2	1.4312	5.80
	0.150	2	1.6480	2.00	2	1.2659	3.90	2	1.2925	5.80
	0.300	2	1.6488	1.84	2	1.6721	2.86	2	1.6709	4.01
0.05	0.100	3	1.4525	3.00	2	1.5109	3.90	2	1.5370	5.80
	0.150	2	1.4123	2.00	2	1.2658	3.90	2	1.2920	5.80
	0.200	2	1.4116	2.00	2	1.0713	3.90	2	1.0974	5.80
	0.250	2	1.4130	2.00	2	0.9039	3.90	2	0.9300	5.80
	0.500	2	1.1468	1.36	2	1.1466	2.68	2	1.1465	4.01

Table 4.3.4
Plan parameters for proposed resubmitted plan when σ is known
with $\rho = 0.50$ and $\lambda = 0.2$

		$m = 1$			$m = 2$			$m = 3$		
p_1	p_2	n	k_a	ASN	n	k_a	ASN	n	k_a	ASN
0.001	0.002	25	2.9715	16	11	3.0203	21.44	9	3.0532	26.08
	0.003	16	2.9092	7	5	2.9587	9.74	4	3.0103	11.59
	0.004	7	2.8503	4	3	2.9243	5.85	3	2.9553	8.69
	0.006	4	2.8119	3	2	2.8454	3.90	2	2.8839	5.80
	0.008	3	2.7420	2	2	2.7422	3.90	2	2.7801	5.80
	0.010	2	2.7539	2	2	2.6595	3.90	2	2.6976	5.80
	0.015	2	2.7537	2	2	2.5033	3.90	2	2.5414	5.80
	0.020	2	2.7540	2	2	2.3870	3.90	2	2.4250	5.80
0.0025	0.005	19	2.6777	14	9	2.7330	17.54	8	2.7616	23.18
	0.010	4	2.5673	4	3	2.5985	5.85	2	2.6976	5.80
	0.015	2	2.4668	2	2	2.5034	3.90	2	2.5413	5.80
	0.020	2	2.4611	2	2	2.3876	3.90	2	2.4251	5.80
	0.025	2	2.4581	2	2	2.2933	3.90	2	2.3312	5.80
	0.030	2	2.4706	2	2	2.2140	3.90	2	2.2522	5.80
	0.050	2	2.4669	2	2	1.9788	3.90	2	2.0165	5.80
0.005	0.010	12	2.4348	12	8	2.4931	15.59	7	2.5254	20.29
	0.015	5	2.3624	5	3	2.4422	5.85	3	2.4743	8.70
	0.020	3	2.2878	3	2	2.3870	3.90	2	2.4251	5.80
	0.030	2	2.2370	2	2	2.2140	3.90	2	2.2520	5.80
	0.040	2	2.2385	2	2	2.0839	3.90	2	2.1219	5.80
	0.050	2	2.2363	2	2	1.9781	3.90	2	2.0162	5.80
	0.100	2	2.2349	2	2	1.6153	3.90	2	1.6531	5.80
0.01	0.020	10	2.1739	10	7	2.2319	13.64	6	2.2683	17.39
	0.030	4	2.0865	4	3	2.1532	5.85	2	2.2521	5.80
	0.040	3	2.0447	3	2	2.0840	3.90	2	2.1219	5.80
	0.050	2	1.9895	2	2	1.9785	3.90	2	2.0161	5.80
	0.100	2	1.9881	2	2	1.6148	3.90	2	1.6531	5.80
	0.150	2	1.9906	2	2	1.3696	3.90	2	1.4083	5.80
	0.200	2	1.9899	2	2	1.1749	3.90	2	1.2128	5.80
0.03	0.060	7	1.7009	7	5	1.7662	9.75	4	1.8177	11.59
	0.090	3	1.5990	3	2	1.6742	3.90	2	1.7119	5.80
	0.120	2	1.5450	2	2	1.5082	3.90	2	1.5468	5.80
	0.150	2	1.5372	2	2	1.3698	3.90	2	1.4081	5.80
	0.300	2	1.5435	2	2	0.8576	3.90	2	0.8964	5.80
0.05	0.100	6	1.4448	6	4	1.5174	7.80	3	1.5848	8.69
	0.150	2	1.2995	2	2	1.3698	3.90	2	1.4077	5.80
	0.200	2	1.3086	2	2	1.1749	3.90	2	1.2129	5.80
	0.250	2	1.3071	2	2	1.0077	3.90	2	1.0461	5.80
	0.500	2	1.3067	2	2	0.5002	3.99	2	1.5744	5.95

4.3.2 Interpretation of the Table 4.3.3 – 4.3.4

These tables contains the computed values of n , m , k_α and ASN when sigma is known with ρ is 0.50 and λ 0.1 and 0.2 and various values of risk probabilities (P_1 and P_2). Table 4.3.3 contains the $\lambda = 0.1$ and Table 4.3.4 contains with same value of ρ at ρ is 0.50 and m varying from 1 to 3.

In Table 4.3.3, We note that for the same value of P_1 , as the P_2 changes from 0.002 to 0.020. When $P_1 = 0.001$ and $P_2 = 0.002$, the values of $n = 8$, $k_\alpha = 2.9688$ and $ASN = 8.00$ at $\lambda = 0.1$ and $m = 1$. As the value of $P_2 = 0.020$, and same value of P_1 the values of $n = 2$, $k_\alpha = 2.8546$ $ASN = 2.00$. So, it conclude that for the same value of P_1 , the sample size n and ASN are decreases as P_2 increases at ρ is 0.50. At $\lambda = 0.1$ and $m = 2$ the values of $n = 6$, $k_\alpha = 3.0106$ and $ASN = 11.69$ When $P_1 = 0.001$ and $P_2 = 0.002$, similarly at $\lambda = 0.1$ and $m = 3$ the values of $n = 5$, $k_\alpha = 3.0400$ and $ASN = 14.49$ for same values of P_1 and P_2 .

Now in the Table 4.3.4, at $\lambda = 0.2$ and $m = 1$ when $P_1 = 0.001$ and $P_2 = 0.002$, the values of $n = 20$, $k_\alpha = 2.9715$ and $ASN = 20.00$. As the value of $P_2 = 0.020$, and same value of P_1 the values of $n = 2$, $k_\alpha = 2.7540$ and $ASN = 2.00$. So, it conclude that for the same value of P_1 , the sample size n and ASN are decreases as P_2 increases at ρ is 0.50.

At $\lambda = 0.2$ and $m = 2$ the values of $n = 11$, $k_\alpha = 3.0203$ and $ASN = 21.44$ When $P_1 = 0.001$ and $P_2 = 0.002$, similarly at $\lambda = 0.2$ and $m = 3$ the values of $n = 9$, $k_\alpha = 3.0532$ and $ASN = 26.08$ for same values of P_1 and P_2 . So we conclude that in both tables keeping $P_1 = 0.001$ and $P_2 = 0.002$ constant as the value of m and λ increases then the value of n and ASN increases and the value of k_α decreases at ρ is 0.50.

Table 4.3.5
Plan parameters for proposed resubmitted plan when σ is known
with $\rho = 0.75$ and $\lambda = 0.1$

		$m = 1$			$m = 2$			$m = 3$		
p_1	p_2	n	k_a	ASN	n	k_a	ASN	n	k_a	ASN
0.001	0.002	5	2.9780	5.00	3	3.0213	5.85	3	3.0376	8.69
	0.003	2	2.9117	2.00	2	2.9232	3.90	2	2.9432	5.80
	0.004	2	2.9097	2.00	2	2.8275	3.90	2	2.8475	5.80
	0.006	2	2.9126	2.00	2	2.6874	3.90	2	2.7074	5.80
	0.008	2	2.9114	2.00	2	2.5844	3.90	2	2.6040	5.80
	0.010	2	2.9120	2.00	2	2.5018	3.90	2	2.5216	5.80
	0.015	2	2.9122	2.00	2	2.3453	3.90	2	3.0459	4.05
	0.020	2	2.9127	1.86	2	2.9295	2.69	2	2.9295	4.05
0.0025	0.005	4	2.6765	4.00	3	2.7189	5.85	3	2.7355	8.70
	0.010	2	2.6299	2.00	2	2.5017	3.90	2	2.5215	5.80
	0.015	2	2.6294	2.00	2	2.3453	3.90	2	2.3653	5.80
	0.020	2	2.6282	2.00	2	2.2289	3.90	2	2.2493	5.80
	0.025	2	2.6265	2.00	2	2.1355	3.90	2	2.1553	5.80
	0.030	2	2.6296	2.00	2	2.7248	3.89	2	2.7566	4.05
	0.050	2	2.5206	1.35	2	2.5206	2.69	2	2.5205	4.00
0.005	0.010	4	2.4503	4.00	3	2.4694	5.85	2	2.5217	5.80
	0.015	2	2.3973	2.00	2	2.3455	3.90	2	2.3655	5.80
	0.020	2	2.3971	2.00	2	2.2293	3.90	2	2.2490	5.80
	0.030	2	2.3982	2.00	2	2.0560	3.90	2	2.0760	5.80
	0.040	2	2.3989	2.00	2	1.9259	3.90	2	1.9459	5.80
	0.050	2	2.3985	2.00	2	2.4938	3.85	2	2.5206	4.03
	0.100	2	2.1573	1.34	2	2.1572	2.67	2	2.1574	4.07
0.01	0.020	3	2.1772	3.00	2	2.2294	3.90	2	2.2490	5.80
	0.030	2	2.1483	2.00	2	2.0561	3.90	2	2.0766	5.80
	0.040	2	2.1477	2.00	2	1.9260	3.90	2	1.9467	5.80
	0.050	2	2.1478	2.00	2	1.8205	3.90	2	1.8401	5.80
	0.100	2	2.1467	1.78	2	2.1573	2.70	2	2.1572	4.01
	0.150	2	1.9123	1.36	2	1.9122	2.68	2	1.9122	4.03
	0.200	2	1.7175	1.35	2	1.7177	2.77	2	1.7174	4.03
0.03	0.060	2	1.7028	2.00	2	1.7302	3.90	2	1.7500	5.80
	0.090	2	1.6963	2.00	2	1.5165	3.90	2	1.5360	5.80
	0.120	2	1.7028	2.00	2	1.3503	3.90	2	1.3702	5.80
	0.150	2	1.7014	2.00	2	1.2118	3.90	2	1.2321	5.80
	0.300	2	1.4002	1.35	2	1.4002	2.70	2	1.4003	4.07
0.05	0.100	2	1.4625	2.00	2	1.4567	3.90	2	1.4767	5.80
	0.150	2	1.4652	2.00	2	1.2120	3.90	2	1.2318	5.80
	0.200	2	1.4658	2.00	2	1.0174	3.90	2	1.0368	5.80
	0.250	2	1.4647	2.00	2	1.5501	2.67	2	1.5502	4.02
	0.500	2	1.4645	2.00	2	1.5344	2.27	2	1.3567	4.00

Table 4.3.6
Plan parameters for proposed resubmitted plan when σ is known
with $\rho = 0.75$ and $\lambda = 0.2$

		$m = 1$			$m = 2$			$m = 3$		
p_1	p_2	n	k_a	ASN	n	k_a	ASN	n	k_a	ASN
0.001	0.002	10	2.9728	10.00	7	3.0143	13.64	6	3.0420	17.39
	0.003	4	2.8980	4.00	3	2.9558	5.85	2	3.0315	5.80
	0.004	3	2.8787	3.00	2	2.9065	3.90	2	2.9356	5.80
	0.006	2	2.8305	2.00	2	2.7667	3.90	2	2.7956	5.80
	0.008	2	2.8275	2.00	2	2.6634	3.90	2	2.6925	5.80
	0.010	2	2.8320	2.00	2	2.5809	3.90	2	2.6100	5.80
	0.015	2	2.8307	2.00	2	2.4248	3.90	2	2.4536	5.80
	0.020	2	2.8321	2.00	2	2.3083	3.90	2	2.3375	5.80
0.0025	0.005	8	2.6775	8.00	6	2.7234	11.70	5	2.7557	14.49
	0.010	2	2.5412	2.00	2	2.5810	3.90	2	2.6100	5.80
	0.015	2	2.5482	2.00	2	2.4246	3.90	2	2.4541	5.80
	0.020	2	2.5502	2.00	2	2.3082	3.90	2	2.3374	5.80
	0.025	2	2.5495	2.00	2	2.2147	3.90	2	2.2435	5.80
	0.030	2	2.5505	2.00	2	2.1353	3.90	2	2.1645	5.80
	0.050	2	2.5499	2.00	2	1.8993	3.90	2	1.9284	5.80
0.005	0.010	7	2.4361	7.00	5	2.4874	9.74	4	2.5270	11.59
	0.015	3	2.3656	3.00	2	2.4248	3.90	2	2.4539	5.80
	0.020	2	2.3104	2.00	2	2.3083	3.90	2	2.3375	5.80
	0.030	2	2.3182	2.00	2	2.1357	3.90	2	2.1650	5.80
	0.040	2	2.3166	2.00	2	2.0052	3.90	2	2.0344	5.80
	0.050	2	2.3182	2.00	2	1.8994	3.90	2	1.9284	5.80
	0.100	2	2.3146	2.00	2	1.5360	3.90	2	2.5208	5.68
0.01	0.020	6	2.1750	6.00	4	2.2339	7.80	4	2.2543	11.59
	0.030	3	2.1120	3.00	2	2.1353	3.90	2	2.1643	5.80
	0.040	2	2.0671	2.00	2	2.0052	3.90	2	2.0344	5.80
	0.050	2	2.0668	2.00	2	1.8994	3.90	2	1.9285	5.80
	0.100	2	2.0689	2.00	2	1.5361	3.90	2	1.5651	5.80
	0.150	2	2.0681	2.00	2	1.2913	3.90	2	2.2698	5.76
	0.200	2	2.0692	1.94	2	2.1142	2.71	2	2.1142	4.07
0.03	0.060	4	1.6976	4.00	3	1.7628	5.85	3	1.7864	8.69
	0.090	2	1.6230	2.00	2	1.5955	3.90	2	1.6255	5.80
	0.120	2	1.6243	2.00	2	1.4298	3.90	2	1.4586	5.80
	0.150	2	1.6231	2.00	2	1.2911	3.90	2	1.3202	5.80
	0.300	2	1.6218	2.00	2	1.7596	3.83	2	1.7967	4.01
0.05	0.100	4	1.4622	4.00	3	1.4895	5.85	2	1.5653	5.80
	0.150	2	1.3848	2.00	2	1.2912	3.90	2	1.3199	5.80
	0.200	2	1.3851	2.00	2	1.0961	3.90	2	1.1256	5.80
	0.250	2	1.3878	2.00	2	0.9290	3.90	2	0.9583	5.80
	0.500	2	1.3909	2.00	2	0.9300	3.90	2	1.2723	4.01

4.3.3 Interpretation of the Table 4.3.5 – 4.3.6

These tables contains the computed values of n , m , k_α and ASN when sigma is known with ρ is 0.75 and λ 0.1 and 0.2 and various values of risk probabilities (P_1 and P_2). Table 4.3.5 contains the $\lambda = 0.1$ and Table 4.3.6 contains with same value of ρ at ρ is 0.75 and m varying from 1 to 3.

In Table 4.3.5, We note that for the same value of P_1 , as the P_2 changes from 0.002 to 0.020. When $P_1 = 0.001$ and $P_2 = 0.002$, the values of $n = 5$, $k_\alpha = 2.9780$ and $ASN = 5.00$ at $\lambda = 0.1$ and $m = 1$. As the value of $P_2 = 0.020$, and same value of P_1 the values of $n = 2$, $k_\alpha = 2.9127$ and $ASN = 1.86$. So, it conclude that for the same value of P_1 , the sample size n and ASN are decreases as P_2 increases at ρ is 0.75. At $\lambda = 0.1$ and $m = 2$ the values of $n = 3$, $k_\alpha = 3.0216$ and $ASN = 5.85$ When $P_1 = 0.001$ and $P_2 = 0.002$, similarly at $\lambda = 0.1$ and $m = 3$ the values of $n = 3$, $k_\alpha = 3.0376$ and $ASN = 8.69$ for same values of P_1 and P_2 .

Now in the Table 4.3.6, at $\lambda = 0.2$ and $m = 1$ when $P_1 = 0.001$ and $P_2 = 0.002$, the values of $n = 10$, $k_\alpha = 2.9728$ and $ASN = 10.00$. As the value of $P_2 = 0.020$, and same value of P_1 the values of $n = 2$, $k_\alpha = 2.8321$ and $ASN = 2.00$. So, it conclude that for the same value of P_1 , the sample size n and ASN are decreases as P_2 increases at ρ is 0.75.

At $\lambda = 0.2$ and $m = 2$ the values of $n = 7$, $k_\alpha = 3.0143$ and $ASN = 13.64$. When $P_1 = 0.001$ and $P_2 = 0.002$, similarly at $\lambda = 0.2$ and $m = 3$ the values of $n = 6$, $k_\alpha = 3.0420$ and $ASN = 17.39$ for same values of P_1 and P_2 . So we conclude that in both tables keeping $P_1 = 0.001$ and $P_2 = 0.002$ constant as the value of m and λ increases then the value of n and ASN increases and the value of k_α decreases at ρ is 0.75.

4.4 RESULTS OF PLAN PARAMETERS FOR PROPOSED RESUBMITTED PLAN WHEN σ IS UNKNOWN

Table 4. 4. 1
Plan parameters for proposed resubmitted plan when σ is unknown
with $\rho = 0.25$ and $\lambda = 0.1$

p_1	p_2	$m = 1$			$m = 2$			$m = 3$		
		n	k_a	ASN	n	k_a	ASN	n	k_a	ASN
0.001	0.002	55	2.9850	55	38	3.0434	74.06	32	3.0809	92.76
	0.003	21	2.9336	21	15	3.0341	29.23	13	3.0953	37.67
	0.004	13	2.9028	13	10	3.0216	19.49	9	3.0915	26.08
	0.006	8	2.8760	8	6	3.0396	11.69	6	3.0916	17.39
	0.008	6	2.8583	6	5	3.0064	9.74	4	3.2230	11.59
	0.010	5	2.8307	5	4	3.0449	7.79	4	3.1159	11.59
	0.015	4	2.8510	4	3	3.0998	5.85	3	3.1930	8.69
0.0025	0.020	3	2.8345	3	3	2.9397	5.85	3	3.0283	8.69
	0.005	40	2.6957	40	28	2.7571	54.57	23	2.8020	66.65
	0.010	10	2.6095	10	7	2.7611	13.64	6	2.8689	17.39
	0.015	6	2.5943	6	5	2.7165	9.74	4	2.9134	11.59
	0.020	4	2.58551	4	4	2.6989	7.79	3	3.0286	8.69
	0.025	4	2.5837	4	3	2.8103	5.85	3	2.8957	8.69
	0.030	3	2.5976	3	3	2.7018	5.85	3	2.7839	8.69
0.005	0.050	3	2.5922	3	2	2.9580	3.90	2	3.1032	5.80
	0.010	30	2.4567	30	21	2.5261	40.92	18	2.5698	52.16
	0.015	12	2.4108	12	9	2.5077	17.54	8	2.5761	23.18
	0.020	7	2.3820	7	6	2.4985	11.69	5	2.6272	14.49
	0.030	5	2.3702	5	4	2.4805	7.80	3	2.7841	8.69
	0.040	4	2.3682	4	3	2.5229	5.85	3	2.6006	8.69
	0.050	3	2.3785	3	3	2.3781	5.85	3	2.4521	8.69
0.01	0.100	2	2.4464	2	2	2.3428	3.90	2	2.4602	5.80
	0.020	21	2.2004	21	15	2.2799	29.24	13	2.3276	37.67
	0.030	8	2.1522	8	6	2.2953	11.69	6	2.3361	17.39
	0.040	5	2.1314	5	4	2.3157	7.79	4	2.3718	11.59
	0.050	4	2.1312	4	3	2.3780	5.85	3	2.4520	8.69
	0.100	2	2.1997	2	2	2.3428	3.90	2	2.4604	5.80
	0.150	2	2.2011	2	2	1.9341	3.90	2	2.0329	5.80
0.03	0.200	2	2.2065	2	2	1.6129	3.90	2	1.6991	5.80
	0.060	11	1.7414	11	8	1.8407	15.59	7	1.9033	20.29
	0.090	5	1.7069	5	4	1.8016	7.80	4	1.8475	11.59
	0.120	3	1.7083	3	3	1.7407	5.85	3	1.7983	8.69
	0.150	3	1.7073	3	2	1.9336	3.90	2	2.0331	5.80
	0.300	2	1.7466	2	2	1.1057	3.90	2	1.1715	5.80
	0.05	0.100	8	1.4999	8	6	1.5948	11.69	5	1.6836
0.150		3	1.4618	3	3	1.5553	5.85	3	1.6079	8.69
0.200		2	1.5179	2	2	1.6130	3.90	2	1.6990	5.80
0.250		2	1.5155	2	2	1.3429	3.90	2	1.4180	5.80
0.500		2	1.5152	2	2	0.3350	3.90	2	0.3772	5.80

4.4.1 Interpretation of the Table 4. 4. 1

This table contains the computed values of n , m , k_α and ASN when sigma is unknown with ρ is 0.25 and λ 0.1 and various values of risk probabilities (P_1 and P_2). Table 4.1.1 contains the $\lambda = 0.1$ and with same value of ρ at ρ is 0.25 and m varies from 1 to 3.

In Table 4.4.1, we note that for the same value of P_1 , as the P_2 changes from 0.002 to 0.020, for the same value of P_1 , When $P_1 = 0.0025$ and $P_2 = 0.005$ to 0.050 and so on $P_1 = 0.05$ and $P_2 = 0.050$. Now in the Table 4.4.1, the proposed parameters for at $\lambda = 0.1$ and $m = 1$, When $P_1 = 0.001$ and $P_2 = 0.002$ the values of $n = 55$, $k_\alpha = 2.9850$ and $ASN = 55$. As the value of $P_2 = 0.0025$ and value of P_1 is 0.005 the values of $n = 40$, $k_\alpha = 2.6957$ and $ASN = 40$. So, it conclude that for the same value of P_1 , the sample size n and ASN are decreases as values of k_α increases at ρ is 0.25.

At $\lambda = 0.1$ and $m = 2$ the proposed parameters for $P_1 = 0.001$ and $P_2 = 0.002$ the values of $n = 38$, $k_\alpha = 3.0434$ and $ASN = 74.06$. As the value of $P_2 = 0.005$ and value of P_1 is 0.0025 the values of $n = 28$, $k_\alpha = 2.7571$ and $ASN = 54.57$. So, it conclude that for the same value of P_1 , the sample size n and ASN are decreases as values of k_α increases at ρ is 0.25.

At $\lambda = 0.1$ and $m = 3$ the proposed parameters for $P_1 = 0.001$ and $P_2 = 0.002$ the values of $n = 32$ $k_\alpha = 3.0809$ and $ASN = 92.76$. As the value of $P_2 = 0.0025$ and value of P_1 is 0.005 the values of $n = 23$, $k_\alpha = 2.8020$ and $ASN = 66.65$. So, it conclude that for the same value of P_1 , the sample size n and ASN are decreases as values of k_α increases at ρ is 0.25.

From the above table, we conclude that as the value of So, it conclude that for the same value of P_1 , the sample size n and ASN are decreases as values of k_α increases at ρ is 0.25 and as the value of m increase then the values of ASN is decreases and k_α is also decreases.

Table 4. 4. 2
Plan parameters for proposed resubmitted plan when σ is unknown
with $\rho = 0.25$ and $\lambda = 0.2$

		$m = 1$			$m = 2$			$m = 3$		
p_1	p_2	n	k_a	ASN	n	k_a	ASN	n	k_a	ASN
0.001	0.002	115	2.9778	115	80	3.0317	155.93	66	3.0683	191.29
	0.003	43	2.9145	43	31	3.0035	60.42	26	3.0638	75.34
	0.004	26	2.8714	26	19	2.9883	37.03	16	3.0703	46.37
	0.006	15	2.8137	15	11	2.9769	21.44	10	3.0658	28.98
	0.008	11	2.7831	11	8	2.9766	15.59	8	3.0415	23.18
	0.010	9	2.7586	9	7	2.9391	13.64	6	3.1031	17.39
	0.015	6	2.7021	6	5	2.9415	9.74	5	3.0318	14.49
	0.020	5	2.6686	5	4	2.9684	7.79	4	3.0786	11.59
0.0025	0.005	82	2.6857	82	57	2.7454	111.09	48	2.7840	139.12
	0.010	19	2.5783	19	14	2.6956	27.28	12	2.7824	34.77
	0.015	11	2.5169	11	8	2.6910	15.59	7	2.8145	20.28
	0.020	8	2.4773	8	6	2.6814	11.69	6	2.7538	17.39
	0.025	6	2.4479	6	5	2.6694	9.74	5	2.7519	14.49
	0.030	5	2.4320	5	5	2.5663	9.74	4	2.8330	11.59
	0.050	4	2.4021	4	3	2.6962	5.85	3	2.8310	8.69
	0.010	61	2.4461	61	43	2.5103	83.80	36	2.5532	104.32
0.005	0.015	23	2.3770	23	17	2.4772	33.13	14	2.5583	40.57
	0.020	14	2.3337	14	10	2.4761	19.49	9	2.5615	26.08
	0.030	8	2.2777	8	6	2.4658	11.69	6	2.5334	17.39
	0.040	6	2.2248	6	5	2.3985	9.74	4	2.6490	11.59
	0.050	5	2.2142	5	4	2.4079	7.79	4	2.4997	11.59
	0.100	3	2.1895	3	3	2.1465	5.85	3	2.2571	8.69
	0.020	44	2.1866	44	31	2.2566	60.41	26	2.3046	75.35
	0.030	16	2.1109	16	12	2.2281	23.38	10	2.3199	28.98
0.01	0.040	10	2.0702	10	8	2.1912	15.59	7	2.2952	20.29
	0.050	7	2.0304	7	6	2.1727	11.69	5	2.3348	14.49
	0.100	3	1.9605	3	3	2.1464	5.85	3	2.2570	8.69
	0.150	3	1.9629	3	2	2.3851	3.90	2	2.5972	5.80
	0.200	2	1.9614	2	2	2.0005	3.90	2	2.1808	5.80
	0.060	23	1.7204	23	16	1.8060	31.18	14	1.8595	40.57
	0.090	8	1.6328	8	7	1.7455	13.64	6	1.8505	17.39
	0.120	5	1.5820	5	4	1.7729	7.79	4	1.8446	11.59
0.03	0.150	4	1.5674	4	3	1.7816	5.85	3	1.8765	8.69
	0.300	2	1.5581	2	2	1.3975	3.90	2	1.5301	5.80
	0.100	15	1.4664	15	11	1.5664	21.44	10	1.6200	28.98
	0.150	6	1.3801	6	5	1.4892	9.74	4	1.6547	11.59
0.05	0.200	4	1.3445	4	3	1.4964	5.85	3	1.5797	8.69
	0.250	3	1.3330	3	3	1.2566	5.85	2	1.8328	5.80
	0.500	2	1.3238	2	2	0.5123	3.90	2	0.5852	5.80

4.4.2 Interpretation of the Table 4.4.2

This table contains the computed values of n , m , k_α and ASN when sigma is unknown with ρ is 0.25 and λ 0.2 and various values of risk probabilities (P_1 and P_2), and m varies from 1 to 3.

In Table 4.4.2, we note that for the same value of P_1 , as the P_2 changes from 0.002 to 0.020, for the same value of P_1 , When $P_1 = 0.0025$ and $P_2 = 0.005$ to 0.050 and so on $P_1 = 0.05$ and $P_2 = 0.050$. Now in the table, the proposed parameters for at $\lambda = 0.1$ and $m = 1$, When $P_1 = 0.001$ and $P_2 = 0.002$ the values of $n = 55$, $k_\alpha = 2.9850$ and $ASN = 55$. As the value of $P_2 = 0.0025$ and value of P_1 is 0.005 the values of $n = 40$, $k_\alpha = 2.6957$ and $ASN = 40$. So, it conclude that for the same value of P_1 , the sample size n and ASN are decreases as values of k_α increases at ρ is 0.25.

At $\lambda = 0.1$ and $m = 2$ the proposed parameters for $P_1 = 0.001$ and $P_2 = 0.002$ the values of $n = 38$, $k_\alpha = 3.0434$ and $ASN = 74.06$. As the value of $P_2 = 0.005$ and value of P_1 is 0.0025 the values of $n = 28$, $k_\alpha = 2.7571$ and $ASN = 54.57$. So, it conclude that for the same value of P_1 , the sample size n and ASN are decreases as values of k_α increases at ρ is 0.25.

At $\lambda = 0.1$ and $m = 3$ the proposed parameters for $P_1 = 0.001$ and $P_2 = 0.002$ the values of $n = 32$ $k_\alpha = 3.0809$ and $ASN = 92.76$. As the value of $P_2 = 0.0025$ and value of P_1 is 0.005 the values of $n = 23$, $k_\alpha = 2.8020$ and $ASN = 66.65$. So, it conclude that for the same value of P_1 , the sample size n and ASN are decreases as values of k_α increases at ρ is 0.25.

From the above table, we conclude that as the value of So, it conclude that for the same value of P_1 , the sample size n and ASN are decreases as values of k_α increases at ρ is 0.25 and as the value of m increase then the values of ASN is decreases and k_α is also decreases.

Table 4.4.3
Plan parameters for proposed resubmitted plan when σ is unknown
with $\rho = 0.50$ and $\lambda = 0.1$

		$m = 1$			$m = 2$			$m = 3$		
p_1	p_2	n	k_a	ASN	n	k_a	ASN	n	k_a	ASN
0.001	0.002	53	2.9852	53	37	3.0433	72.10	31	3.0817	89.85
	0.003	21	2.9312	21	15	3.0298	29.23	13	3.0904	37.67
	0.004	13	2.9081	13	10	3.0162	19.49	8	3.1267	23.18
	0.006	8	2.8798	8	6	3.0326	11.69	5	3.1845	14.49
	0.008	6	2.8579	6	5	2.9986	9.74	4	3.2138	11.59
	0.010	5	2.8624	5	4	3.0361	7.79	4	3.1059	11.59
	0.015	4	2.8620	4	3	3.0893	5.85	3	3.1812	8.69
0.0025	0.020	3	2.8708	3	3	2.9284	5.85	3	3.0160	8.69
	0.005	38	2.6955	38	27	2.7580	52.62	23	2.7981	66.66
	0.010	9	2.6184	9	7	2.7540	13.64	6	2.8605	17.39
	0.015	6	2.5975	6	5	2.7077	9.74	4	2.9029	11.59
	0.020	4	2.5941	4	4	2.6891	7.79	3	3.0160	8.69
	0.025	4	2.5915	4	3	2.7988	5.85	3	2.8828	8.69
	0.030	3	2.6067	3	3	2.6895	5.85	3	2.7708	8.69
0.005	0.050	3	2.6035	3	2	2.9421	3.90	2	3.0853	5.80
	0.010	28	2.4581	28	20	2.5283	38.97	17	2.5739	49.26
	0.015	11	2.4106	11	8	2.5326	15.59	7	2.6127	20.28
	0.020	7	2.3817	7	6	2.4909	11.69	5	2.6170	14.49
	0.030	4	2.3723	4	4	2.4695	7.79	3	2.7707	8.69
	0.040	3	2.3772	3	3	2.5103	5.85	3	2.5868	8.69
	0.050	3	2.3886	3	3	2.3649	5.85	3	2.4374	8.69
0.01	0.100	2	2.4594	2	2	2.3237	3.90	2	2.4390	5.80
	0.020	20	2.2023	20	15	2.2741	29.23	13	2.3216	37.68
	0.030	8	2.1566	8	6	2.2865	11.69	6	2.3265	17.39
	0.040	5	2.1395	5	4	2.3049	7.80	4	2.3597	11.59
	0.050	4	2.1328	4	3	2.3651	5.85	3	2.4373	8.69
	0.100	2	2.2173	2	2	2.3238	3.90	2	2.4390	5.80
	0.150	2	2.2132	2	2	1.9113	3.90	2	2.0083	5.80
0.03	0.200	2	2.2145	2	2	1.5883	3.90	2	1.6712	5.80
	0.060	11	1.7459	11	8	1.8325	15.59	7	1.8931	20.28
	0.090	4	1.7137	4	4	1.7883	7.79	3	2.0105	8.69
	0.120	3	1.7115	3	3	1.7241	5.85	3	1.7799	8.69
	0.150	2	1.7515	2	2	1.9114	3.90	2	2.0084	5.80
	0.300	2	1.7645	2	2	1.0759	3.90	2	1.1384	5.80
	0.05	0.100	7	1.5033	7	6	1.5839	11.69	5	1.6691
0.150		3	1.4828	3	3	1.5374	5.85	3	1.5882	8.69
0.200		2	1.5334	2	2	1.5883	3.90	2	1.6712	5.80
0.250		2	1.5364	2	2	1.3156	3.90	2	1.3874	5.80
0.500		2	1.5280	2	2	0.2997	3.90	2	0.3375	5.80

4.4.3 Interpretation of the Table 4. 4. 3

This table contains the computed values of n , m , k_α and ASN when sigma is unknown with ρ is 0.50 and λ 0.1 and various values of risk probabilities (P_1 and P_2). Table 4.4.3 contains the $\lambda = 0.1$ and with same value of ρ at ρ is 0.50 and m varies from 1 to 3.

In Table 4.4.3, we note that for the same value of P_1 , as the P_2 changes from 0.002 to 0.020, for the same value of P_1 , When $P_1 = 0.0025$ and $P_2 = 0.005$ to 0.050 and so on $P_1 = 0.05$ and $P_2 = 0.050$. Now in the Table 4.1.2, at $\lambda = 0.1$ and $m = 1$, the proposed parameters for $P_1 = 0.001$ and $P_2 = 0.002$ to $P_1 = 0.0025$ and $P_2 = 0.040$ are not exist at ρ is 0.50. When $P_1 = 0.005$ and $P_2 = 0.100$ the values of $n = 240$, $k_\alpha = 1.8501$ and $ASN = 240$. As the value of $P_2 = 0.150$ and value of P_1 is 0.01 the values of $n = 200$, $k_\alpha = 1.6028$ and $ASN = 200$. As the value of $P_2 = 0.200$ and same value of P_1 then the values of $n = 139$, $k_\alpha = 1.4929$ and $ASN = 139$. So, it conclude that the sample size n and ASN are decreases as values of k_α increases at ρ is 0.50.

At $\lambda = 0.1$ and $m = 2$ the proposed parameters for $P_1 = 0.001$ and $P_2 = 0.002$ to $P_1 = 0.0025$ and $P_2 = 0.030$ are not exist at ρ is 0.50. When $P_1 = 0.0025$ and $P_2 = 0.050$ the values of $n = 301$ $k_\alpha = 2.4396$ and $ASN = 301$. Next the proposed parameters for $P_1 = 0.005$ and $P_2 = 0.050$ does not exist. When $P_1 = 0.005$ and $P_2 = 0.100$ the values of $n = 202$, $k_\alpha = 2.1667$ and $ASN = 202$. So, it conclude that the sample size n and ASN are decreases as values of k_α increases at ρ is 0.50.

At $\lambda = 0.1$ and $m = 3$ the proposed parameters for $P_1 = 0.001$ and $P_2 = 0.002$ to $P_1 = 0.0025$ and $P_2 = 0.030$ are not exist at ρ is 0.25. When $P_1 = 0.0025$ and $P_2 = 0.050$ the values of $n = 276$ $k_\alpha = 2.6257$ and $ASN = 799.75$. Next the proposed parameters for $P_1 = 0.005$ and $P_2 = 0.050$ does not exist. As the value of $P_2 = 0.050$ and value of P_1 is 0.005 the values of $n = 189$, $k_\alpha = 2.3756$ and $ASN = 547.67$. So, it conclude that the sample size n and ASN are decreases as values of k_α increases at ρ is 0.50.

Table 4. 4. 4
Plan parameters for proposed resubmitted plan when σ is unknown
with $\rho = 0.50$ and $\lambda = 0.2$

		$m = 1$			$m = 2$			$m = 3$		
p_1	p_2	n	k_a	ASN	n	k_a	ASN	n	k_a	ASN
0.001	0.002	111	2.9776	111	77	3.0321	150.05	64	3.0682	185.46
	0.003	42	2.9156	42	30	3.0040	58.46	25	3.0663	72.44
	0.004	25	2.8740	25	18	2.9945	35.08	16	3.0636	46.37
	0.006	15	2.8250	15	11	2.9695	21.44	10	3.0571	28.98
	0.008	11	2.7867	11	8	2.9678	15.59	7	3.1012	20.28
	0.010	9	2.7618	9	7	2.9292	13.64	6	3.0913	17.39
	0.015	6	2.7219	6	5	2.9291	9.74	5	3.0181	14.49
	0.020	5	2.6770	5	4	2.9541	7.79	4	3.0628	11.59
0.0025	0.005	79	2.6857	79	55	2.7454	107.18	46	2.7850	133.31
	0.010	18	2.5744	18	13	2.7069	25.33	12	2.7740	34.77
	0.015	10	2.5189	10	8	2.6809	15.59	7	2.8028	20.28
	0.020	8	2.4870	8	6	2.6697	11.69	6	2.7412	17.39
	0.025	6	2.4672	6	5	2.6555	9.74	5	2.7373	14.49
	0.030	5	2.4479	5	4	2.7155	7.79	4	2.8161	11.59
	0.050	4	2.4211	4	3	2.6770	5.85	3	2.8098	8.69
0.005	0.010	58	2.4464	58	41	2.5111	79.90	34	2.5560	98.53
	0.015	22	2.3762	22	16	2.4827	31.18	14	2.5500	40.57
	0.020	13	2.3314	13	10	2.4667	19.49	9	2.5505	26.08
	0.030	8	2.2811	8	6	2.4532	11.69	6	2.5190	17.39
	0.040	6	2.2566	6	5	2.3840	9.74	4	2.6310	11.59
	0.050	5	2.2290	5	4	2.3912	7.79	4	2.4810	11.59
	0.100	3	2.1902	3	3	2.1239	5.85	3	2.2315	8.69
0.01	0.020	41	2.1870	41	29	2.2593	56.51	25	2.3041	72.45
	0.030	15	2.1142	15	12	2.2192	23.39	10	2.3089	28.98
	0.040	9	2.0661	9	7	2.2266	13.64	7	2.2812	20.28
	0.050	7	2.0433	7	6	2.1588	11.69	5	2.3177	14.49
	0.100	3	1.9662	3	3	2.1240	5.85	3	2.2315	8.69
	0.150	3	1.9625	3	2	2.3522	3.90	2	2.5605	5.80
	0.200	2	1.9593	2	2	1.9637	3.90	2	2.1393	5.80
0.03	0.060	21	1.7187	21	15	1.8074	29.23	13	1.8639	37.67
	0.090	8	1.6323	8	6	1.7821	11.69	6	1.8336	17.39
	0.120	5	1.6050	5	4	1.7522	7.79	4	1.8218	11.59
	0.150	4	1.5850	4	3	1.7557	5.85	3	1.8474	8.69
	0.300	2	1.5656	2	2	1.3526	3.90	2	1.4788	5.80
0.05	0.100	14	1.4686	14	11	1.5545	21.44	9	1.6315	26.08
	0.150	5	1.3886	5	4	1.5663	7.79	4	1.6299	11.59
	0.200	3	1.3400	3	3	1.4679	5.85	3	1.5475	8.69
	0.250	3	1.3582	3	2	1.6376	3.90	2	1.7864	5.80
	0.500	2	1.3577	2	2	0.4581	3.90	2	0.5233	5.80

4.4.4 Interpretation of the Table 4.4.4

This table contains the computed values of n , m , k_a and ASN when sigma is unknown with ρ is 0.50 and λ 0.2 and various values of risk probabilities (P_1 and P_2). Table 4.4.4 contains $\lambda = 0.2$ and with same value of ρ at ρ is 0.50 and m varies from 1 to 3.

In Table 4.4.4, we note that for the same value of P_1 , as the P_2 changes from 0.002 to 0.020, for the same value of P_1 , When $P_1 = 0.0025$ and $P_2 = 0.005$ to 0.050 and so on $P_1 = 0.05$ and $P_2 = 0.050$. Now in the Table 4.1.2, at $\lambda = 0.2$ and $m = 1$, the proposed parameters for $P_1 = 0.001$ and $P_2 = 0.002$ to $P_1 = 0.001$ and $P_2 = 0.015$ does not exist at ρ is 0.50. When $P_1 = 0.001$ and $P_2 = 0.020$ the values of $n = 281$, $k_a = 1.5096$ and $ASN = 281$. Next the proposed parameters for $P_1 = 0.0025$ and $P_2 = 0.005$ does not exist. As the value of $P_2 = 0.050$ and value of P_1 is 0.0025 the values of $n = 177$, $k_a = 2.1561$ and $ASN = 177$. So, it conclude that the sample size n and ASN are decreases as values of k_a increases at ρ is 0.50.

At $\lambda = 0.2$ and $m = 2$ the proposed parameters for $P_1 = 0.001$ and $P_2 = 0.002$ to $P_1 = 0.001$ and $P_2 = 0.010$ are not exist at ρ is 0.50. When $P_1 = 0.001$ and $P_2 = 0.015$ the values of $n = 285$ $k_a = 2.8000$ and $ASN = 555.37$ and When $P_1 = 0.001$ and $P_2 = 0.020$ the values of $n = 220$ $k_a = 2.7672$ and $ASN = 428.72$ Next the proposed parameters for $P_1 = 0.005$ and $P_2 = 0.050$ does not exist. So, it conclude that the sample size n and ASN are decreases as values of k_a increases at ρ is 0.50.

At $\lambda = 0.2$ and $m = 3$ the proposed parameters for $P_1 = 0.001$ and $P_2 = 0.002$ to $P_1 = 0.001$ and $P_2 = 0.010$ are not exist at ρ is 0.25. When $P_1 = 0.001$ and $P_2 = 0.015$ the values of $n = 253$ $k_a = 2.9481$ and $ASN = 733.10$. As the value of $P_2 = 0.020$ and value of P_1 is 0.001 the values of $n = 197$, $k_a = 2.9322$ and $ASN = 570.84$. So, it conclude that the sample size n and ASN are decreases as values of k_a increases at ρ is 0.50.

Table 4.4.5
Plan parameters for proposed resubmitted plan when σ is unknown
with $\rho=0.75$ and $\lambda=0.1$

		$m = 1$			$m = 2$			$m = 3$		
p_1	p_2	n	k_a	ASN	n	k_a	ASN	n	k_a	ASN
0.001	0.002	50	2.9861	50	35	3.0444	68.20	30	3.0800	86.93
	0.003	19	2.9381	19	14	3.0361	27.28	12	3.1013	34.77
	0.004	12	2.9108	12	9	3.0372	17.54	8	3.1155	23.18
	0.006	7	2.8847	7	6	3.0210	11.69	5	3.1702	14.49
	0.008	6	2.8624	6	5	2.9855	9.74	4	3.1974	11.59
	0.010	5	2.8533	5	4	3.0211	7.79	4	3.0891	11.59
	0.015	4	2.8625	4	3	3.0712	5.85	3	3.1612	8.69
	0.020	3	2.8495	3	3	2.9093	5.85	3	2.9953	8.69
0.0025	0.005	36	2.6979	36	25	2.7611	48.72	21	2.8041	60.85
	0.010	9	2.6271	9	7	2.7423	13.64	6	2.8465	17.39
	0.015	5	2.6014	5	4	2.8210	7.79	4	2.8852	11.59
	0.020	4	2.6070	4	4	2.6725	7.79	3	2.9949	8.69
	0.025	4	2.6076	4	3	2.7791	5.85	3	2.8608	8.69
	0.030	3	2.6201	3	3	2.6696	5.85	3	2.7479	8.69
	0.050	2	2.6950	2	2	2.9154	3.90	2	3.0549	5.80
0.005	0.010	26	2.4601	26	19	2.5279	37.03	16	2.5754	46.37
	0.015	10	2.4133	10	8	2.5212	15.59	7	2.5992	20.29
	0.020	7	2.3903	7	5	2.5512	9.74	5	2.6001	14.49
	0.030	4	2.3914	4	4	2.4515	7.79	3	2.7482	8.69
	0.040	3	2.4016	3	3	2.4887	5.85	3	2.5624	8.69
	0.050	3	2.3942	3	3	2.3421	5.85	3	2.4119	8.69
	0.100	2	2.4738	2	2	2.2903	3.90	2	2.4016	5.80
0.01	0.020	19	2.2019	19	14	2.2752	27.28	12	2.3253	34.77
	0.030	7	2.1633	7	6	2.2714	11.69	5	2.3859	14.49
	0.040	5	2.1546	5	4	2.2856	7.79	4	2.3383	11.59
	0.050	4	2.1516	4	3	2.3423	5.85	3	2.4120	8.69
	0.100	2	2.2311	2	2	2.2909	3.90	2	2.4016	5.80
	0.150	2	2.2304	2	2	1.8724	3.90	2	1.9650	5.80
	0.200	2	2.2391	2	2	1.5436	3.90	2	1.6217	5.80
0.03	0.060	9	1.7518	9	7	1.8463	13.64	6	1.9185	17.39
	0.090	4	1.7287	4	3	1.9223	5.85	3	1.9810	8.69
	0.120	3	1.7178	3	3	1.6949	5.85	2	2.2113	5.80
	0.150	2	1.7824	2	2	1.8726	3.90	2	1.9648	5.80
	0.300	2	1.7911	2	2	1.0199	3.90	2	1.0754	5.80
0.05	0.100	6	1.5137	6	5	1.6123	9.74	5	1.6450	14.49
	0.150	3	1.5125	3	3	1.5056	5.85	3	1.5535	8.69
	0.200	2	1.5625	2	2	1.5440	3.90	2	1.6213	5.80
	0.250	2	1.5573	2	2	1.2654	3.90	2	1.3309	5.80
	0.500	2	1.5564	2	2	0.2290	3.90	2	0.2577	5.80

4.4.5 Interpretation of the Table 4. 4. 5

This table contains the computed values of n , m , k_α and ASN when sigma is unknown with ρ is 0.75 and λ 0.1 and various values of risk probabilities (P_1 and P_2). Table 4.4.5 contains $\lambda = 0.2$ and with same value of ρ at ρ is 0.75 and m varies from 1 to 3.

In Table 4.4.5, we note that for the same value of P_1 , as the P_2 changes from 0.002 to 0.020, for the same value of P_1 , When $P_1 = 0.0025$ and $P_2 = 0.005$ to 0.050 and so on $P_1 = 0.05$ and $P_2 = 0.050$. Now in the Table 4.1.2, at $\lambda = 0.1$ and $m = 1$, the proposed parameters for $P_1 = 0.001$ and $P_2 = 0.002$ to $P_1 = 0.005$ and $P_2 = 0.050$ does not exist at ρ is 0.75. When $P_1 = 0.005$ and $P_2 = 0.100$ the values of $n = 210$, $k_\alpha = 1.8512$ and $ASN = 21$. Next the proposed parameters for $P_1 = 0.010$ and $P_2 = 0.020$ does not exist. As the value of $P_2 = 0.050$ and value of P_1 is 0.010 the values of $n = 292$, $k_\alpha = 1.7408$ and $ASN = 292$. So, it conclude that the sample size n and ASN are decreases as values of k_α increases at ρ is 0.75.

At $\lambda = 0.1$ and $m = 2$ the proposed parameters for $P_1 = 0.001$ and $P_2 = 0.002$ to $P_1 = 0.001$ and $P_2 = 0.010$ are not exist at ρ is 0.50. When $P_1 = 0.0025$ and $P_2 = 0.050$ the values of $n = 276$ $k_\alpha = 2.4391$ and $ASN = 537.83$. Next the proposed parameters for $P_1 = 0.005$ and $P_2 = 0.010$ does not exist. When $P_1 = 0.005$ and $P_2 = 0.100$ the values of $n = 182$ $k_\alpha = 2.1660$ and $ASN = 354.66$. So, it conclude that the sample size n and ASN are decreases as values of k_α increases at ρ is 0.75.

At $\lambda = 0.1$ and $m = 3$ the proposed parameters for $P_1 = 0.001$ and $P_2 = 0.002$ to $P_1 = 0.001$ and $P_2 = 0.010$ are not exist at ρ is 0.25. When $P_1 = 0.0025$ and $P_2 = 0.050$ the values of $n = 255$ $k_\alpha = 2.6279$ and $ASN = 738.93$. Next the proposed parameters for $P_1 = 0.005$ and $P_2 = 0.010$ does not exist. When $P_1 = 0.005$ and $P_2 = 0.100$ the values of $n = 173$ $k_\alpha = 2.3765$ and $ASN = 501.30$. So, it conclude that the sample size n and ASN are decreases as values of k_α increases at ρ is 0.75.

Table 4.4.6
Plan parameters for proposed resubmitted plan when σ is unknown
with $\rho = 0.75$ and $\lambda = 0.2$

p_1	p_2	$m = 1$			$m = 2$			$m = 3$		
		n	k_a	ASN	n	k_a	ASN	n	k_a	ASN
0.001	0.002	104	2.9782	104	72	3.0335	140.31	60	3.0697	173.86
	0.003	39	2.9175	39	28	3.0074	54.56	24	3.0653	69.54
	0.004	24	2.8755	24	18	2.9848	35.08	15	3.0698	43.46
	0.006	14	2.8188	14	11	2.9565	21.44	9	3.0863	26.08
	0.008	10	2.7923	10	8	2.9524	15.59	7	3.0829	20.28
	0.010	8	2.7644	8	7	2.9122	13.64	6	3.0706	17.39
	0.015	6	2.7261	6	5	2.9080	9.74	5	2.9949	14.49
	0.020	5	2.7190	5	4	2.9296	7.79	4	3.0355	11.59
0.0025	0.005	73	2.6865	73	51	2.7469	99.38	43	2.7863	124.63
	0.010	17	2.5708	17	13	2.6942	25.33	11	2.7869	31.87
	0.015	10	2.5220	10	8	2.6641	15.59	7	2.7826	20.28
	0.020	7	2.4969	7	6	2.6493	11.69	5	2.8377	14.49
	0.025	6	2.4833	6	5	2.6327	9.74	4	2.9007	11.59
	0.030	5	2.4348	5	4	2.6891	7.79	4	2.7867	11.59
	0.050	3	2.4295	3	3	2.6436	5.85	3	2.7724	8.69
0.005	0.010	54	2.4471	54	38	2.5124	74.06	32	2.5553	92.73
	0.015	20	2.3781	20	15	2.4838	29.23	13	2.5546	37.67
	0.020	12	2.3356	12	9	2.4831	17.54	8	2.5772	23.18
	0.030	7	2.2856	7	6	2.4318	11.69	5	2.6050	14.49
	0.040	5	2.2565	5	4	2.5084	7.79	4	2.5999	11.59
	0.050	4	2.2377	4	4	2.3617	7.79	4	2.4488	11.59
	0.100	3	2.2041	3	3	2.0833	5.85	3	2.1864	8.69
0.01	0.020	37	2.1882	37	27	2.2585	52.61	23	2.3054	66.65
	0.030	14	2.1147	14	11	2.2241	21.44	9	2.3232	26.08
	0.040	9	2.0744	9	7	2.2053	13.64	6	2.3272	17.39
	0.050	6	2.0419	6	5	2.2208	9.74	5	2.2883	14.49
	0.100	3	1.9925	3	3	2.0834	5.85	3	2.1864	8.69
	0.150	2	2.0034	2	2	2.2950	3.90	2	2.4959	5.80
	0.200	2	2.0192	2	2	1.8977	3.90	2	2.0652	5.80
0.03	0.060	18	1.7220	18	14	1.8024	27.28	12	1.8608	34.77
	0.090	7	1.6442	7	6	1.7541	11.69	5	1.8825	14.49
	0.120	4	1.6069	4	4	1.7149	7.79	4	1.7800	11.59
	0.150	3	1.5918	3	3	1.7094	5.85	3	1.7954	8.69
	0.300	2	1.6025	2	2	1.2686	3.90	2	1.3837	5.80
0.05	0.100	12	1.4756	12	9	1.5723	17.54	8	1.6348	23.18
	0.150	5	1.4177	5	4	1.5263	7.80	3	1.4890	8.69
	0.200	3	1.3744	3	3	1.4156	5.85	2	1.7023	5.80
	0.250	2	1.3785	2	2	1.5625	3.90	2	0.3997	5.80
	0.500	2	1.3904	2	2	0.3499	3.90	23	1.3533	66.64

4.4.6 Interpretation of the Table 4. 4. 6

This table contains the computed values of n , m , k_α and ASN when sigma is unknown with ρ is 0.75 and λ 0.2 and various values of risk probabilities (P_1 and P_2). Table 4.4.6 contains $\lambda = 0.2$ and with same value of ρ at ρ is 0.75 and m varies from 1 to 3.

In Table 4.4.6, we note that for the same value of P_1 , as the P_2 changes from 0.002 to 0.020, for the same value of P_1 , When $P_1 = 0.0025$ and $P_2 = 0.005$ to 0.050 and so on $P_1 = 0.05$ and $P_2 = 0.050$. Now in the Table 4.1.2, at $\lambda = 0.2$ and $m = 1$, the proposed parameters for $P_1 = 0.001$ and $P_2 = 0.015$ does not exist at ρ is 0.75. When $P_1 = 0.001$ and $P_2 = 0.020$ the values of $n = 259$, $k_\alpha = 2.5102$ and $ASN = 259$. So, it conclude that the sample size n and ASN are decreases as values of k_α increases at ρ is 0.75.

At $\lambda = 0.2$ and $m = 2$ the proposed parameters for $P_1 = 0.001$ and $P_2 = 0.010$ does not exist at ρ is 0.75. When $P_1 = 0.001$ and $P_2 = 0.015$ the values of $n = 266$, $k_\alpha = 2.8004$ and $ASN = 518.35$ and When $P_1 = 0.001$ and $P_2 = 0.020$ the values of $n = 205$, $k_\alpha = 2.7644$ and $ASN = 399.49$. Next the proposed parameters for $P_1 = 0.005$ and $P_2 = 0.050$ does not exist. As the value of $P_2 = 0.025$ and value of P_1 is 0.0025 the values of $n = 264$, $k_\alpha = 2.5399$ and $ASN = 514.45$ and the value of $P_2 = 0.030$ and value of P_1 is 0.0025 the values of $n = 217$, $k_\alpha = 2.5154$ and $ASN = 422.86$. So, it conclude that the sample size n and ASN are decreases as values of k_α increases at ρ is 0.75.

At $\lambda = 0.2$ and $m = 3$ the proposed parameters for $P_1 = 0.001$ and $P_2 = 0.010$ does not exist at ρ is 0.75. When $P_1 = 0.001$ and $P_2 = 0.015$ the values of $n = 237$, $k_\alpha = 2.9497$ and $ASN = 686.75$ and When $P_1 = 0.001$ and $P_2 = 0.020$ the values of $n = 185$, $k_\alpha = 2.9324$ and $ASN = 536.08$. Next the proposed parameters for $P_1 = 0.005$ and $P_2 = 0.050$ does not exist. As the value of $P_2 = 0.025$ and value of P_1 is 0.0025 the values of $n = 212$, $k_\alpha = 2.4493$ and $ASN = 614.31$ and the value of $P_2 = 0.030$ and value of P_1 is 0.0025 the values of $n = 165$, $k_\alpha = 2.4333$ and $ASN = 478.15$. So, it conclude that the sample size n and ASN are decreases as values of k_α increases at ρ is 0.75.

4.5 COMPARISON TABLES OF PLAN PARAMETERS FOR PROPOSED MDS PLAN WHEN σ IS KNOWN AND UNKNOWN

Table 4. 5. 1
Comparison of proposed MDS plan when σ is known
with $\lambda = 0.1$ and $\rho = 0.25, 0.75$

p_1	p_2	$\rho = 0.25$				$\rho = 0.75$			
		n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	6	2	2.9995	0.3320	3	2	3.0012	2.5725
	0.003	3	2	2.9407	2.4982	2	3	2.9266	0.2315
	0.004	2	6	2.8865	0.7162	2	8	2.8248	1.2866
	0.006	2	5	2.8160	1.5617	2	6	2.9471	0.0043
	0.008	2	3	2.7892	0.8412	2	6	2.6257	0.3289
	0.010	2	2	2.8040	2.0527	2	2	2.6735	1.2082
	0.015	2	2	2.3807	0.8922	2	2	2.9808	0.9935
	0.020	2	4	2.5062	2.2058	2	10	2.2057	1.7197
0.0025	0.005	5	2	2.7092	2.4942	3	3	2.7021	0.9377
	0.010	2	10	2.5883	0.6940	2	8	2.4956	0.7389
	0.015	2	3	2.4899	2.0876	2	2	2.4100	0.0210
	0.020	2	5	2.3190	1.0002	2	8	2.4220	0.3586
	0.025	2	9	2.1825	0.8788	2	8	2.4383	2.3571
	0.030	2	3	2.1281	1.5657	2	8	2.4908	2.1032
	0.050	2	5	1.8611	0.6671	2	3	2.0816	1.5517
0.005	0.010	5	3	2.4564	0.5685	2	2	2.4697	2.0984
	0.015	2	5	2.3809	1.8316	2	7	2.3573	0.2637
	0.020	2	9	2.3200	1.0024	2	10	2.2131	1.3295
	0.030	2	4	2.2088	1.1908	2	5	2.1591	1.3232
	0.040	2	4	2.0387	1.3546	2	2	2.4186	0.3945
	0.050	2	4	1.9434	0.9025	2	3	2.2843	1.8919
	0.100	2	3	2.0731	0.1659	2	5	1.6768	1.3874
0.01	0.020	4	3	2.1992	0.3965	2	4	2.1988	1.1708
	0.030	2	3	2.0886	0.0459	2	5	2.0923	0.6626
	0.040	2	6	2.0335	1.9447	2	2	1.9455	1.2823
	0.050	2	2	2.1202	0.4414	2	7	1.8308	0.6994
	0.100	2	4	1.8828	0.9729	2	8	1.9655	0.8274
	0.150	2	10	1.7324	0.5713	2	6	1.5375	0.9871
	0.200	2	3	1.5981	0.6257	2	4	1.3978	0.4558
0.03	0.060	3	2	1.7546	0.7373	2	7	1.7372	0.5088
	0.090	2	6	1.6405	0.4290	2	7	1.5681	0.3516
	0.120	2	2	1.5323	0.2496	2	2	1.6234	1.0146
	0.150	2	6	1.4805	1.1859	2	8	1.7295	1.4957
	0.300	2	5	1.6015	0.9860	2	6	1.6261	0.2455
0.05	0.100	2	2	1.4908	0.1182	2	9	1.4394	0.7117
	0.150	2	5	1.2629	0.6008	2	7	1.3215	0.4233
	0.200	2	2	1.4219	0.8097	2	4	1.2802	0.9717
	0.250	2	4	1.3117	0.4794	2	4	1.0709	0.9153
	0.500	2	7	0.9960	0.8950	2	4	0.4439	0.0108

Table 4.5.2
Comparison of proposed MDS plan when σ is unknown
with $\lambda = 0.1$ and $\rho = 0.25, 0.75$

		$\rho = 0.25$				$\rho = 0.75$			
p_1	p_2	n	m	k_a	k_r	n	m	k_a	k_r
0.001	0.002	-	-	-	-	-	-	-	-
	0.003	202	2	2.9480	1.0989	199	2	2.9490	2.5793
	0.004	121	2	2.9098	1.5099	119	2	2.9112	0.0589
	0.006	67	2	2.8546	1.8504	67	2	2.8542	1.7751
	0.008	47	2	2.8163	0.9867	47	2	2.8138	1.3997
	0.010	37	2	2.7817	1.9674	37	2	2.7892	0.3547
	0.015	25	2	2.7271	2.2027	24	2	2.7233	2.1278
	0.020	19	2	2.6892	1.3136	19	2	2.6821	1.4795
0.0025	0.005	-	-	-	-	-	-	-	-
	0.010	82	2	2.6093	1.0359	80	2	2.6122	0.7641
	0.015	44	2	2.5521	0.4217	44	2	2.5527	1.0587
	0.020	31	2	2.5022	2.0456	31	2	2.5042	1.7989
	0.025	24	2	2.4717	1.7713	24	2	2.4700	0.0967
	0.030	20	2	2.4413	0.3517	20	2	2.4432	0.9000
	0.050	12	2	2.3638	1.5569	12	2	2.3709	0.3778
0.005	0.010	-	-	-	-	-	-	-	-
	0.015	97	2	2.4104	1.9446	96	2	2.4092	1.4387
	0.020	57	2	2.3627	0.8756	56	2	2.3652	0.1691
	0.030	31	2	2.296	1.6974	31	2	2.3039	0.7693
	0.040	21	2	2.2536	0.4215	21	2	2.2511	1.7812
	0.050	17	3	2.1821	0.251	16	2	2.2169	1.4911
	0.100	8	3	2.0555	1.311	8	3	2.0540	0.4495
0.01	0.020	180	2	2.2142	0.0898	180	2	2.2146	0.4265
	0.030	64	2	2.1455	1.0319	64	2	2.1436	0.8486
	0.040	37	2	2.0927	1.7857	37	2	2.0947	0.0387
	0.050	26	2	2.0548	1.008	26	2	2.0401	1.7461
	0.100	10	2	1.9246	1.3282	10	2	1.9343	1.1909
	0.150	7	5	1.7508	1.4513	7	2	1.7834	0.8812
	0.200	5	2	1.7146	1.0871	5	3	1.6898	0.9923
0.03	0.060	82	2	1.748	0.3604	79	2	1.7488	0.6120
	0.090	28	2	1.6609	0.5123	27	2	1.6639	1.2213
	0.120	16	2	1.5821	1.3002	15	2	1.6122	0.0359
	0.150	11	4	1.5096	0.8175	10	2	1.5551	1.1566
	0.300	4	3	1.347	0.8207	4	2	1.3655	0.3585
0.05	0.100	48	2	1.4985	0.1298	48	2	1.4928	1.3189
	0.150	16	2	1.4062	0.0202	16	2	1.4017	0.8528
	0.200	9	3	1.3121	0.3081	9	2	1.3567	0.6285
	0.250	6	2	1.2936	0.9402	6	2	1.2781	0.2232
	0.500	2	4	1.0804	0.1046	2	2	1.1126	0.7584

4.5.1 Interpretation of Table 4.5.1 and 4.5.2

In Table 4.5.1 the computed values of comparison of proposed MDS plan parameters which are n , m , k_a and K_r at $\lambda = 0.1$ and ρ is 0.25 and 0.75 with various values of risk probabilities (P_1 and P_2) when sigma is known. In order to compare the values of n , m , k_a and k_r with different values of ρ we note that for the same value of P_1 , as the P_2 changes from 0.002 to 0.020. When $P_1 = 0.001$ and $P_2 = 0.002$, the values of $n = 6$, $m = 2$, $k_a = 2.9995$ and $K_r = 0.3220$ at $\rho = 0.25$ and when $\rho = 0.75$ the values of $n = 3$, $m = 2$, $k_a = 3.0012$ and $K_r = 2.5725$. So, it conclude that for the same value of P_1 , the sample size n and k_a are decreases as ρ increases same value of λ .

In Table 4.5.2 the computed values of comparison of proposed MDS plan parameters which are n , m , k_a and K_r at $\lambda = 0.1$ and ρ is 0.25 and 0.75 with various values of risk probabilities (P_1 and P_2) when sigma is unknown. In order to compare the values of n , m , k_a and k_r with different values of ρ we note that for the same value of P_1 , as the P_2 changes from 0.002 to 0.020. When $P_1 = 0.001$ and $P_2 = 0.002$ the values of $n = 6$, $m = 2$, $k_a = 2.9995$ and $K_r = 0.3320$ at $\rho = 0.25$ and when $\rho = 0.75$ the values of $n = 199$, $m = 2$, $k_a = 2.9490$ and $K_r = 2.5793$. So, it conclude that for the same value of P_1 , the sample size n and k_a are decreases as ρ increases at same value of λ .

It can be noted that the reduction ratios are much higher for sigma unknown case than for the sigma known case.

4.6 COMPARISON TABLES OF PLAN PARAMETERS FOR PROPOSED RESUBMITTED PLAN WHEN SIGMA (σ) IS KNOWN AND UNKNOWN

Table 4. 6. 1

Plan parameters for proposed resubmitted plan with $\lambda = 0.1$ When σ is known

		$\rho = 0.25$						$\rho = 0.50$					
		$m = 1$			$m = 3$			$m = 1$			$m = 3$		
p_1	p_2	n	k_a	ASN	n	k_a	ASN	n	k_a	ASN	n	k_a	ASN
0.001	0.002	10	2.9741	10.00	6	3.0434	17.39	8	2.9688	8.00	5	3.0400	14.49
	0.003	4	2.9075	4.00	2	3.0336	5.80	3	2.8980	3.00	2	3.0035	5.80
	0.004	3	2.8690	3.00	2	2.9378	5.80	2	2.8551	2.00	2	2.9078	5.80
	0.006	2	2.8313	2.00	2	2.7978	5.80	2	2.8517	2.00	2	2.7678	5.80
	0.008	2	2.8298	2.00	2	2.6946	5.80	2	2.8569	2.00	2	2.6647	5.80
	0.010	2	2.8314	2.00	2	2.6126	5.80	2	2.8512	2.00	2	2.5819	5.80
	0.015	2	2.8301	2.00	2	2.4559	5.80	2	2.8563	2.00	2	2.4255	5.80
	0.020	2	2.8283	2.00	2	2.3394	5.80	2	2.8546	2.00	2	2.3092	5.80
0.0025	0.005	8	2.6776	8.00	5	2.7571	14.50	7	2.6786	7.00	4	2.7575	11.60
	0.010	2	2.5394	2.00	2	2.6123	5.80	2	2.5735	2.00	2	2.5819	5.80
	0.015	2	2.5471	2.00	2	2.4558	5.80	2	2.5748	2.00	2	2.4257	5.80
	0.020	2	2.5484	2.00	2	2.3396	5.80	2	2.5739	2.00	2	2.3099	5.80
	0.025	2	2.5473	2.00	2	2.2457	5.80	2	2.5720	2.00	2	2.2156	5.80
	0.030	2	2.5424	2.00	2	2.1667	5.80	2	2.5720	2.00	2	2.1364	5.80
	0.050	2	2.5484	2.00	2	1.9305	5.80	2	2.5700	2.00	2	2.7580	5.78
0.005	0.010	7	2.4361	7.00	4	2.5287	11.59	6	2.4388	6.00	3	2.5350	8.69
	0.015	3	2.3648	3.00	2	2.4558	5.80	3	2.3825	3.00	2	2.4257	5.80
	0.020	2	2.3119	2.00	2	2.3394	5.80	2	2.3441	2.00	2	2.3092	5.80
	0.030	2	2.3157	2.00	2	2.1666	5.80	2	2.3424	2.00	2	2.1363	5.80
	0.040	2	2.3128	2.00	2	2.0372	5.80	2	2.3421	2.00	2	2.0061	5.80
	0.050	2	2.3168	2.00	2	1.9308	5.80	2	2.3396	2.00	2	1.9005	5.80
	0.100	2	2.3170	2.00	2	2.5226	5.78	2	2.3434	1.99	2	2.4286	4.14
0.01	0.020	6	2.1749	6.00	4	2.2557	11.59	5	2.1788	5.00	3	2.2625	8.69
	0.030	3	2.1089	3.00	2	2.1666	5.80	2	2.0924	2.00	2	2.1363	5.80
	0.040	2	2.0623	2.00	2	2.0367	5.80	2	2.0821	2.00	2	2.0062	5.80
	0.050	2	2.0601	2.00	2	1.9305	5.80	2	2.0952	2.00	2	1.9006	5.80
	0.100	2	2.0664	2.00	2	1.5672	5.80	2	2.0895	2.00	2	1.5371	5.80
	0.150	2	2.0669	2.00	2	1.3221	5.80	2	2.0938	2.00	2	2.1830	4.02
	0.200	2	2.0678	1.97	2	2.1238	4.07	2	1.9882	1.34	2	1.9882	4.02
0.03	0.060	4	1.6972	4.00	3	1.7886	8.70	4	1.7079	4.00	2	1.8103	5.80
	0.090	2	1.6166	2.00	2	1.6265	5.80	2	1.6451	2.00	2	1.5962	5.80
	0.120	2	1.6112	2.00	2	1.4606	5.80	2	1.6492	2.00	2	1.4312	5.80
	0.150	2	1.6201	2.00	2	1.3220	5.80	2	1.6480	2.00	2	1.2925	5.80
	0.300	2	1.6219	2.00	2	1.8064	4.04	2	1.6488	1.84	2	1.6709	4.01
0.05	0.100	4	1.4564	4.00	2	1.5674	5.80	3	1.4525	3.00	2	1.5370	5.80
	0.150	2	1.3847	2.00	2	1.3225	5.80	2	1.4123	2.00	2	1.2920	5.80
	0.200	2	1.3835	2.00	2	1.1275	5.80	2	1.4116	2.00	2	1.0974	5.80
	0.250	2	1.3856	2.00	2	0.9601	5.80	2	1.4130	2.00	2	0.9300	5.80
	0.500	4	1.4588	4.00	2	1.2824	4.12	2	1.1468	1.36	2	1.1465	4.01

Table 4. 6. 2
Plan parameters for proposed resubmitted plan with $\lambda = 0.1$
When σ is unknown

		$\rho = 0.25$						$\rho = 0.50$					
		$m = 1$			$m = 3$			$m = 1$			$m = 3$		
p_1	p_2	n	k_a	ASN	n	k_a	ASN	n	k_a	ASN	n	k_a	ASN
0.001	0.002	55	2.9851	55.00	32	3.0809	92.76	53	2.9852	53	31	3.0817	89.85
	0.003	21	2.9336	21.00	13	3.0953	37.67	21	2.9312	21	13	3.0904	37.67
	0.004	13	2.9029	13.00	9	3.0915	26.08	13	2.9081	13	8	3.1267	23.18
	0.006	8	2.8760	8.00	6	3.0916	17.39	8	2.8798	8	5	3.1845	14.49
	0.008	6	2.8584	6.00	4	3.2230	11.59	6	2.8579	6	4	3.2138	11.59
	0.010	5	2.8308	5.00	4	3.1159	11.59	5	2.8624	5	4	3.1059	11.59
	0.015	4	2.8511	4.00	3	3.1930	8.69	4	2.8620	4	3	3.1812	8.69
	0.020	3	2.8345	3.00	3	3.0283	8.69	3	2.8708	3	3	3.0160	8.69
0.0025	0.005	40	2.6957	40.00	23	2.8020	66.65	38	2.6955	38	23	2.7981	66.66
	0.010	10	2.6096	10.00	6	2.8689	17.39	9	2.6184	9	6	2.8605	17.39
	0.015	6	2.5943	6.00	4	2.9134	11.59	6	2.5975	6	4	2.9029	11.59
	0.020	4	2.5855	4.00	3	3.0286	8.69	4	2.5941	4	3	3.0160	8.69
	0.025	4	2.5837	4.00	3	2.8957	8.69	4	2.5915	4	3	2.8828	8.69
	0.030	3	2.5976	3.00	3	2.7839	8.69	3	2.6067	3	3	2.7708	8.69
	0.050	3	2.5922	3.00	2	3.1032	5.80	3	2.6035	3	2	3.0853	5.80
0.005	0.010	30	2.4567	30.00	18	2.5698	52.16	28	2.4581	28	17	2.5739	49.26
	0.015	12	2.4109	12.00	8	2.5761	23.18	11	2.4106	11	7	2.6127	20.28
	0.020	7	2.3820	7.00	5	2.6272	14.49	7	2.3817	7	5	2.6170	14.49
	0.030	5	2.3702	5.00	3	2.7841	8.69	4	2.3723	4	3	2.7707	8.69
	0.040	4	2.3682	4.00	3	2.6006	8.69	3	2.3772	3	3	2.5868	8.69
	0.050	3	2.3785	3.00	3	2.4521	8.69	3	2.3886	3	3	2.4374	8.69
	0.100	2	2.4464	2.00	2	2.4602	5.80	2	2.4594	2	2	2.4390	5.80
0.01	0.020	21	2.2004	21.00	13	2.3276	37.67	20	2.2023	20	13	2.3216	37.68
	0.030	8	2.1522	8.00	6	2.3361	17.39	8	2.1566	8	6	2.3265	17.39
	0.040	5	2.1314	5.00	4	2.3718	11.59	5	2.1395	5	4	2.3597	11.59
	0.050	4	2.1312	4.00	3	2.4520	8.69	4	2.1328	4	3	2.4373	8.69
	0.100	2	2.1997	2.00	2	2.4604	5.80	2	2.2173	2	2	2.4390	5.80
	0.150	2	2.2011	2.00	2	2.0329	5.80	2	2.2132	2	2	2.0083	5.80
	0.200	2	2.2065	2.00	2	1.6991	5.80	2	2.2145	2	2	1.6712	5.80
0.03	0.060	11	1.7414	11.00	7	1.9033	20.29	11	1.7459	11	7	1.8931	20.28
	0.090	5	1.7069	5.00	4	1.8475	11.59	4	1.7137	4	3	2.0105	8.69
	0.120	3	1.7083	3.00	3	1.7983	8.69	3	1.7115	3	3	1.7799	8.69
	0.150	3	1.7073	3.00	2	2.0331	5.80	2	1.7515	2	2	2.0084	5.80
	0.300	2	1.7466	2.00	2	1.1715	5.80	2	1.7645	2	2	1.1384	5.80
0.05	0.100	8	1.5000	8.00	5	1.6836	14.49	7	1.5033	7	5	1.6691	14.49
	0.150	3	1.4619	3.00	3	1.6079	8.69	3	1.4828	3	3	1.5882	8.69
	0.200	2	1.5179	2.00	2	1.6990	5.80	2	1.5334	2	2	1.6712	5.80
	0.250	2	1.5155	2.00	2	1.4180	5.80	2	1.5364	2	2	1.3874	5.80
	0.500	2	1.5152	2.00	2	0.3772	5.80	2	1.5280	2	2	0.3375	5.80

4.6.1 Interpretation of Table 4.6.1 and 4.6.2

In Table 4.6.1 the computed values of comparison of proposed resubmitted plan parameters which are n , k_a and ASN at $\lambda = 0.1$ and ρ is 0.25 and 0.75 with various values of risk probabilities (P_1 and P_2) when sigma is known. In order to compare the values of n , k_a and k_r with different values of ρ and m . We note that for the same value of P_1 , as the P_2 changes from 0.002 to 0.020. When $P_1 = 0.001$ and $P_2 = 0.002$, with $m = 1$ the values of $n = 10$, $k_a = 2.9741$ and $ASN = 10$ at $\rho = 0.25$, and $m = 3$, the values of $n = 6$, $k_a = 3.0434$ and $ASN = 17.39$ at $\rho = 0.25$, when $\rho = 0.75$ and $m = 1$, the values of $n = 8$, $k_a = 2.9688$ and $ASN = 8.00$ and $m = 3$, the values of $n = 5$, $k_a = 3.0400$ and $ASN = 14.49$ so, it conclude that for the same value of P_1 and P_2 the sample size n is decreases and value of k_a and ASN are increases as m increases same value of λ . Similarly the value sample size n is decreases and value of k_a and ASN are increases as ρ increases same value of λ .

In Table 4.6.2 the computed values of comparison of proposed resubmitted plan parameters which are n , k_a and ASN at $\lambda = 0.1$ and ρ is 0.25 and 0.75 with various values of risk probabilities (P_1 and P_2) when sigma is unknown. In order to compare the values of n , k_a and k_r with different values of ρ and m . We note that for the value of P_1 and P_2 changes When $P_1 = 0.001$ and $P_2 = 0.002$ and $m = 1$ the values of $n = 55$, $k_a = 2.9851$ and $ASN = 55$ at $\rho = 0.25$ and when $m = 3$, then $P_1 = 0.001$ and $P_2 = 0.002$ the values of $n = 32$, $k_a = 3.0809$ and $ASN = 92.76$ at $\rho = 0.25$. when $m = 1$ the values of $n = 53$, $k_a = 2.9852$ and $ASN = 53$ at $\rho = 0.50$ and when $m = 3$, then $P_1 = 0.001$ and $P_2 = 0.002$ the values of $n = 31$, $k_a = 3.0817$ and $ASN = 89.85$ at $\rho = 0.50$. We note that for the value of P_1 and P_2 changes When $P_1 = 0.0025$ and $P_2 = 0.050$ and $m = 1$ the values of $n = 40$, $k_a = 2.6957$ and $ASN = 40$ at $\rho = 0.25$ when $\rho = 0.75$ value of P_1 and P_2 changes from $P_1 = 0.001$ to $P_1 = 0.005$ and $P_2 = 0.002$ to $P_2 = 0.500$, When $P_1 = 0.0025$ and $P_2 = 0.005$ and $m = 1$ the values of $n = 40$, $k_a = 2.6957$ and $ASN = 40$ at $\rho = 0.25$ and when $m = 3$, the values of $n = 23$, $k_a = 2.8020$ and $ASN = 66.65$ at $\rho = 0.25$. When $P_1 = 0.0025$ and $P_2 = 0.005$ and $m = 1$ the values of $n = 38$, $k_a = 2.6955$ and $ASN = 38$ at $\rho = 0.50$ and when $m = 3$, the values of $n = 23$, $k_a = 2.7981$ and $ASN = 66.66$ at $\rho = 0.50$. So, it concludes that the sample size, ASN and k_a are decreases as ρ increases at same value of λ . It can be noted that the reduction ratios are much higher for sigma unknown case than for the sigma known case.

4.7 COMPARISONS OF SAMPLE SIZE OF PROPOSED MDS AND RESUBMITTED SAMPLING PLAN

In this section we will compare the performance of the two proposed plan in terms of sample size when σ is known and σ is unknown. That sampling plan will be more efficient which will be smaller sample size. Here we use the same values of λ , ρ , α and β for the comparison between the two plans. The values of n are placed in the following table.

Table 4.7.1
Sample size comparisons of proposed MDS and resubmitted plan
with $\lambda = 0.1$ and $\rho = 0.25$

		When σ is known		When σ is unknown		
		MDS plan	Resubmitted plan when $m = 1$	MDS plan	Resubmitted plan when $m = 1$	
p_1	p_2	n	n	n	n	
0.001	0.002	6	10	-	55	
	0.003	3	4	202	21	
	0.004	2	3	121	13	
	0.006	2	2	67	8	
	0.008	2	2	47	6	
	0.010	2	2	37	5	
	0.015	2	2	25	4	
	0.020	2	2	19	3	
	0.0025	0.005	5	8	-	40
		0.010	2	2	82	10
0.015		2	2	44	6	
0.020		2	2	31	4	
0.025		2	2	24	4	
0.030		2	2	20	3	
0.050		2	2	12	3	
0.005	0.010	5	7	-	30	
	0.015	2	3	97	12	
	0.020	2	2	57	7	
	0.030	2	2	31	5	
	0.040	2	2	21	4	
	0.050	2	2	17	3	
	0.100	2	2	8	2	
	0.01	0.020	4	6	180	21
0.030		2	3	64	8	
0.040		2	2	37	5	
0.050		2	2	26	4	
0.100		2	2	10	2	
0.150		2	2	7	2	
	0.200	2	2	5	2	

Table 4.7.1 (contd.....)

		When σ is known		When σ is unknown	
		MDS plan	Resubmitted plan when $m = 1$	MDS plan	Resubmitted plan when $m = 1$
p_1	p_2	n	n	n	n
0.03	0.060	3	4	82	11
	0.090	2	2	28	5
	0.120	2	2	16	3
	0.150	2	2	11	3
0.05	0.300	2	2	4	2
	0.100	2	4	48	8
	0.150	2	2	16	3
	0.200	2	2	9	2
	0.250	2	2	6	2
	0.500	2	4	2	2

4.7.1 Interpretation of the Table 4.7

In Table 4.7 the sample size comparisons of proposed MDS and resubmitted plan with $\lambda = 0.1$ and $\rho = 0.25$ with various values of risk probabilities (P_1 and P_2) when sigma is known and unknown. It can observe that the MDS plan has small sample size than the resubmitted plan at $m = 1$. It means that the MDS plan is more efficient than the resubmitted plan. It can also be noted that the reduction ratios are much higher for sigma unknown case than for the sigma known case.

4.8 INDUSTRIAL APPLICATION

In this section, we apply the industrial data to the proposed plan. The data of brinell hardness (H) and tensile strength (S) for the real bivariate processes considered by Chen (1994), Wang and Chen (1998) and Sultan (1986). For this process, we consider brinell hardness (denoted by y) is the quality of interest having USL of 180 and tensile strength (denoted by x) is an auxiliary variable with mean $\bar{X} = 50$. The 25 values of both variables are as follows:

$$(y) = 143, 200, 168, 181, 148, 178, 162, 215, 161, 141, 175, 187, 187, 186, 172, 182, 177, 204, 178, 196, 160, 183, 179, 194, 181.$$

(x) = 34.2, 57.0, 47.5, 53.4, 47.8, 51.5, 45.9, 59.1, 48.4, 47.3, 57.3, 58.5, 58.2, 57.0, 49.4, 57.2, 50.6, 55.1, 50.9, 57.9, 45.5, 53.9, 51.2, 57.5, 18.5.

From this data we have $S_y = 18.14$, $S_x = 8.83$, $\bar{y} = 177.52$, $\bar{x} = 50.83$ and $\rho \cong 0.50$. Assume that $T_{i-1}^* = 170$ and $\lambda = 0.50$. From the Table 4.1.8, we have $P_1 = 0.0025$ and $P_2 = 0.005$, $K_a = 2.7092$, $K_r = 0.8700$, $n = 25$ and $m = 2$.

4.8.1 Implementation of the MDS Plan

The implementation of the plan is as follows:

Step 1. Select a random sample of size 25 from the lot and calculate the estimator of E^* as

$$E^* = \frac{USL - T_i^*}{\sigma}$$

where $T_i^* = \lambda \bar{Y} + (1 - \lambda) T_{i-1}^*$

$$b = (0.50) \frac{18.14}{8.83} = 1.0272$$

$$\bar{Y} = 177.52 + 1.0272 (50 - 50.83)$$

$$\bar{Y} = 176.67$$

$$T_i^* = (0.50) (176.67) + (1 - 0.50) (170)$$

$$T_i^* = 173.34$$

Now

$$E^* = \frac{180 - 173.34}{18.14} = 0.367$$

$$E^* = 0.367$$

Step 2. Accept the lot if $E^* \geq k_a$ and reject the lot if $E^* \leq K_r$ ($k_a \geq K_r$), where K_a is acceptance number and K_r is the rejection number.

As $E^* = 0.367 \leq K_a = 2.7092$, we reject the lot.

and

Reject the lot if $E^* \leq K_r$ ($k_a \geq K_r$)

As $K_r = 0.8700 \leq E^* = 0.367$ so we reject the lot.

4.8.2 Implementation of the Resubmitted Plan

The implementation of the plan is as follows:

From the above data we have $S_y = 18.14$, $S_x = 8.83$, $\bar{y} = 177.52$, $\bar{x} = 50.83$ and $\rho \cong 0.50$. Assume that $T_{i-1}^* = 170$ and $\lambda = 0.20$. From the Table 4.4.4, we have $P_1 = 0.001$ and $P_2 = 0.004$, $K_a = 2.8740$, $n = 25$ and $m = 1$.

Step 1. Select a random sample of size 25 from the submitted lot and calculate E^* using r characteristics.

$$E^* = \frac{USL - T_i^*}{\sigma}$$

where $T_i^* = \lambda \bar{Y} + (1 - \lambda) T_{i-1}^*$

$$b = (0.50) \frac{18.14}{8.83} = 1.0272$$

$$\bar{Y} = 177.52 + 1.0272 (50 - 50.83)$$

$$\bar{Y} = 176.67$$

$$T_i^* = (0.20) (176.67) + (1 - 0.50) (170)$$

$$T_i^* = 120.33$$

Now

$$E^* = \frac{180 - 120.33}{18.14} = 3.29$$

$$E^* = 3.29$$

Accept the lot if $E^* \geq k_a$

As $E^* = 3.29 \geq K_a = 2.8740$, we accept the lot.

So the lot is accepted then there is no need of step 2.

CHAPTER 5

CONCLUSIONS AND FUTURE RECOMMENDATIONS

5.1 CONCLUSIONS

A lot of work is available on acceptance sampling but very little on the multiple dependent state and resubmitted sampling plan. The combination of multiple dependent state and resubmitted sampling plan using exponential weighted moving average regression estimator have been developed for the first time. In this research, a new exponential weighted moving average multiple dependent state and resubmitted sampling plan using regression estimator is proposed.

An EWMA multiple dependent state plan is useful in giving intermediate value in terms of sample size efficiency and is more proficient than the resubmitted sampling plan when needed to reach the same decision. It is considered to be more efficient as it reduces the cost of inspection.

Two cases are discussed where the standard deviation of the normal distribution is known and unknown. The plan parameters for the both cases are determined such that the given producer's risk and consumer's risk are satisfied. The relevant plan parameters, n, m, k_a and k_r for the multiple dependent state sampling and n, m, k_a and ASN for the resubmitted sampling plan are tabulated with commonly used α, β .

The tables are created at several levels of smoothing constant λ and ρ , it is identified that for small size of smoothing constant, the value of sample size and k_a are smaller and the value of k_r is increase. Whereas the level of λ is increased the sample size are also identified to be high. Thus it is worthy to note that small smoothing constant are usually appropriate. Similarly, it is identified that for small size of ρ , the value of sample size k_a are smaller. Whereas the level of ρ is increased the value of sample size k_a are also identified to be high. Thus it is worthy to note that small smoothing constant are usually appropriate for the efficient results.

The industrial application of the proposed plan is also explained its efficiency with a simulation study. Thus the proposed an exponential weighted moving average multiple dependent state and resubmitted sampling plan using regression estimator is efficient minimum value of n . Due to the practical application and procedure the proposed plan is extremely suggested for the

industrialist to approve this plan as this is more effective in terms of its applicability and cost effectiveness.

5.2 FUTURE RECOMMENDATION

The estimation of the proposed plan to other sampling plan may be a representative area for the future research. Other statistical tool can be used at the other EWMA regression estimator to determine the effect on multiple dependent state and resubmitted sampling plan.

A future study can be made to extend our results to a multivariate normal distribution for multiple quality characteristics. The development of a new sampling plan using different estimators can be other area of the future research. Other commonly used estimators in survey sampling can be used as a statistic. Regression estimator with two or more auxiliary variables can be used.

REFERENCES

1. American Society for Quality Control (1987). *American National Standard Terms, Symbols and Definitions for Acceptance Sampling*. ANSI/ASQC Standard A2 (1987), American Society for Quality Control, Milwaukee, Wisconsin.
2. Aslam, M. (2010). *Group Acceptance Sampling Plans for Some Continuous Distributions*. Ph.D. Dissertation. National College of Business Administration and Economics (BNCBA&E) Lahore, Pakistan.
3. Aslam, M., and Azam, M., Jun, C.H. (2013). Multiple Dependent State Sampling Plan Based on Process Capability Index. *Journal of Testing and Evaluation*, 41(2), 340-346.
4. Aslam, M., Azam, M. and Jun, C.H. (2015). A New Lot Inspection Procedure Based on Exponentially Weighted Moving Average. *International Journal of Systems Science*, 46(8), 1392-1400.
5. Aslam, M., Wu, C.W., Azam, M. and Jun, C.H. (2013). Variable Sampling Inspection for Resubmitted Lots Based on Process Capability Index CPK for Normally Distributed Items. *Applied Mathematical Modeling*, 37(3), 667-675.
6. Baker, R.C. (1971). *Dependent-Deferred State Attribute Acceptance Sampling*. Ph.D. Dissertation. Texas A & M University, USA.
7. Balakrishnan, N., Leiva, V. and Lopez, J. (2007). Acceptance Sampling Plans From Truncated Life Tests Based on the Generalized Birnbaum-Saunders Distribution. *Communications in Statistics - Simulation and Computation*, 36(3), 643-656.
8. Balamurali, S. and Jun, C.H. (2006). Repetitive Group Sampling Procedure For Variable Inspection. *Journal of Applied Statistics*, 33(3), 327-338.
9. Balamurali, S. and Jun, C.H. (2007). Multiple Dependent State Sampling Plans for Lot Acceptance Based On Measurement Data. *European Journal of Operations Research*, 180(3), 1221-1230.

10. Balamurali, S., Park, H., Jun, C.H., Kim, K.J. and Lee, J. (2005). Designing of Variable Repetitive Group Sampling Plan Involving Minimum Average Sample Number, *Journal of Statistical Simulation and Computation*, 34(3), 799-807.
11. Chen, H. (1994), A multivariate process capability index over a rectangular solid tolerance zone. *Statist. Sinica.*, 4, 749-758.
12. Cochran, W.G. (1940). The estimation of the yields of cereal experiments by sampling for the ratio of grain in total produce. *Journal of The Agricultural Sciences*, 30, 262-275.
13. Collani, E.V. (1990). A Note on Acceptance Sampling for Variables. *Metrika*, 38(1), 19-36.
14. Dodge H.F. (1955). Chain Sampling Inspection Plan, *Industrial Quality Control*, 11(4), 10-13.
15. Duncan, A.J. (1986). *Quality Control and Industrial Statistics*, (5th ed.), Homewood, Illinois, Richard D. Irwin.
16. Govindaraju, K. and Ganesalingam, S. (1997). Sampling Inspection for Resubmitted Lots. *Communications in Statistics Simulation and Computation*, 26(3), 1163-1176.
17. Hansen, M.H., Hurwitz, W.N. and Madow, W.G. (1953). *Sample Survey Methods and Theory*, Volume 2. Wiley, New York.
18. Jun, C.-H., Balamurali, S. and Lee, S.-H. (2006). Variables Sampling Plans for Weibull Distributed Lifetimes Under Sudden Death Testing. *IEEE Transactions on Reliability*, 55(1), 53-58.
19. Kuralmani V. and Govindaraju, K. (1992) Selection of Multiple Deferred (Dependent) State Sampling Plans, *Communications in Statistics - Theory and Methods*, 21(5), 1339-1366.
20. Liu, S.W., Lin, S.W. and Wu, C.W. (2014). A Resubmitted Sampling Scheme by Variables Inspection for Controlling Lot Fraction Nonconforming. *International Journal of Production Research*, 52(12), 3744-3754.
21. Montgomery, D.C. (2009). *Introduction to Statistical Quality Control* (6th ed.). John Wiley & Sons, New York, NY.
22. Oakland, J.S. (1986). *Statistical Process Control.*, Heinemann, London.

23. Riaz, M. (2008). Monitoring Process Variability Using Auxiliary Information. *Computational Statistics*, 23(2), 253-276. Retrieved from: <http://link.springer.com/article/10.1007/s00180-007-0084-6>.
24. Roberts, S.W. (1959). Control Chart Tests Based on Geometric Moving Averages, *Technometrics*, 1(3), 239-250.
25. Schilling, E.G. (1982). *Acceptance Sampling in Quality Control*. Marcel Dekker, New York.
26. Seidel, W. (1997). Is Sampling By Variables Worse Than Sampling by Attributes? A Decision Theoretic Analysis and A New Mixed Strategy for Inspecting Individual Lots. *Sankhyā: The Indian Journal of Statistics, Series B*, 59(1), 96-107. Retrieved from: <http://www.jstor.org/stable/25052983>
27. Sherman, R.E. (1965). Design and Evaluation of a Repetitive Group Sampling Plan. *Technometrics*, 7(1), 11-21.
28. Soundararajan, V. and Vijayaraghavan, R. (1990). Construction and Selection of Multiple Dependent (Deferred) State Sampling Plan. *Journal of Applied Statistics*, 17(3), 397-409.
29. Sultan, T.L. (1986). An acceptance chart for raw materials of two correlated properties. *Quality Assurance*, 12(3), 70-72.
30. Vaerst, R. (1982). A Procedure to Construct Multiple Deferred State Sampling Plans, *Methods of Operations Research*, 37, 477-485.
31. Wajeeha (2014). *Repetitive Sampling Plan based on Regression Estimator as Statistic*. Thesis. Kinnaird College for Women, Lahore, Pakistan.
32. Wang, F.K. and Chen, J.C. (1998). Capability index using principal components analysis. *Quality Engineering*, 11(1), 21-27.
33. Wortham, A.W. and Baker, R.C. (1976). Multiple Deferred State Sampling Inspection, *International Journal of Production Research*, 14(6), 719-731.
34. Yen, C-H. Aslam, M., and Jun, C-H. (2014). A Lot Inspection Sampling Plan Based on Ewma Yield Index. *International Journal of Advanced Manufacturing Technology*, 75(5-8), 861-868. doi: 10.1007/s00170-014-6174-z

APPENDIX-A

ALGORITHM 1

Computation of An EWMA Multiple Dependent State Sampling Plan Using Regression Estimator When Sigma is known.

Input:

no of repetitions of basic program (J), sample size (ss), value of (λ), value of (ρ), P1, P2, (α) and β (beta).

for(i in 1:J)

{

- $ka \leftarrow \text{runif}(\text{nos}, 0, 5)$; $kr \leftarrow \text{runif}(\text{nos}, 0, ka)$; $m = \text{sample}(2:10)$ random sample for each iteration with replacement.
- Computation of minimum value of n for each iteration at P_2 and corresponding plan parameters when sigma is known.

}

Computation of minimum value of n out of J no of iterations and corresponding plan parameters. It based on the selected values of λ and ρ .

Output:

It will give the sample size and plan parameters for various values of λ and ρ

APPENDIX-B

ALGORITHM 2

Computation of An EWMA Multiple Dependent State Sampling Plan Using Regression Estimator When Sigma is unknown.

Input:

no of repetitions of basic program (J), sample size (ss), value of (λ), value of (ρ), P1, P2, (α) and β (beta).

for(i in 1:J)

{

- $ka \leftarrow \text{runif}(\text{nos}, 0, 5)$; $kr \leftarrow \text{runif}(\text{nos}, 0, ka)$; $m = \text{sample}(2:10, \text{nos})$) random sample for each iteration with replacement.
- Computation of minimum value of n for each iteration at P_2 and corresponding plan parameters when sigma is unknown.

}

Computation of minimum value of n out of J no of iterations and corresponding plan parameters. It based on the selected values of λ and ρ .

Output:

It will give sample size and plan parameters for various values of λ and ρ .

APPENDIX-C

ALGORITHM 3

Computation of An EWMA Resubmitted Sampling Plan Using Regression Estimator When Sigma is known.

Input:

no of repetitions of basic program (J), sample size (ss), value of (λ), value of (ρ), P1, P2, (α) and β (beta).

for(i in 1:J)

{

- $n = \text{sample}(2:500, \text{nos}); ka \leftarrow \text{runif}(\text{nos}, 0, 5); kr \leftarrow \text{runif}(\text{nos}, 0, ka);$
 $m = \text{sample}(2:10, \text{nos},)$

- Computation of minimum value of n and the value of ASN for each iteration at P_2 and corresponding parameters when sigma is known.

}

Computation of minimum value of n and the value of ASN out of J no of iterations and corresponding plan parameters for the for various values of λ and ρ .

}

Output:

It will give the average sample number and plan parameters for various values of λ and ρ

APPENDIX-D

ALGORITHM 4

Computation of An EWMA Resubmitted Sampling Plan Using Regression Estimator When Sigma is unknown.

Input:

no of repetitions of basic program (J), sample size (ss), value of (λ), value of (ρ), P1, P2, (α) and β (beta).

for(i in 1:J)

{

- $n = \text{sample}(2:340, \text{nos,}); ka <- \text{runif}(\text{nos}, 0, 5)$
- Computation of minimum value of n and the value of ASN for each iteration at P_2 and corresponding plan parameters when sigma is unknown.

}

Computation of minimum value of n and the value of ASN out of J no of iterations and corresponding plan parameters. It based on the selected values of λ and ρ .

Output:

It will give the average sample number and plan parameters for various values of λ and ρ .