

A LEAST-SQUARES COMPUTATIONAL "TOOL KIT"^a

by

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ABSTRACT

The information assembled in this report is intended to offer a useful computational "tool kit" to individuals who are interested in a variety of practical applications for the least-squares method of parameter estimation. The fundamental principles of Bayesian analysis are outlined first and these are applied to development of both the simple and the generalized least-squares conditions. Formal solutions that satisfy these conditions are given subsequently. Their application to both linear and non-linear problems is described in detail. Numerical procedures required to implement these formal solutions are discussed and two utility computer algorithms are offered for this purpose (codes LSMOD and GLSMOD written in FORTRAN). Some simple, easily understood examples are included to illustrate the use of these algorithms. Several related topics are then addressed, including the generation of covariance matrices, the role of iteration in applications of least-squares procedures, the effects of numerical precision and an approach that can be pursued in developing data analysis packages that are directed toward special applications.

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