FINAL REPORT ON

"Search of Good Rotation Patterns on Successive Occasions and its Applications"

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Summary of Findings

Nature permits certain changes in different real life phenomenon such as social, economic, agricultural, medicinal, financial and even vital statistics related to life span of human being etc. with the change of time. To study these changes with the change of time, the different real life phenomenon need to be observed more than once since single time observation contains the subsisting situation of the study variable but not the change, over the time period. So observation need to be made at several occasions. Such a design of observations is known as Successive sampling or rotation sampling in statistical surveys which is considered a very strong statistical tool for analyzing change occurred in the phenomenon over a span of time.

The work done focuses on searching effective rotation patterns for the estimation of different population parameters like population mean and population median on successive occasions in two occasion successive sampling. The entire work has been divided in six units, in each unit population parameter has been estimated under certain set of assumption, underlying the situations for survey has been conducted.

The First unit has been devoted to the estimation of population median at current occasion in two occasion successive sampling. Various estimators have been proposed under different chapters and they have been compared to some of well-known estimators existing in the literature of successive sampling.

In chapter-1, the work deals with the problem of estimation of population median at current occasion in two-occasion successive sampling. Best linear unbiased estimators have been proposed by utilizing additional auxiliary information which is stable in nature and readily available on both the occasions.

Chapter-2 deals with the problem of estimation of finite population median at current occasion, in two occasion successive (rotation) sampling. A class of estimators has been proposed for the estimation of population median at current occasion, which includes many existing estimators as a particular case.

Chapter-3 is an attempt to explore the rotation patterns using exponential ratio type estimators for the estimation of finite population median at current occasion in two occasion rotation sampling.

Chapter-4 makes an attempt to explore the analysis on longitudinal surveys in which same units are investigated on several occasions. Multivariate exponential ratio type estimator has been proposed for the estimation of finite population median at current occasion in two occasion longitudinal surveys. Information on several additional auxiliary variables which are stable over time and readily available on both the occasions has been utilized.

In chapter-5, the problem of estimation of finite population median at current occasion in two occasion successive sampling has been considered using the additional auxiliary variate which is dynamic over time and is readily available at both the occasions.

Looking at the effective gain in precision of the estimates and decreased cost of the survey by using the exponential ratio type estimators in two occasion successive sampling, Unit-II has been devoted to the estimation of population mean by utilizing the exponential ratio type estimators since these are least utilized estimators in two occasion successive sampling.

Chapter-6 considers the problem of longitudinal analysis of population mean in two occasion successive sampling. The usefulness of exponential type estimators in enhancing the working efficiency of different ratio type estimators for population mean, when embedded with auxiliary information which is stable over time in two occasion successive sampling have been explored.

Chapter-7 deals with the problem of estimation of the population mean in presence of multi auxiliary information in two occasion rotation sampling. A multivariate exponential ratio type estimator has been proposed to estimate population mean at current (second) occasion using information on p-additional auxiliary variates which are positively correlated to study variates and are stable in nature over successive occasion.

The key and fundamental purpose of sampling over successive waves lies in the varying nature of study character, it so may happen with ancillary information if

the time lag between two successive waves is sufficiently large. Chapter-8 consumes the varying nature of auxiliary information and modern approaches have been proposed to estimate population mean over two successive waves. Four exponential ratio type estimators have been designed. Cost models have also been worked out to minimize the total cost of the survey design over two successive waves.

Unit-III carry forward the idea of estimating population mean at current occasion in two occasion successive sampling but here one more aspect of surveys has been taken in to consideration that some-times in surveys, some units or the whole sample tends to be non-informative or non-responding due to any of the reason. The reason of non-response may include the absence of sample unit at said place, refusal to response or lost information etc. In such a situation, analysis of real state of facts is troubled. Unit-III explores the exponential ratio type estimators in the presence of non-response in two occasion successive sampling with the application of technique of imputation to deal with non-response.

Chapter-9 takes in consideration that while sample surveys are conducted, prompt chances of non-response of sample units leads to incompleteness of data and analyzing such data may result in false inference of facts. So utilizing the method of imputation with the aid of a completely known auxiliary character correlated to the study character and is stable in nature over the occasions, an affective estimation procedure has been suggested to deal with non-response for estimating population mean in two occasion successive sampling. A vast study has been done to elaborate the properties of the proposed estimator through theoretical and empirical entails considering that (i) non-response may arise on both occasions, (ii) it may occur only at first occasion or (iii) it may occur only at second occasion while comparing the proposed estimator with the same estimator having complete response for all sample units at each occasion.

In chapter-10, it has been discussed that the occurrence of non-response is very much plebeian in surveys, which troubles the analysis and hence an inappropriate inference is left out. To counterbalance the sour effects of the incompleteness, fresh imputation techniques have been proposed with the aid of multi-auxiliary variates for the estimation of population mean on successive waves.

Chapter-11 considers that encountering non-response is quite prone in sample surveys however smart be the design, which sours the analysis and hence the results. An effort has been made to exploit the non-response by using a completely fresh approach of imputation technique to estimate the population mean in two occasion successive sampling, utilizing completely known auxiliary information which is dynamic in nature and pronto over the occasions.

Unit-III provides a tool to negotiate with the non-response of sample units due to sensitivity of issue, although non-response may creep due to many reasons. What if non-response is due to stigmatizing character of study variable? In such surveys there is a possibility that in place of non-response, respondent simply under or over response the real facts due to social desirability and inclination. If a certain privacy level is ensured to the respondents then they may respond truthfully. Such a technique known as scrambled response technique has been explored to estimate population mean of a sensitive character.

The work done in chapter-12 is an attempt to use non-sensitive auxiliary character and scrambled response techniques to estimate population mean of a sensitive character. Various estimators using Scrambled Response Techniques (SRT) to estimate the population mean of a sensitive character have been proposed in sampling over two successive waves. Two models; Additive (ASRM) and Multiplicative (MSRM) scrambled response model have been used and the estimators have been discussed under both the models. Further pros and cons for two models in successive sampling have been illustrated. The model for optimum total cost of the survey has also been designed and discussed.

Unit-V illustrates the findings of the work done in the previous four units and makes recommendations of the work done in previous chapters on basis of requirement of survey design.

It also illustrates the further scopes for present work to be explored in future through different other survey sampling techniques.

Unit-VI show cases all the literature available in survey sampling which has been refereed to carry out the work done in this study.