**Πανεπιστήμιο Ιωαννίνων**

**Τμήμα Μαθηματικών**


# Εβδομαδιαια Σεμιναρια Τμηματος Μαθηματικων

## Sampling under a general correlated superpopulation model. Applications to Statistical Quality Control and Pairwise Likelihood Estimation

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The present work deals with sampling from a finite population with correlated units. As in the classical case of finite populations the interest in this context is to estimate unknown population parameters, usually functions of the population measurements, such as means or totals. Assuming an autocorrelation among the population units we focus on deriving an efficient sample allocation and its resulting statistical inference about the population parameters that incorporate the existing correlation. As presented in the paper the optimal sample allocation is closely related with the type of correlation and therefore is a problem with no unique answer. All approaches proposed in the literature are complex, computationally intensive, time consuming and almost unrealistic for real problems. However, it is worth pursuing because the efficiency of the resulting estimates is significant. The proposed methodology can cover any type of correlation function among the units. It is based on a continuous approximation of finite sums, is practically feasible and not computationally expensive. The result includes the sampling allocation that ensures optimal efficiency of the population parameters estimates and the expressions of the estimates and their mean square error. The limitation of the method is that an initial knowledge or estimation of the existing correlation is necessary. Examples from real problems that deal with autocorrelated populations where the proposed methodology can be implemented include the sampling of units in a production line within the framework of the statistical quality control; geostatistical data in spatial statistics; genetics and ecological statistics. A presentation of the proposed method and how it can be implemented in the problem of quality control and bivariate pairwise likelihood estimation is provided in the application section.

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