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**INVESTIGATING THE STATISTICAL PROPERTIES
OF EXPONENTIAL FAMILY OF DISTRIBUTIONS AND
ESTIMATION OF PARAMETERS**

**A PROJECT REPORT PRESENTED BY
SINNATHAMBY KUHANANTHAN**

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ABSTRACT

An important class of distributions in Statistics is known as the Exponential family of distributions, which possess very nice properties for estimation, testing and other inference problems. Many researchers devoted their time to analyze the properties of the Exponential family, since a large number of probability distributions belonging to it.

In a probability distribution, one can identify fixed parameters as well as probability parameters. For example, in a Binomial distribution with parameters n and p , n is called the fixed parameter and p is the probability parameter. A probability distribution is said to belong to a one parameter exponential family if only one *unknown* probability parameter is available in the distribution. Otherwise it is said to belong to a k -parameter exponential family. Estimation of these unknown parameters can be done using the standard techniques, and unbiased estimators were derived for the unknown parameters. However it is well known that a biased estimator with a small mean squared error is preferable to an unbiased estimator with a large variance. Further it is also preferable if the *Minimum Mean Squared Error estimator* can be derived.

A general method for finding *Minimum Mean Squared Error estimators* was given by Bibby and Toutenburg (1977). In 2003 Wijekoon P. applied this method to one parameter exponential family and obtained the best improved estimator.

In this study the results are extended to k -parameter exponential family, and the *Minimum Mean Squared Error estimator* (MIMSEE) for the vector of unknown parameters was obtained. This method has been applied to several probability distributions; such as Normal, Trinomial and lognormal, and the minimum mean squared error matrix was derived for each case. Further to display the properties of one parameter exponential family of distributions, a *MATLAB* Computer program was developed.