

**PACKAGE ID** - 001347IBMPC00 SATOOL

**KWIC TITLE** - A Post-Monte-Carlo Sensitivity Analysis Code

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**LIMITATION CODE** -COPY                   **AUDIENCE CODE** - UNL

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**DESCRIPTION** - SATOOL (Sensitivity Analysis TOOL) is a code for sensitivity analysis, following an uncertainty analysis with Monte Carlo simulations. Sensitivity analysis identifies those input variables, whose variance contributes dominantly to the variance in the output. This analysis can be used to reduce the variance in the output variables by redefining the "sensitive" variables with greater precision, i.e. with lower variance. The code identifies a group of sensitive variables, ranks them in the order of importance and also quantifies the relative importance among the sensitive variables.

**PACKAGE CONTENTS** - Media Directory; Software Abstract; Media Includes Source Code, User Guide, Executable Module, Compilation Instructions, Linking Instructions, Sample Problem Input and Output Data;

**SOURCE CODE INCLUDED?** - Yes

**MEDIA QUANTITY** - 1 CD Rom

**METHOD OF SOLUTION** - The code SATOOL uses step-wise regression for identifying a set of the most sensitive variables. Partial correlation coefficients are then used for sensitivity ranking within the set of variables selected by the stepwise regression. This procedure has been found necessary to handle the situation of strongly correlated input variables, while being equally applicable to the cases of uncorrelated or mildly correlated input variables. The code also provides the loss in the explanatory power of the multiple linear regression model (the loss in R to the second power) when a particular sensitive variable is dropped from the model, and this output can be used to estimate the relative importance among the sensitivity variables. This methodology assumes that a good linear model can be fitted between the output

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**METHOD OF SOLUTION - (CONT)** and input variables.

**COMPUTER** - IBM PC

**OPERATING SYSTEMS** - Windows 95/98

**PROGRAMMING LANGUAGES** - FORTRAN77

**SOFTWARE LIMITATIONS** - Present dimensioning restricts the problem to have 200 independent (input) variables, 50 dependent (output) variables, and 1000 sampled realizations in the Monte Carlo analysis.

**SOURCE CODE AVAILABLE (Y/N)** - Y

**UNIQUE FEATURES** - The code utilizes a special interpretation of the partial correlation coefficients and simplified algebraic relations derived thereby (Ramarao et al., 1998) and provides the partial correlation coefficients as simple by-products from a stepwise regression procedure. This provides a logistic convenience, compared to the present practice of using two separate codes, at each step. The code is structured to handle strongly correlated input variables. The problem dimensions are set in a separate parameter file, which will be included in the program at the compile time. To modify the dimensions, the user would edit the file: PARAM.INC without being involved in the main code.

**RELATED SOFTWARE** - The code can be used only after a prior Monte Carlo Simulation, for which a separate code is needed. The output from the Monte Carlo simulation becomes the input for this code. However, this code does not depend upon the Monte Carlo simulation code.

**OTHER PROG/OPER SYS INFO** - User guide (file:CSDUM.DOC) includes installation instructions and sample (test) problems. The compilation and linking batch files used for generating the executable are given in the files:COMP.BAT.RESP.LNK and LF90.RUN. These files and the file (CSDUM.DOC) are included in the media in the directory named SOURCE. MSWORD used to produce text file. The source code is provided and hence the code can be compiled and executed across different platforms. The details of installation and application are given in the User's Manual provided herewith.

**HARDWARE REQS** - An IBM compatible PC with 32 MB RAM, and 500MB hard disk drive (HDD) is required.

**TIME REQUIREMENTS** - A problem with 100 input variables, 12 output variables and 100 realizations, will take under one minute on PC with 166 MHz processor. Time would not be a limitation to the analysis.

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**ABSTRACT STATUS** - Released AS-IS 9/1/2000.

**SUBJECT CLASS CODE** - Z

**KEYWORDS** -

S CODES  
COMPUTER PROGRAM DOCUMENTATION  
UNCERTAINTY ANALYSIS  
MONTE CARLO SIMULATIONS  
SENSITIVITY ANALYSIS  
MULTIPLE LINEAR REGRESSION  
STANDARDIZED REGRESSION COEFFICIENTS  
PARTIAL CORRELATION COEFFICIENTS  
UNCERTAINTY IMPORTANCE RANKING

**EDB SUBJECT CATEGORIES** -  
990200

**SPONSOR** - DOE

**PACKAGE TYPE** - AS - IS