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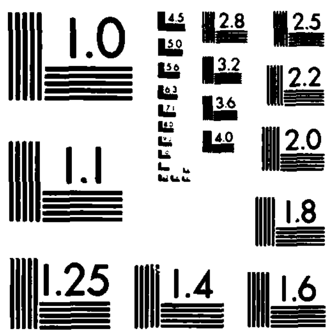
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NONLINEAR REGRESSION ANALYSIS METHODOLOGY FOR THE ESTIMATION OF DETECTION PROBABILITIES FROM EMPIRICAL DATA

JL Hofmockel
Computer Sciences Corporation

September 1982

Final Report: FY82

Approved for public release; distribution unlimited

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A methodology is described which can be used for the determination and use of parameters that describe acoustic detection as a function of signal excess.

NONLINEAR REGRESSION ANALYSIS METHODOLOGY FOR THE ESTIMATION OF DETECTION PROBABILITIES FROM EMPIRICAL DATA

September 1982

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INTRODUCTION

The Naval Ocean Systems Center (NOSC) was tasked by NAVELEX 612 under the subject of empirical detection analysis to develop techniques for estimating detection probabilities. Computer Sciences Corporation ~~(CSC)~~ was subsequently tasked by NOSC to develop data bases and nonlinear regression analysis techniques to describe the acoustic detection process as a function of signal excess.

Statistical techniques, primitive empirical data bases and ancillary computer programs used to relate the empirical data to models were developed previously at NOSC during other analyses of acoustic detection probabilities. These resources and the UCLA Department of Biomathematics ~~(BMDP)~~ Statistical Software were made available as a baseline for the nonlinear regression analysis methodology used in this investigation.

PROBLEM STATEMENT

Technical Requirements

The general problem addressed in this task is to establish a methodology for the determination and use of parameters that describe acoustic detection as a function of signal excess. The statistical technique to be used is nonlinear regression analysis using the computer programs available in the UCLA BMDP statistical programs library available on the UNIVAC 1100/82 system at NOSC.

Specific subtasks assigned and addressed in this report are to:

1. Establish the viability of the current version of the BMDP nonlinear regression software.
2. Prepare data bases for input to the nonlinear regression analysis programs.
3. Write computer programs to implement the Gaussian distribution function in the nonlinear model.
4. Perform nonlinear regression analysis with supplied data sets.

Approach

The derivation of the regression model used in this study is based on the sonar equation and the concept of random acoustic fluctuations. The passive sonar equation may be stated in decibel form as:

$$SE = SL - TL - AN + AG - RD$$

where

SE is signal excess

SL is source level

TL is transmission loss

AN is ambient noise level

AG is array gain

RD is recognition differential (detection threshold)

The term performance index (PI) is defined as follows:

$$PI = TL + (AN - AG)$$

Substituting PI into the sonar equation gives

$$SE = (SL - RD) - PI$$

It is known that there are random acoustic fluctuations which cause the signal excess to vary over time even though the sonar equation parameters are held constant and that these fluctuations have a standard deviation about the mean of approximately 8 dB. The sonar equation can be rewritten in a form normalized to the standard deviation of signal excess (σ).

$$\frac{SE}{\sigma} = \frac{SL - RD}{\sigma} - \frac{PI}{\sigma}$$

Linear Regression Model

Considering that PI is the independent variable which varies as a target moves about within tracking range of an array and that the probability of detecting and holding a target depends on the signal excess, the above form of the sonar equation suggests a simple linear slope-intercept regression model.

$$Y = P_1 + P_2X + \varepsilon$$

where

Y is the inverse cumulative Gaussian of (1-fractional holding time)

X is the performance index

$P_1 = (SL - RD)/\sigma$ is the Y-intercept of the regression line

$P_2 = 1/\sigma$ is the slope of the regression line

ε is the error term

The linear regression model may be extended to include empirical data from several different targets by the use of dummy variables. Then the equation becomes:

$$Y = P_1 + P_2X_1 + P_3X_2 + P_4X_3 + \ldots + P_{n-1}X_n + \varepsilon$$

where

$X_2 \ldots X_n$ are coded as 1 to indicate the presence of specific additional targets data and 0 otherwise.

This arrangement as a multiple linear regression model provides for separate parallel regression lines with different intercepts for each target contributing data to the sample but a common slope for all regression lines. The advantage of multiple regression analysis is a better estimate of the slope due to increased sample size which for practical cases greatly overrides the disadvantage of giving up an additional degree of freedom for each dummy variable added.

Nonlinear Regression Model

Previous regression analyses performed at NOSC used the linear regression model described in the previous paragraphs. However, the current task is to perform the regression analyses using nonlinear regression, that is, a model of the form:

$$Y = 1 - F(Z) + \varepsilon$$

where

$$F(Z) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{Z} e^{-(t^2)/2} \, dt;$$ the cumulative Gaussian distribution function

$$Z = P_1 + P_2X_1 + P_3X_2 + \ldots + P_nX_{n-1}$$

Y is the probability of detecting/holding a contact (assumed to be a nonlinear function of P_i, X_j)

ε is the error term

This model will permit the use of a different weighting function than that used with the linear model which effectively excluded some data points by zero weighting. Hopefully, a more accurate determination of regression parameters will result. The BMDP Statistical Software (references 1 and 2) available at NOSC contains computer programs suitable for implementing this nonlinear regression model.

Weighting Function

There is no basis to assume that the variance of the error term in the regression equation is homogeneous, therefore it is necessary to use case weighting (reference 1, p 302) inversely proportional to the variance. The weighting function provided for this study is:

$$W_i = \frac{T_i^2}{[1 - F(Z_i)]\, F(Z_i)}$$

where

W_i is the weighting assigned to a datum

T_i is the available holding time for the datum

$F(Z_i)$ is the cumulative Gaussian distribution function evaluated for the datum

The weighting function is used in the nonlinar regression algorithm as part of the least squares criterion for a best fit to the observed data. That is, when determining the parameters for regression line equations, the term

$$\sum_{i=1}^{N} W_i(Y_i - Y_i')^2$$

is minimized where:

i is the case index

W_i is the weight for a particular case

Y_i is the observed fractional holding time

Y_i' is the predicted fractional holding time

RESULTS AND DISCUSSION

Nonlinear Regression Computer Program Viability

BMDP Software, 1977 Version

At the commencement of this study, the 1977 version of the UCLA BMDP Statistical Software library (reference 2) was operational on the UNIVAC 1100/82 at NOSC and the 1981 version of the programs (reference 1) was undergoing installation. Initial program evaluation was accomplished using the 1977 versions of both the P3R and the PAR nonlinear regression analysis programs (reference 2, p 464). First the example problems presented with the program description in the BMDP documentation were executed and the outputs verified with the published outputs. The examples were found to execute as advertised in the BMDP document. Next an example was taken from a textbook (reference 3, example 10.4) which had been worked out using a nonlinear regression algorithm different than the one implemented in the BMDP programs. The nonlinear function implementing this example was programmed and collected with both the P3R and PAR programs. The regression equation parameters obtained by executing P3R and PAR matched those in the textbook example. Finally, three sets of data were taken from prior linear regression analyses and processed through the P3R and PAR software programmed for the cumulative Gaussian nonlinear regression model with iteratively reweighted least squares described in previous paragraphs. Results from executing the programs yielded parameters which compared favorably with the linear regression. Appendix A lists the formatted outputs from the 1977 version of the nonlinear regression analysis programs.

Comparison of P3R and PAR Programs

The BMDP P3R and PAR programs both perform nonlinear regression by the minimizing of least squares criterion. The algorithms differ operationally in that P3R requires the first partial derivatives of the nonlinear function with respect to each parameter in the regression equation while PAR does not require them. Parameter estimates output from the two programs were generally in good agreement for the cases tested but PAR required more iterations to converge to a solution than P3R. Since the partial derivatives and satisfactory initial estimates can be specified for the cumulative Gaussian function, the P3R program was selected as the best algorithm to use for this study.

BMDP Software, 1981 Version

When the 1981 version of the BMDP P3R program was installed on the UNIVAC 1100/82 the same checkout procedures as executed for the 1977 version were used. The results from the two versions were found to be essentially in agreement. The 1981 version of the program contains some more advanced features than the 1977 version and appears to converge with fewer iterations so the 1981 version of the P3R program is the best program to use for the nonlinear regression analyses assigned to this task. Appendix B lists the outputs from the execution of the 1981 version of the P3R nonlinear regression analysis program.

Evaluation of Cumulative Gaussian Distribution Function

Initial efforts with the 1977 BMDP programs used the single precision subroutine MDNOR available in the IMSL mathematical subroutine library on the UNIVAC 1100/82 at NOSC (reference 4). The BMDP P3R and PAR programs both operate in double precision but the IMSL double precision subroutine MDNORD is not implemented in the IMSL-8 library at NOSC. It became apparent during runs with the nonlinear regression model that a double precision subroutine for evaluation of the cumulative Gaussian distribution function would be required because the dynamic range of the input argument during the regression program iterations sometimes exceeded the capability of the single precision subroutine to calculate the function.

MDNORD Subroutine Algorithm

A double precision subroutine, called MDNORD after the nonimplemented IMSL subroutine, was developed for use with the nonlinear regression analysis model. This subroutine is based on the recursive evaluation of continuing fraction expressions which estimate the area under the normal or Gaussian distribution function (reference 5, arts. 26.2.14 and 26.2.15). The algorithm developed for subroutine MDNORD uses the art. 26.2.14 equation for arguments where the magnitude of x is greater than three, i.e.,

$$Q(x) = Z(x)\left\{\frac{1}{x+}\,\frac{1}{x+}\,\frac{2}{x+}\,\frac{3}{x+}\,\frac{4}{x+}\,\cdots\right\}; \; |x| > 3$$

and when the argument is equal to or less than three the art. 26.2.15 equation is used.

$$Q(x) = \frac{1}{2} - Z(x)\left\{\frac{x}{1-}\,\frac{x^2}{3+}\,\frac{2x^2}{5-}\,\frac{3x^2}{7+}\,\cdots\right\}; \; |x| \leq 3$$

where

x is the abscissa of the Gaussian distribution function expressed as the number of standard deviations from the mean.

Q(x) is the complement of the area under the Gaussian (1-area).

Z(x) is the ordinate of the Gaussian distribution function.

This dual algorithm was used because testing showed that the number of terms required for the art. 26.2.14 equation to reach double precision accuracy increased as the input argument x became smaller whereas the art. 26.2.15 equation exhibited the reverse effect with the number of terms required increasing as x became larger. A convenient branching point was reached at a value of x = 3 standard deviations from the mean.

The FORTRAN program listing and test outputs for subroutine MDNORD are included in Appendix C of this report. The source and relocatable code are located in PASS*NRL.MDNORD on the UNIVAC 1100/82.

Continuing Fraction Evaluation

A convenient theorem on the evaluation of continued fractions (reference 5, art. 3.10) was implemented in subroutine MDNORD. This theorem provides a matrix multiplication technique for evaluation of the n^{th} fractional of the continued fraction.

$$f_n = \frac{A_n}{B_n} = \left\{ b_o + \frac{a_1}{b_1+} \frac{a_2}{b_2+} \frac{a_3}{b_3+} \cdots \frac{a_n}{b_n+} \right\}$$

A_n and B_n are by definition terms expressing the numerator and denominator of the n^{th} fractional which are used in stating the matrix form of the theorem.

$$\begin{bmatrix} A_n \\ B_n \end{bmatrix} = \begin{bmatrix} A_{n-1} & A_{n-2} \\ B_{n-1} & B_{n-2} \end{bmatrix} \begin{bmatrix} b_n \\ a_n \end{bmatrix}$$

Calculation of the n^{th} fractional can be done recursively once the two matrices on the right side of the equation are initialized. The MDNORD program uses a recursive calculation loop for $f_n = (A_n)/B_n$ which continues until the difference between consecutive terms is less than 1×10^{-19}.

P3RFUN and FUN Subroutines

The Cumulative Gaussian Nonlinear Regression function described previously is implemented as subroutine P3RFUN. This subroutine is written in FORTRAN and is listed in Appendix C. The logic is set up to evaluate the expression

$$Y(Z) = 1 - \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{Z} e^{-t^2/2}\, dt + \varepsilon$$

where

$$Z = P_1 + P_2X_1 + P_3X_2 + \dots + P_nX_{n-1}$$

and the first partial derivatives of Y with respect to the nonlinear parameters P_1, P_2, ..., P_n (see reference 6, art. 67, differentiation under the integral)

$$\frac{dY(Z)}{dP_1} = \frac{1}{\sqrt{2\pi}} e^{-Z^2/2}$$

$$\frac{dY(Z)}{dP_{2\dots n-1}} = (X_{2\dots n})\left[\frac{dY(Z)}{dP_1}\right]$$

as well as the weighting function

$$W_i = \frac{T_i^2}{[1 - F(Z_i)]\ F(Z_i)}$$

each time the BMDP P3R nonlinear regression program calls P3RFUN.

Each iteration of the nonlinear regression analysis algorithm causes a call to P3RFUN for each case in the input data set. Thus the total number of calls to P3RFUN during a nonlinear regression analysis run is the number of iterations times the number of cases. Program branches are provided to write a debug aid file on logical unit 20 if the BMDP P3R input NUMBER is set to a value of 3. The data written in the debug file is the sequential number of the call to P3RFUN, the case number, the value of $Z = P_1 + P_2X_1 + P_3X_2 + \ldots + P_nX_{n-1}$, the area under the Gaussian distribution curve and the value of the weighting function. This feature can create a large amount of data and should be used only under controlled conditions to observe the variations in the arguments when a close look is needed at the dynamics of the nonlinear regression algorithm. Normally, the input NUMBER is set to a value of 2 for iteratively recalculated weighting. If desired, any constant weighting input is used via a branch which activates when NUMBER is set to 1.

Very large values of the weighting function sometimes occur for extreme values of the input argument Z to the P3RFUN program. These can be seen to cause the factor $Y(Z)[1 - Y(Z)]$ to approach zero for either $Y(Z)$ approaching 1 or $Y(Z)$ approaching 0 which corresponds to a Z value near one or the other tails of the Gaussian distribution function. Whenever the factor $[Y(Z)][1 - Y(Z)]$ becomes zero by exceeding precision limitations the factor is reset to 1.0×10^{-38} in order to avoid division by zero. In this event, the sequential call number, case number, Z value, area under the Gaussian and the factor are all written to a file on logical unit 21. In addition, the condition word is set so that the executive can sense the condition and the file can be printed out.

Subroutine FUN is the equivalent of subroutine P3RFUN without the evaluation of the derivatives. This subroutine is used with the PAR program in the same way that P3RFUN is used with the P3R program. The FORTRAN source code for both P3RFUN and FUN are included in Appendix C of this report.

Collection of Executable Programs

The MAP directives used to collect the cumulative Gaussian nonlinear regression model programs are listed in Appendix C. The executable programs are located in files PASS*NLR.P3R81, PASS*NLR.P3R77 and PASS*NLR.PAR77. The BMDP programs provided in the NOSC implementation on the UNIVAC 1100/82 have computer programs available to assist the user in constructing the MAP as well as the externally provided nonlinear function. These programs are invoked by using the appropriate EXEC 8 command from the following list:

```
@N*BMDP77.3RBUILDF
@N*BMDP77.ARBUILDF
@N*BMDP81.BUILDFUN/P3R
@N*BMDP81.BUILDFUN/PAR
```

The user then inputs the external function FORTRAN code excluding the DIMENSION or VARIABLE typing and the RETURN,END.

Output from the above processors is written to logical unit 8 so the program may be collected (@MAPed) and executed in file TPF$. by simply using the @ADD 8 command. However, if repeated executions of the absolute element are desired, as in this project, it is wasteful of time and computer resources to collect the program each run. Therefore the MAP commands were extracted from the logical unit 8 file by means of the MED text editor and saved for use as a separate set of directives. The user may also save the FORTRAN code for the external function in a similar way if desired.

Input Data Base Construction

Empirical detection data was taken from two sources and reformatted for input to the BMDP nonlinar regression analysis programs. The input data base for the PAR and P3R programs is constructed as symbolic elements in the FILE.ELEMENT format of the UNIVAC 1100/82 EXEC 8. Two programs were written to reformat data files from either the linear program input format or the primitive data format.

FILEPROC Program

The FILEPROC program is designed to accept data in the format used for the linear regression analysis program and to reformat it for input to the nonlinear regression analysis programs. Operation of the program is interactive in demand mode at a terminal. The EXEC 8 command @XQT PASS*NLR.FILEPROC runs the program. The user should have input data available in either files or elements of files so that it can be added to the runstream at the terminal by the @ADD command when solicited. The output is written to a formatted data file on logical unit 8 and the data can be moved about from the unit 8 file by the MED processors. The FORTRAN code and an example execution of the FILEPROC program are included in Appendix D.

FILPROCS Program

The FILPROCS program is similar to the FILEPROC program in that it reformats data for input to the nonlinear regression analysis programs. However, it receives data from a number of different input files (one for each sound projector or source recorded at an array) and combines the data into a single file. Therefore, the user must have at hand the set of files, previously extracted from primitive data, which represents the whole data set to be used for a nonlinear regression analysis run. The program is executed by the command @XQT PASS*NLR.FILPROCS and the file inputs are solicited interactively. It should be noted that the runstream entry @EOF is necessary after each data file is added as well as after all data is completed. The @EOF may be inserted in the input data file as shown in the FILPROCS example of Appendix D. These @EOFs are not a part of the files after they are extracted from the primitive data, i.e., they were inserted by means of the MED processor for convenience. Output from the FILPROCS program is written to a data file on logical unit 8.

Post Processing Program - SXPROC

The BMDP P3R program data save files do not provide all quantities needed for the analyses of this project. Therefore a post processing program was developed to read selected data from saved printout files and process these data for display, particularly display on the basis of the signal excess. At this writing, SXPROC performs two functions, namely, collection of holding time data on the basis of signal excess and calculation of the parameter covariance matrix.

Signal Excess Versus FHT

The interpretation of the regression equation parameters as related to the sonar equation is as follows:

$\sigma = 1/P_2$ is the standard deviation of the signal excess about the mean.

$SL - RD = \sigma P_1$ is the source level - recognition differential difference.

$SX = (SL - RD) - PI$ is the signal excess.

where

PI is the performance index which is the independent variable in the regression analysis.

The holding time and available holding time are transformed from the 1.5 dB PI domain intervals and accumulated in the corresponding SX domain 1.5 dB intervals. After the data is accumulated for each source in this manner, it is summed over all sources to form the holding time data for the sensor. Then the nonholding time can be formed and combined with a count of the gains (number of source holding periods following a previous source loss) for each SX interval and used in likelihood ratio analyses of the data.

Parameter Covariance Matrix

The covariance matrix of the regression equation parameters is useful for analyzing the confidence intervals for the prediction equations. It is calculated from the BMDP P3R estimates of the standard deviations of the parameters and the correlation matrix for all the parameters using the relationship:

$$cov(P_i, P_j) = S_i\ S_j\ r_{ij}$$

where

S_i is the standard deviation estimated for a parameter P_i

and

r_{ij} is the correlation coefficient between two parameters P_i and P_j.

The covariance matrix is stored and processed in lower left triangular format and a formatted printout of the matrix is available.

SXPROC Operation

The SXPROC program is designed for the FORTRAN NAMELIST type of input. The inputs available currently are:

COVAR - A logical variable set to T or F to initiate the covariance matrix calculation and display.

SIGEX - A logical variable set to T or F to initiate the FHT versus signal excess processing and display.

FILNAM - A character variable for inputting the data file name (up to 12 characters).

ELEM - A character variable for inputting an element name (up to 12 characters).

VERS - A character variable for inputting a version name (up to 12 characters).

UNIT - The logical unit to use for readin of the data file (default is LU 8).

STOP - A logical variable set to T for program stop, otherwise another set of namelist data is expected.

The execution of SXPROC is by the EXEC 8 command @XQT PASS*NLR.SXPROC.

The method of constructing a file for input is to breakpoint the print files for a P3R nonlinear regression run as illustrated in the example runstream for P3R81 in Appendix B. The MED processor is then used to save the printout file as an element/version of the intermediate file needed for input to SXPROC. Typically, element names might be selected to identify arrays and versions to identify variations of conditions at that array such as season. An example runstream for SXPROC using elements built from the P3R81 example is shown in Appendix E along with the formatted printouts resulting from the run. The FORTRAN source code for the SXPROC programs is also included in Appendix E.

Post Processing Program - NLRPLT

The NLRPLT program is designed to plot the nonlinear regression analysis prediction curves. It uses the saved printout files as input just as the SXPROC program does. Two different kinds of plots are plotted for each regression analysis run. The first kind of plot displays the prediction for each source contributing data to the analysis at a particular array with all curves on a single plot. The observed data, from which the predictions result, are shown in the same graph marked with X's of varying size. The size of the X's marking data are proportional to the square root of the case weights. Therefore it can be seen which points have greater or lesser amounts of influence on the regression curve. The second kind of plot displays the prediction curve for one particular source along with the curves bounding the 95 percent confidence region for the predicted curve. A separate plot is made for each source in the data set.

The NLRPLT program is also capable of printing out the source level-recognition differential differences for each source and the covariance matrix for the parameters of the regression equation.

NLRPLT Operation

The NLRPLT program is designed for the FORTRAN NAMELIST type of input similar to the SXPROC program. The inputs available are:

FILNAM - A character variable for inputting the data file name (up to 12 characters).

ELEM - A character variable for inputting the element name in the data file (up to 12 characters).

VERS - A character variable for inputting a version name (up to 12 characters).

UNIT - The logical unit to use for readin of the data file (default is LU 8).

COVAR - A logical variable set to T or F to indicate display of the covariance matrix.

LEVELS - A logical variable set to T or F to indicate display of source level-recognition differential display.

PLOTS - A logical variable set to T or F to indicate plot displays.

STOP - A logical variable set to T or F for program stop, otherwise another set of namelist data is expected.

The execution of the NLRPLT program is by the EXEC 8 command

```
@XQT PASS*NLRPLT.NLRPLT.
```

Input file construction for NLRPLT is identical to that described for the SXPROC program (refer to previous paragraphs on SXPROC). An example runstream with the resulting plot and print outputs are included as Appendix F of this report. The FORTRAN source code and the MAP collection directives are also included.

Maximum Likelihood Criterion

Program P3R may be used with a maximum likelihood calculation to fit the nonlinear regression function to the data rather than the least squares criterion mentioned under the weighting function description. The method recommended (see reference 1, p 315) for recursive recalculation of the weighting function when fitting a curve such as the Gaussian to a data set is as follows:

> Turn off the convergence criterion by using the following inputs to P3R.
>
> CONVERGENCE IS -1.0.
> HALVING IS 0.
>
> Rescale the standard deviations of the parameters to convert them to standard errors by the input.
>
> MEANSQUARE IS 1.0.

This method used with a maximum of 15 iterations gives the best results for nonlinear regression parameters. A sample runstream and P3R program outputs are included in Appendix B as run P3R81A.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Based on the results of computer runs during this task it is concluded that:

- The P3R program is the better nonlinear regression analysis program for fitting the cumulative Gaussian function to observed data for this task.
- The 1981 version of the P3R program gives results essentially the same as the 1977 version.
- Data observations indicating the absence of detection as well as data indicating detections are effectively included in the nonlinear regression.

Recommendations

It is recommended that:

- Future nonlinear regression analysis runs use the 1981 version of the UCLA BMDP P3R program and the maximum likelihood criterion.

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APPENDIX A

BMDP 1977 VERSION
NONLINEAR REGRESSION OUTPUTS

```
@PRT NLR.RUN/3R77BHILDA
PASS*NLR(1).RUN/3R77BHILDA(0)
      @OLD*FIN.FIN,SI P3RFUN
            SUBROUTINE P3RFUN(F,DF,P,X,N,KASE,NVAR,NPAR,IP,XLOSS,ID)
            IMPLICIT DOUBLE PRECISION (A-H,O-Z)
            COMMON/MEMORY/LENGTH,LEXICN,IB(15000)
            DIMENSION DF(NPAR),P(NPAR),X(NVAR)
            DF(1) = DEXP(P(2)*X(3))
            DF(2) = P(1)*X(3)*DF(1)
            DF(3) = DEXP(P(4)*X(3))
            DF(4) = P(3)*X(3)*DF(3)
            F = P(1)*DF(1) + P(3)*DF(3)
            RETURN
            END
      @MAP,I
       IN TPF$.
       IN N*BMDP77.3RREL
       LIB OLD*FIN.
       IN MEMORY
      END
      @XQT
      /PROBLEM
                TITLE IS 'RADIOACTIVE SULFATE DATA'.
      /INPUT
                VARIABLES ARE 3.
                FORMAT IS '(F8.4,F8.6,F8.0)'.
      /VARIABLE
                NAMES ARE COUNT,CASEWT,TIME.
      /REGRESS
                DEPENDENT IS COUNT.
                INDEPENDENT IS TIME.
                NUMBER IS 1.
                PARAMETERS ARE 4.
                WEIGHT IS CASEWT.
      /PARAMETER
                INITIAL ARE 10, -.1, 5, -.01.
      /END
       15.1117 .004379       2
       11.3601 .007749       4
        9.7652 .010487       6
        9.0935 .012093       8
        8.4820 .013900      10
        7.6891 .016914      15
        7.3342 .018591      20
        7.0593 .020067      25
        6.7041 .022249      30
        6.4313 .024177      40
        6.1554 .026393      50
        5.9940 .027833      60
        5.7698 .030039      70
        5.6440 .031392      80
        5.3915 .034102      90
        5.0938 .038540     110
        4.8717 .042135     130
        4.5996 .047267     150
        4.4968 .049453     160
        4.3602 .052600     170
        4.2669 .054928     180
```

```
@OLD*FTN.FTN,SI P3RFUN
FTN 8R1X *09/14/82-14:22(,0)
      SUBROUTINE P3RFUN(F,DF,P,X,N,KASE,NVAR,NPAR,IP,XLOSS,ID)
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
      COMMON/MEMORY/LENGTH,LEXICN,IB(15000)
      DIMENSION DF(NPAR),P(NPAR),X(NVAR)
      DF(1) = DEXP(P(2)*X(3))
      DF(2) = P(1)*X(3)*DF(1)
      DF(3) = DEXP(P(4)*X(3))
      DF(4) = P(3)*X(3)*DF(3)
      F = P(1)*DF(1) + P(3)*DF(3)
      RETURN
      END

END FTN 69 IBANK 25 DBANK 15002 COMMON
```

```
@MAP,I
MAP 30R1 S74T11 09/14/82 14:22:09
START=032126, PROG SIZE(I/D)=19091/31189
SYS$*RLIB$. LEVEL 74R1A
END MAP.  ERRORS: 0  TIME: 19.913  STORAGE: 19840/6/040777/077777

@XQT
```

```
BMDP3R - NONLINEAR REGRESSION                                   PROGRAM REVISED FEBRUARY 1979          1
HEALTH SCIENCES COMPUTING FACILITY                              MANUAL DATE  --  1977
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IN THIS VERSION OF BMDP3R

  -- THE FORM OF SPECIFYING LINEAR CONSTRAINTS HAS BEEN CHANGED. SEE BMDP-77 MANUAL PAGE 480.
  -- COMPUTATIONS ARE NOW PERFORMED IN DOUBLE PRECISION.
     IF YOU USE SUBROUTINE FUN BE SURE ALL FUNCTION REFERENCES ARE IN DOUBLE PRECISION.
  -- DEFAULT TOLERANCE FOR PIVOTING IS NOW .00000001.


 PROGRAM CONTROL INFORMATION

        /PROBLEM
                    TITLE IS 'RADIOACTIVE SULFATE DATA'.
        /INPUT
                    VARIABLES ARE 3.
                    FORMAT IS '(F8.4,F8.6,F8.0)'.
        /VARIABLE
                    NAMES ARE COUNT,CASEWT,TIME.
        /REGRESS
                    DEPENDENT IS COUNT.
                    INDEPENDENT IS TIME.
                    NUMBER IS 1.
                    PARAMETERS ARE 4.
                    WEIGHT IS CASEWT.
        /PARAMETER
                    INITIAL ARE 10, -.1, 5, -.01.
        /END


 PROBLEM TITLE . . . . . . .RADIOACTIVE SULFATE DATA

 NUMBER OF VARIABLES TO READ IN. . . . . . . . .        3
 NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. .        0
 TOTAL NUMBER OF VARIABLES . . . . . . . . . . .        3
 NUMBER OF CASES TO READ IN. . . . . . . . . . .  1000000
 CASE LABELING VARIABLES . . . . . . . . . . . .
 LIMITS AND MISSING VALUE CHECKED BEFORE TRANSFORMATIONS
 BLANKS ARE. . . . . . . . . . . . . . . . . . .    ZEROS
 INPUT UNIT NUMBER . . . . . . . . . . . . . . .        5
 REWIND INPUT UNIT PRIOR TO READING. . DATA. . .       NO

 INPUT FORMAT
        (F8.4,F8.6,F8.0)

 VARIABLES TO BE USED
           1  COUNT          2  CASEWT         3  TIME
```

REGRESSION TITLE

```
REGRESSION NUMBER . . . . . . . . . . . . . . . . .       1
INDEPENDENT VARIABLE(FOR BUILT-IN FUNCTION) . .    TIME
DEPENDENT VARIABLE. . . . . . . . . . . . . . . .    COUNT
WEIGHTING VARIABLE. . . . . . . . . . . . . . . .    CASEWT
NUMBER OF PARAMETERS. . . . . . . . . . . . . . .       4
NUMBER OF CONSTRAINTS . . . . . . . . . . . . . .       0
TOLERANCE FOR PIVOTING. . . . . . . . . . . . . .  .00000001000
TOLERANCE FOR CONVERGENCE . . . . . . . . . . . .  .00001000000
MAXIMUM NUMBER OF ITERATIONS. . . . . . . . . . .      50
MAXIMUM NUMBER OF INCREMENT HALVINGS. . . . . . .       5
NUMBER OF DATA PASSES PER CASE. . . . . . . . . .       1
COMPUTE LOSS FUNCTION . . . . . . . . . . . . . .      NO
```

USING THE ABOVE SPECIFICATIONS THIS PROGRAM COULD PROCESS 1833 CASES.

NUMBER OF CASES READ.   21

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
1	COUNT	5.750701	1.711865	4.266800	15.111700
2	CASEWT	.035707	.014208	.004379	.054928
3	TIME	97.933350	60.915966	2.000000	180.000000

PARAMETER MAXIMA. . . . . ************** ************** ************** **************

PARAMETER MINIMA. . . . . ************** ************** ************** **************

ITERATION NUMBER	INCREMENT HALVINGS	RESIDUAL SUM OF SQUARES	P(1)	P(2)	P(3)	P(4)
0	0	5.592539	10.000000	-.100000	5.000000	-.010000
1	1	.379744	9.907289	-.101484	4.947083	.000353
2	0	.058245	8.301627	-.130408	6.940312	-.003081
3	0	.018950	9.234015	-.178251	7.336724	-.003128
4	0	.013453	10.542872	-.211035	7.343437	-.003137
5	0	.012897	11.124462	-.223769	7.364383	-.003160
6	0	.012850	11.290756	-.227774	7.374456	-.003170
7	0	.012846	11.336529	-.228964	7.377790	-.003174
8	0	.012845	11.349533	-.229309	7.378793	-.003175
9	0	.012845	11.353258	-.229409	7.379086	-.003175
10	0	.012845	11.354327	-.229438	7.379170	-.003176
11	0	.012845	11.354633	-.229446	7.379195	-.003176
12	0	.012845	11.354722	-.229448	7.379202	-.003176
13	0	.012845	11.354747	-.229449	7.379204	-.003176

ITERATION 13 HAS THE SMALLEST RESIDUAL SUM OF SQUARES(SUBJECT TO CONSTRAINTS, IF ANY).
REMAINING CALCULATIONS ARE BASED ON THE RESULTS OF THIS ITERATION.

ASYMPTOTIC CORRELATION MATRIX OF THE PARAMETERS

		P(1) 1	P(2) 2	P(3) 3	P(4) 4
P(1)	1	1.0000			
P(2)	2	-.8140	1.0000		
P(3)	3	.1459	-.5026	1.0000	
P(4)	4	-.1139	.4184	-.8689	1.0000

RESIDUAL MEAN SQUARE .0007556063

DEGREES OF FREEDOM 17

PARAMETER	ESTIMATE	ASYMPTOTIC STANDARD DEVIATION	TOLERANCE
P(1)	11.354747	.865841	.2445359118
P(2)	-.229449	.018740	.1865292843
P(3)	7.379204	.106597	.1970590595
P(4)	-.003176	.000136	.2445051093

CASE NO.	LABEL	PREDICTED COUNT	STD DEV OF PRED VALUE	OBSERVED COUNT	RESIDUAL	CASEWT	TIME
1		14.508458	.362616	15.111700	.503242	.004379	2.000000
2		11.821134	.172042	11.360100	-.461034	.007749	4.000000
3		10.106008	.144709	9.765200	-.340808	.010487	6.000000
4		9.005399	.136218	9.093500	.088101	.012093	8.000000
5		8.293258	.118659	8.482000	.188742	.013900	10.000000
6		7.399400	.078204	7.689100	.289700	.016914	15.000000
7		7.040510	.070454	7.334200	.293690	.018591	20.000000
8		6.852662	.072005	7.059300	.206638	.020067	25.000000
9		6.720285	.071352	6.704100	-.016185	.022249	30.000000
10		6.500131	.065070	6.431300	-.068831	.024177	40.000000
11		6.295938	.057665	6.155400	-.140538	.026393	50.000000
12		6.099043	.051118	5.994000	-.105043	.027833	60.000000
13		5.908395	.045842	5.769800	-.138595	.030039	70.000000
14		5.723715	.042003	5.644000	-.079715	.031392	80.000000
15		5.544809	.039683	5.391500	-.153309	.034402	90.000000
16		5.203598	.039321	5.093800	-.109798	.038540	110.000000
17		4.883384	.043086	4.871700	-.011684	.042135	130.000000
18		4.582875	.048814	4.599600	.016725	.047267	150.000000
19		4.439628	.051932	4.496800	.057172	.049453	160.000000
20		4.300858	.055065	4.360200	.059342	.052600	170.000000
21		4.166426	.058141	4.266800	.100374	.054928	180.000000

SERIAL CORRELATION .36601

```
BMDP3R - NONLINEAR REGRESSION                          PROGRAM REVISED FEBRUARY 1979          5
HEALTH SCIENCES COMPUTING FACILITY                     MANUAL DATE  --  1977
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   -- COMPUTATIONS ARE NOW PERFORMED IN DOUBLE PRECISION.
      IF YOU USE SUBROUTINE FUN BE SURE ALL FUNCTION REFERENCES ARE IN DOUBLE PRECISION.
   -- DEFAULT TOLERANCE FOR PIVOTING IS NOW .00000001.

 PROGRAM TERMINATED NORMALLY.
```

```
@PRT NLR.RUN/3R77INSULIN
PASS•NLR(1).RUN/3R77INSULIN(1)
@OLD•FTN.FTN,SI P3RFUN
      SUBROUTINE P3RFUN(F,DF,P,X,N,KASE,NVAR,NPAR,IP,XLOSS,ID)
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
      COMMON/MEMORY/LENGTH,LEXICN,IB(15000)
      DIMENSION DF(NPAR),P(NPAR),X(NVAR)
      DF(3) = 1.0
      A = P(1)*X(1) + P(2)
      IF(A.LE.0.0) A = 0.000001
      F = 1.0/A + P(3)
      DF(2) = -1.0/A**2.
      DF(1) = X(1)*DF(2)
      RETURN
      END
@MAP,I
 IN TPF$.
 IN N•BMDP77.3RREL
 LIB OLD•FTN.
 IN MEMORY
END
@XQT
/PROBLEM
        TITLE IS 'INSULIN DATA'.
/INPUT
        VARIABLES ARE 2.
        FORMAT IS '(F6.0,F6.3)'.
/VARIABLE
        NAMES ARE STANDARD,COUNT.
/REGRESS
        INDEPENDENT IS STANDARD.
        DEPENDENT IS COUNT.
        NUMBER IS 2.
        PARAMETERS ARE 3.
/PARAMETER
        INITIAL ARE 0.01, 0.1, 5.
/END
     0 9.274
     0 9.522
     5 8.082
     5 8.354
    10 7.296
    10 7.518
    25 5.864
    25 5.974
    50 4.396
    50 4.110
   100 2.830
   100 2.674
   200 1.798
   200 1.566
-EOF
```

```
@OLD*FTN.FTN,SI P3RFUN
FTN 8R1X *09/14/82-14:51(,0)
              SUBROUTINE P3RFUN(F,DF,P,X,N,KASE,NVAR,NPAR,IP,XLOSS,ID)
              IMPLICIT DOUBLE PRECISION (A-H,O-Z)
              COMMON/MEMORY/LENGTH,LEXICN,IB(15000)
              DIMENSION DF(NPAR),P(NPAR),X(NVAR)
              DF(3) = 1.0
              A = P(1)*X(1) + P(2)
              IF(A.LE.0.0) A = 0.000001
              F = 1.0/A + P(3)
              DF(2) = -1.0/A**2.
              DF(1) = X(1)*DF(2)
              RETURN
              END

END FTN 66 IBANK 28 DBANK 15002 COMMON
```

```
@MAP,I
MAP 30R1 S74T11 09/14/82 14:51:37
START=032406, PROG SIZE(I/D)=19267/31281
SYS$*RLIB$. LEVEL 74R1A
END MAP.  ERRORS: 0  TIME: 19.478  STORAGE: 19840/6/040777/077777

@XQT
```

```
BMDP3R - NONLINEAR REGRESSION                              PROGRAM REVISED FEBRUARY 1979          1
HEALTH SCIENCES COMPUTING FACILITY                         MANUAL DATE  --  1977
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  -- COMPUTATIONS ARE NOW PERFORMED IN DOUBLE PRECISION.
     IF YOU USE SUBROUTINE FUN BE SURE ALL FUNCTION REFERENCES ARE IN DOUBLE PRECISION.
  -- DEFAULT TOLERANCE FOR PIVOTING IS NOW .00000001.


 PROGRAM CONTROL INFORMATION

        /PROBLEM
                 TITLE IS 'INSULIN DATA'.
        /INPUT
                 VARIABLES ARE 2.
                 FORMAT IS '(F6.0,F6.3)'.
        /VARIABLE
                 NAMES ARE STANDARD,COUNT.
        /REGRESS
                 INDEPENDENT IS STANDARD.
                 DEPENDENT IS COUNT.
                 NUMBER IS 2.
                 PARAMETERS ARE 3.
        /PARAMETER
                 INITIAL ARE 0.01, 0.1, 5.
        /END

 PROBLEM TITLE . . . . . . .INSULIN DATA

 NUMBER OF VARIABLES TO READ IN. . . . . . . . . .        2
 NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. .          0
 TOTAL NUMBER OF VARIABLES . . . . . . . . . . .          2
 NUMBER OF CASES TO READ IN. . . . . . . . . . . .  1000000
 CASE LABELING VARIABLES . . . . . . . . . . . .
 LIMITS AND MISSING VALUE CHECKED BEFORE TRANSFORMATIONS
 BLANKS ARE. . . . . . . . . . . . . . . . . . . .   ZEROS
 INPUT UNIT NUMBER . . . . . . . . . . . . . . .          5
 REWIND INPUT UNIT PRIOR TO READING. . DATA. . .         NO

 INPUT FORMAT
       (F6.0,F6.3)

 VARIABLES TO BE USED
            1  STANDARD       2  COUNT
```

REGRESSION TITLE

```
REGRESSION NUMBER . . . . . . . . . . . . . . . . . . . .     2
INDEPENDENT VARIABLE(FOR BUILT-IN FUNCTION) . .   STANDARD
DEPENDENT VARIABLE. . . . . . . . . . . . . . . . .   COUNT
WEIGHTING VARIABLE. . . . . . . . . . . . . . . . .
NUMBER OF PARAMETERS. . . . . . . . . . . . . . . .       3
NUMBER OF CONSTRAINTS . . . . . . . . . . . . . . .       0
TOLERANCE FOR PIVOTING. . . . . . . . . . . . . . .  .00000001000
TOLERANCE FOR CONVERGENCE . . . . . . . . . . . . .  .00001000000
MAXIMUM NUMBER OF ITERATIONS. . . . . . . . . . . .      50
MAXIMUM NUMBER OF INCREMENT HALVINGS. . . . . . . .       5
NUMBER OF DATA PASSES PER CASE. . . . . . . . . . .       1
COMPUTE LOSS FUNCTION . . . . . . . . . . . . . . .      NO
```

USING THE ABOVE SPECIFICATIONS THIS PROGRAM COULD PROCESS 2103 CASES.

NUMBER OF CASES READ. 14

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
1	STANDARD	55.714285	69.637996	.000000	200.000000
2	COUNT	5.661286	2.773082	1.566000	9.522000

PARAMETER MAXIMA. . . . . ************** ************** **************

PARAMETER MINIMA. . . . . ************** ************** **************

ITERATION NUMBER	INCREMENT HALVINGS	RESIDUAL SUM OF SQUARES	P(1)	P(2)	P(3)
0	0	168.067703	.010000	.100000	5.000000
1	0	7.070963	.002958	.120812	1.312471
2	0	.319398	.002667	.107692	.137569
3	0	.249154	.002694	.108966	.138173
4	0	.249144	.002694	.108981	.138055
5	0	.249144	.002694	.108981	.138049
6	0	.249144	.002694	.108981	.138049
7	0	.249144	.002694	.108981	.138049
8	0	.249144	.002694	.108981	.138049
8	5	.249144	.002694	.108981	.138049

ITERATION 8 HAS THE SMALLEST RESIDUAL SUM OF SQUARES(SUBJECT TO CONSTRAINTS, IF ANY).
REMAINING CALCULATIONS ARE BASED ON THE RESULTS OF THIS ITERATION.

ASYMPTOTIC CORRELATION MATRIX OF THE PARAMETERS

		P(1) 1	P(2) 2	P(3) 3
P(1)	1	1.0000		
P(2)	2	.7446	1.0000	
P(3)	3	.9357	.8830	1.0000

RESIDUAL MEAN SQUARE .0226494987

DEGREES OF FREEDOM 11

PARAMETER	ESTIMATE	ASYMPTOTIC STANDARD DEVIATION	TOLERANCE
P(1)	.002694	.000220	.0942264330
P(2)	.108981	.002070	.1667719092
P(3)	.138049	.186350	.0465878323

CASE NO.	LABEL	PREDICTED COUNT	STD DEV OF PRED VALUE	OBSERVED COUNT	RESIDUAL	STANDARD
1		9.313981	.088011	9.274000	-.039981	.000000
2		9.313981	.088011	9.522000	.208019	.000000
3		8.304731	.056879	8.082000	-.222731	5.000000
4		8.304731	.056879	8.354000	.049269	5.000000
5		7.495495	.054245	7.296000	-.199495	10.000000
6		7.495495	.054245	7.518000	.022505	10.000000
7		5.809533	.066495	5.864000	.054467	25.000000
8		5.809533	.066495	5.974000	.164467	25.000000
9		4.242118	.061842	4.396000	.153882	50.000000
10		4.242118	.061842	4.110000	-.132118	50.000000
11		2.781170	.059201	2.830000	.048830	100.000000
12		2.781170	.059201	2.674000	-.107170	100.000000
13		1.681973	.091104	1.798000	.116027	200.000000
14		1.681973	.091104	1.566000	-.115973	200.000000

SERIAL CORRELATION -.42374

```
BMDP3R - NONLINEAR REGRESSION                          PROGRAM REVISED FEBRUARY 1979
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   -- COMPUTATIONS ARE NOW PERFORMED IN DOUBLE PRECISION.
      IF YOU USE SUBROUTINE FUN BE SURE ALL FUNCTION REFERENCES ARE IN DOUBLE PRECISION.
   -- DEFAULT TOLERANCE FOR PIVOTING IS NOW .00000001.

  PROGRAM TERMINATED NORMALLY.

@BRKPT PRINTS
```

```
@PRT NLR.RUN/3R77SMITHEX
PASS*NLR(1).RUN/3R77SMITHEX(0)
      @OLD*FIN.FTN,SI P3RFUN
            SUBROUTINE P3RFUN(F,DF,P,X,N,KASE,NVAR,NPAR,IP,XLOSS,ID)
            IMPLICIT DOUBLE PRECISION (A-H,O-Z)
            COMMON/MEMORY/LENGTH,LEXICN,IB(15000)
            DIMENSION DF(NPAR),P(NPAR),X(NVAR)
            DF(1)=1.0D0-DEXP(-P(2)*(X(3)-8.0D0))
            DF(2)=-(0.49D0-P(1))*(X(3)-8.0D0)*DEXP(-P(2)*(X(3)-8.0D0))
            F=P(1)+(0.49D0-P(1))*DEXP(-P(2)*(X(3)-8.0D0))
            RETURN
            END
      @MAP,I
       IN TPF$.
       IN N*BMDP77.3RREL
       LIB OLD*FTN.
       IN MEMORY
      END
      @XQT
      /PROBLEM
                TITLE IS 'AN EXAMPLE NONLINEAR REGRESSION - H. SMITH'.
      /INPUT
                VARIABLES ARE 3.
                FORMAT IS '(F5.3,F5.1,F5.1)'.
      /VARIABLE
                NAMES ARE CHLOR,CASEWT,TIME.
      /REGRESS
          TITLE IS'% CHLORINE/UNIT OF PRODUCT RES ON TIME ELAPSED'.
                INDEPENDENT IS TIME.
                DEPENDENT IS CHLOR.
                PARAMETERS ARE 2.
                WEIGHT IS CASEWT.
                HALVING IS 20
      /PARAMETER
                INITIAL ARE 0.30,0.02.
      /END
      0.490  1.0  8.0
      0.490  1.0  8.0
      0.480  1.0 10.0
      0.470  1.0 10.0
      0.480  1.0 10.0
      0.470  1.0 10.0
      0.460  1.0 12.0
      0.460  1.0 12.0
      0.450  1.0 12.0
      0.430  1.0 12.0
      0.450  1.0 14.0
      0.430  1.0 14.0
      0.430  1.0 14.0
      0.440  1.0 16.0
      0.430  1.0 16.0
      0.430  1.0 16.0
      0.460  1.0 18.0
      0.450  1.0 18.0
```

```
0.420  1.0 20.0
0.420  1.0 20.0
0.430  1.0 20.0
0.410  1.0 22.0
0.410  1.0 22.0
0.400  1.0 22.0
0.420  1.0 24.0
0.400  1.0 24.0
0.400  1.0 24.0
0.410  1.0 26.0
0.400  1.0 26.0
0.410  1.0 26.0
0.410  1.0 28.0
0.400  1.0 28.0
0.400  1.0 30.0
0.400  1.0 30.0
0.380  1.0 30.0
0.410  1.0 32.0
0.400  1.0 32.0
0.400  1.0 34.0
0.410  1.0 36.0
0.380  1.0 36.0
0.400  1.0 38.0
0.400  1.0 38.0
0.390  1.0 40.0
0.390  1.0 42.0
*EOF
```

```
@OLD•FTN.FTN,SI P3RFUN
FTN BRIX •09/14/82-14:59(,0)
      SUBROUTINE P3RFUN(F,DF,P,X,N,KASE,NVAR,NPAR,IP,XLOSS,ID)
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
      COMMON/MEMORY/LENGTH,LEXICN,IB(15000)
      DIMENSION DF(NPAR),P(NPAR),X(NVAR)
      DF(1)=1.0D0-DEXP(-P(2)*(X(3)-8.0D0))
      DF(2)=-(0.49D0-P(1))*(X(3)-8.0D0)*DEXP(-P(2)*(X(3)-8.0D0))
      F=P(1)+(0.49D0-P(1))*DEXP(-P(2)*(X(3)-8.0D0))
      RETURN
      END

END FTN 91 IBANK 33 DBANK 15002 COMMON
```

```
@MAP,I
MAP 30R1 S74T11 09/14/82 14:59:26
START=032154, PROG SIZE(I/D)=19113/31197
SYS$*RLIB$. LEVEL 74R1A
END MAP.  ERRORS: 0  TIME: 19.162  STORAGE: 19840/6/040777/077777

@XQT
```

```
BMDP3R - NONLINEAR REGRESSION                                   PROGRAM REVISED FEBRUARY 1979          1
HEALTH SCIENCES COMPUTING FACILITY                              MANUAL DATE  --  1977
UNIVERSITY OF CALIFORNIA, LOS ANGELES
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IN THIS VERSION OF BMDP3R

  -- THE FORM OF SPECIFYING LINEAR CONSTRAINTS HAS BEEN CHANGED, SEE BMDP-77 MANUAL PAGE 480.
  -- COMPUTATIONS ARE NOW PERFORMED IN DOUBLE PRECISION.
     IF YOU USE SUBROUTINE FUN BE SURE ALL FUNCTION REFERENCES ARE IN DOUBLE PRECISION.
  -- DEFAULT TOLERANCE FOR PIVOTING IS NOW .00000001.


 PROGRAM CONTROL INFORMATION

        /PROBLEM
                  TITLE IS 'AN EXAMPLE NONLINEAR REGRESSION - H. SMITH'.
        /INPUT
                  VARIABLES ARE 3.
                  FORMAT IS '(F5.3,F5.1,F5.1)'.
        /VARIABLE
                  NAMES ARE CHLOR,CASEWT,TIME.
        /REGRESS
              TITLE IS'% CHLORINE/UNIT OF PRODUCT RES ON TIME ELAPSED'.
                  INDEPENDENT IS TIME.
                  DEPENDENT IS CHLOR.
                  PARAMETERS ARE 2.
                  WEIGHT IS CASEWT.
                  HALVING IS 20
        /PARAMETER
                  INITIAL ARE 0.30,0.02.
        /END


 PROBLEM TITLE . . . . . . . .AN EXAMPLE NONLINEAR REGRESSION - H. SMITH

 NUMBER OF VARIABLES TO READ IN. . . . . . . . . .          3
 NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. .            0
 TOTAL NUMBER OF VARIABLES . . . . . . . . . . .            3
 NUMBER OF CASES TO READ IN. . . . . . . . . . . .    1000000
 CASE LABELING VARIABLES . . . . . . . . . . . .
 LIMITS AND MISSING VALUE CHECKED BEFORE TRANSFORMATIONS
 BLANKS ARE. . . . . . . . . . . . . . . . . . . . .    ZEROS
 INPUT UNIT NUMBER . . . . . . . . . . . . . . . .          5
 REWIND INPUT UNIT PRIOR TO READING. . DATA. . .           NO

 INPUT FORMAT
       (F5.3,F5.1,F5.1)


 VARIABLES TO BE USED
             1  CHLOR          2  CASEWT          3  TIME
```

```
REGRESSION TITLE
      % CHLORINE/UNIT OF PRODUCT RES ON TIME ELAPSED

REGRESSION NUMBER . . . . . . . . . . . . . . . . . .       0
INDEPENDENT VARIABLE(FOR BUILT-IN FUNCTION) . .   TIME
DEPENDENT VARIABLE. . . . . . . . . . . . . . . . .   CHLOR
WEIGHTING VARIABLE. . . . . . . . . . . . . . . . .   CASEWT
NUMBER OF PARAMETERS. . . . . . . . . . . . . . . .       2
NUMBER OF CONSTRAINTS . . . . . . . . . . . . . . .       0
TOLERANCE FOR PIVOTING. . . . . . . . . . . . . . . .00000001000
TOLERANCE FOR CONVERGENCE . . . . . . . . . . . . . .00001000000
MAXIMUM NUMBER OF ITERATIONS. . . . . . . . . . . .      50
MAXIMUM NUMBER OF INCREMENT HALVINGS. . . . . . . .      20
NUMBER OF DATA PASSES PER CASE. . . . . . . . . . .       1
COMPUTE LOSS FUNCTION . . . . . . . . . . . . . . .      NO

USING THE ABOVE SPECIFICATIONS THIS PROGRAM COULD PROCESS 1842 CASES.

NUMBER OF CASES READ. . . . . . . . . . . . . . . .      44
```

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
1	CHLOR	.425000	.030309	.380000	.490000
2	CASEWT	1.000000	.000000	1.000000	1.000000
3	TIME	22.272725	9.650555	8.000000	42.000000

```
PARAMETER MAXIMA. . . . . . . . . . . . . . ************** **************

PARAMETER MINIMA. . . . . . . . . . . . . . ************** **************
```

ITERATION NUMBER	INCREMENT HALVINGS	RESIDUAL SUM OF SQUARES	P(1)	P(2)
0	0	.026315	.300000	.020000
1	5	.025921	.316927	.022521
2	5	.025305	.329635	.024988
3	4	.024764	.349264	.029796
4	3	.024479	.373851	.038986
5	2	.022256	.395049	.055743
6	0	.010686	.407726	.107597
7	0	.005008	.390266	.100513
8	0	.005002	.390135	.101609
9	0	.005002	.390140	.101632
10	0	.005002	.390140	.101633
11	0	.005002	.390140	.101633
12	0	.005002	.390140	.101633
13	1	.005002	.390140	.101633

```
ITERATION   13 HAS THE SMALLEST RESIDUAL SUM OF SQUARES(SUBJECT TO CONSTRAINTS, IF ANY).
 REMAINING CALCULATIONS ARE BASED ON THE RESULTS OF THIS ITERATION.
```

3

ASYMPTOTIC CORRELATION MATRIX OF THE PARAMETERS

		P(1) 1	P(2) 2
P(1)	1	1.0000	
P(2)	2	.8879	1.0000

RESIDUAL MEAN SQUARE .0001190876

DEGREES OF FREEDOM 42

PARAMETER	ESTIMATE	ASYMPTOTIC STANDARD DEVIATION	TOLERANCE
P(1)	.390140	.005045	.2117044590
P(2)	.101633	.013360	.2117044590

CASE NO.	LABEL	PREDICTED CHLOR	STD DEV OF PRED VALUE	OBSERVED CHLOR	RESIDUAL	CASEWT	TIME
1		.490000	.000000	.490000	.000000	1.000000	8.000000
2		.490000	.000000	.490000	.000000	1.000000	8.000000
3		.471632	.001419	.480000	.008368	1.000000	10.000000
4		.471632	.001419	.470000	-.001632	1.000000	10.000000
5		.471632	.001419	.480000	.008368	1.000000	10.000000
6		.471632	.001419	.470000	-.001632	1.000000	10.000000
7		.456642	.002199	.460000	.003358	1.000000	12.000000
8		.456642	.002199	.460000	.003358	1.000000	12.000000
9		.456642	.002199	.450000	-.006642	1.000000	12.000000
10		.456642	.002199	.430000	-.026642	1.000000	12.000000
11		.444410	.002537	.450000	.005590	1.000000	14.000000
12		.444410	.002537	.430000	-.014410	1.000000	14.000000
13		.444410	.002537	.430000	-.014410	1.000000	14.000000
14		.434428	.002587	.440000	.005572	1.000000	16.000000
15		.434428	.002587	.430000	-.004428	1.000000	16.000000
16		.434428	.002587	.430000	-.004428	1.000000	16.000000
17		.426282	.002465	.460000	.033718	1.000000	18.000000
18		.426282	.002465	.450000	.023718	1.000000	18.000000
19		.419634	.002269	.420000	.000366	1.000000	20.000000
20		.419634	.002269	.420000	.000366	1.000000	20.000000
21		.419634	.002269	.430000	.010366	1.000000	20.000000
22		.414209	.002078	.410000	-.004209	1.000000	22.000000
23		.414209	.002078	.410000	-.004209	1.000000	22.000000
24		.414209	.002078	.400000	-.014209	1.000000	22.000000
25		.409782	.001959	.420000	.010218	1.000000	24.000000
26		.409782	.001959	.400000	-.009782	1.000000	24.000000
27		.409782	.001959	.400000	-.009782	1.000000	24.000000
28		.406169	.001951	.410000	.003831	1.000000	26.000000
29		.406169	.001951	.400000	-.006169	1.000000	26.000000
30		.406169	.001951	.410000	.003831	1.000000	26.000000
31		.403220	.002056	.410000	.006780	1.000000	28.000000
32		.403220	.002056	.400000	-.003220	1.000000	28.000000
33		.400814	.002246	.400000	-.000814	1.000000	30.000000
34		.400814	.002246	.400000	-.000814	1.000000	30.000000
35		.400814	.002246	.380000	-.020814	1.000000	30.000000
36		.398851	.002483	.410000	.011149	1.000000	32.000000
37		.398851	.002483	.400000	.001149	1.000000	32.000000
38		.397249	.002740	.400000	.002751	1.000000	34.000000
39		.395941	.002996	.410000	.014059	1.000000	36.000000
40		.395941	.002996	.380000	-.015941	1.000000	36.000000
41		.394874	.003241	.400000	.005126	1.000000	38.000000
42		.394874	.003241	.400000	.005126	1.000000	38.000000
43		.394003	.003468	.390000	-.004003	1.000000	40.000000
44		.393293	.003674	.390000	-.003293	1.000000	42.000000

SERIAL CORRELATION .00703

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BMDP3R - NONLINEAR REGRESSION                          PROGRAM REVISED FEBRUARY 1979
HEALTH SCIENCES COMPUTING FACILITY                     MANUAL DATE  --  1977
UNIVERSITY OF CALIFORNIA, LOS ANGELES
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IN THIS VERSION OF BMDP3R

   -- THE FORM OF SPECIFYING LINEAR CONSTRAINTS HAS BEEN CHANGED. SEE BMDP-77 MANUAL PAGE 480.
   -- COMPUTATIONS ARE NOW PERFORMED IN DOUBLE PRECISION.
      IF YOU USE SUBROUTINE FUN BE SURE ALL FUNCTION REFERENCES ARE IN DOUBLE PRECISION.
   -- DEFAULT TOLERANCE FOR PIVOTING IS NOW .00000001.


 PROGRAM TERMINATED NORMALLY.

@BRKPT PRINT$
```

```
@PRT NLR.RUN/AR77BHILDA
PASS*NLR(1).RUN/AR77BHILDA(0)
      @OLD*FTN.FTN,SI PARFUN
            SUBROUTINE FUN(F,P,X,N,KASE,NVAR,NPAR,IP,XLOSS)
            IMPLICIT DOUBLE PRECISION (A-H,O-Z)
            DIMENSION P(NPAR),X(NVAR)
            F = P(1)*DEXP(P(2)*X(3))
           *    + P(3)*DEXP(P(4)*X(3))
            RETURN
            END
      @MAP,I
       IN TPF$.
       IN N*BMDP77.ARREL
       LIB OLD*FTN.
       IN MEMORY
      END
      @XQT
      /PROBLEM
                TITLE IS 'RADIOACTIVE SULFATE DATA'.
      /INPUT
                VARIABLES ARE 3.
                FORMAT IS '(F8.4,F8.6,F8.0)'.
      /VARIABLE
                NAMES ARE COUNT,CASEWT,TIME.
      /REGRESS
                DEPENDENT IS COUNT.
                PARAMETERS ARE 4.
                WEIGHT IS CASEWT.
      /PARAMETER
                INITIAL ARE 10, -.1, 5, -.01.
      /END
       15.1117 .004379       2
       11.3601 .007749       4
        9.7652 .010487       6
        9.0935 .012093       8
        8.4820 .013900      10
        7.6891 .016914      15
        7.3342 .018591      20
        7.0593 .020067      25
        6.7041 .022249      30
        6.4313 .024177      40
        6.1554 .026393      50
        5.9940 .027833      60
        5.7698 .030039      70
        5.6140 .031392      80
        5.3915 .034402      90
        5.0938 .038540     110
        4.8717 .042135     130
        4.5996 .047267     150
        4.4968 .049453     160
        4.3602 .052600     170
        4.2668 .054928     180
      @EOF
```

```
@OLD*FTN.FTN,SI PARFUN
FTN 8R1X *09/14/82-15:13(,0)
      SUBROUTINE FUN(F,P,X,N,KASE,NVAR,NPAR,IP,XLOSS)
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
      DIMENSION P(NPAR),X(NVAR)
      F = P(1)*DEXP(P(2)*X(3))
     *     + P(3)*DEXP(P(4)*X(3))
      RETURN
      END

END FTN 47 IBANK 23 DBANK
```

```
@MAP,I
MAP 30R1 S74T11 09/14/82 15:13:14
START=032247, PROG SIZE(I/D)=22560/32958
SYS$*RLIB$. LEVEL 74R1A
END MAP.  ERRORS: 0  TIME: 20.951  STORAGE: 19328/6/040777/076777

@XQT
```

```
BMDPAR--DERIVATIVE-FREE NONLINEAR REGRESSION              PROGRAM REVISED OCTOBER 25, 1978          1
HEALTH SCIENCES COMPUTING FACILITY                        MANUAL DATE  --  1977
UNIVERSITY OF CALIFORNIA, LOS ANGELES
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  PROGRAM CONTROL INFORMATION

        /PROBLEM
                  TITLE IS 'RADIOACTIVE SULFATE DATA'.
        /INPUT
                  VARIABLES ARE 3.
                  FORMAT IS '(F8.4,F8.6,F8.0)'.
        /VARIABLE
                  NAMES ARE COUNT,CASEWT,TIME.
        /REGRESS
                  DEPENDENT IS COUNT.
                  PARAMETERS ARE 4.
                  WEIGHT IS CASEWT.
        /PARAMETER
                  INITIAL ARE 10, -.1, 5, -.01.
        /END

  PROBLEM TITLE . . . . . . .RADIOACTIVE SULFATE DATA

  NUMBER OF VARIABLES TO READ IN. . . . . . . . . .        3
  NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. .        0
  TOTAL NUMBER OF VARIABLES . . . . . . . . . . .        3
  NUMBER OF CASES TO READ IN. . . . . . . . . . . . 1000000
  CASE LABELING VARIABLES . . . . . . . . . . . .
  LIMITS AND MISSING VALUE CHECKED BEFORE TRANSFORMATIONS
  BLANKS ARE. . . . . . . . . . . . . . . . . . .    ZEROS
  INPUT UNIT NUMBER . . . . . . . . . . . . . . .        5
  REWIND INPUT UNIT PRIOR TO READING. . DATA. . .       NO

  INPUT FORMAT
        (F8.4,F8.6,F8.0)

  VARIABLES TO BE USED
              1  COUNT         2  CASEWT        3  TIME
```

REGRESSION TITLE

```
REGRESSION NUMBER . . . . . . . . . . . . . . . . .        0
DEPENDENT VARIABLE. . . . . . . . . . . . . . . . .    COUNT
WEIGHTING VARIABLE. . . . . . . . . . . . . . . . .   CASEWT
NUMBER OF PARAMETERS. . . . . . . . . . . . . . . .        4
NUMBER OF CONSTRAINTS . . . . . . . . . . . . . . .        0
TOLERANCE FOR PIVOTING. . . . . . . . . . . . . . .  1.0-008
TOLERANCE FOR CONVERGENCE . . . . . . . . . . . . .  1.0-005
MAXIMUM NUMBER OF ITERATIONS. . . . . . . . . . . .       50
MAXIMUM NUMBER OF INCREMENT HALVINGS. . . . . . . .        5
```

PARAMETERS TO BE ESTIMATED

	1 P(1)	2 P(2)	3 P(3)	4 P(4)
MINIMUM	****************	****************	****************	****************
MAXIMUM	****************	****************	****************	****************
INITIAL	10.000000	-.100000	5.000000	-.010000

USING THE ABOVE SPECIFICATIONS THIS PROGRAM COULD USE UP TO 507 CASES.

NUMBER OF CASES READ. 21

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
1	COUNT	5.750701	1.711865	4.266800	15.111700
3	TIME	97.933350	60.915966	2.000000	180.000000
2	CASEWT	NOT	COMPUTED	.004379	.054928

ITER. NO.	INCR. HALV.	RESIDUAL SUM OF SQUARES	PARAMETERS 1 P(1)	2 P(2)	3 P(3)	4 P(4)
0	0	6.116146+000	1.000000+001	-1.000000-001	5.000000+000	-1.100000-002
0	0	5.680315+000	1.000000+001	-1.100000-001	5.000000+000	-1.000000-002
0	0	5.592539+000	1.000000+001	-1.000000-001	5.000000+000	-1.000000-002
0	0	5.561265+000	1.100000+001	-1.000000-001	5.000000+000	-1.000000-002
0	0	4.992196+000	1.000000+001	-1.000000-001	5.500000+000	-1.000000-002
1	1	9.132877-001	1.010270+001	-1.004698-001	5.023928+000	1.339884-003
2	0	2.592328-001	7.585943+000	-1.668396-001	8.652810+000	-4.083750-003
3	0	1.101769-001	8.947059+000	-1.694156-001	6.950856+000	-3.428245-003
4	0	2.821596-002	9.058780+000	-1.731121-001	7.156356+000	-2.707384-003
5	3	1.902498-002	9.163392+000	-1.748002-001	7.168310+000	-2.907734-003
6	0	1.592020-002	1.013788+001	-1.899852-001	7.216170+000	-2.973439-003
7	5	1.565809-002	1.018638+001	-1.911234-001	7.233586+000	-3.014487-003
8	1	1.528276-002	1.068700+001	-2.092101-001	7.339659+000	-3.234907-003
9	0	1.306964-002	1.084404+001	-2.190415-001	7.367586+000	-3.165851-003
10	0	1.305002-002	1.085948+001	-2.197150-001	7.363722+000	-3.157654-003
11	0	1.300182-002	1.132483+001	-2.266235-001	7.331679+000	-3.118144-003

12	0	1.293429-002	1.119550+001	-2.231202-001	7.347094+000	-3.136071-003
13	0	1.285337-002	1.128930+001	-2.275992-001	7.374185+000	-3.174284-003
14	2	1.285332-002	1.129117+001	-2.276029-001	7.374536+000	-3.174530-003
15	0	1.284938-002	1.129724+001	-2.282159-001	7.377357+000	-3.170904-003
16	0	1.284771-002	1.130544+001	-2.282372-001	7.376182+000	-3.171629-003
17	0	1.284682-002	1.133493+001	-2.286582-001	7.374824+000	-3.169997-003
18	0	1.284605-002	1.133647+001	-2.288256-001	7.376315+000	-3.172028-003
19	0	1.284564-002	1.134889+001	-2.291834-001	7.379225+000	-3.175627-003
20	0	1.284544-002	1.134628+001	-2.291928-001	7.378816+000	-3.175202-003
21	3	1.284543-002	1.134661+001	-2.292209-001	7.378939+000	-3.175041-003
22	0	1.284535-002	1.135685+001	-2.294227-001	7.376521+000	-3.174768-003
23	0	1.284533-002	1.135295+001	-2.293666-001	7.378706+000	-3.174985-003
24	0	1.284532-002	1.135310+001	-2.293832-001	7.378854+000	-3.175185-003
25	0	1.284531-002	1.135461+001	-2.294265-001	7.379204+000	-3.175618-003

THE RESIDUAL SUM OF SQUARES (= 1.284531-002) WAS SMALLEST WITH THE FOLLOWING PARAMETER VALUES

1 P(1)	2 P(2)	3 P(3)	4 P(4)
1.135461+001	-2.294265-001	7.379204+000	-3.175618-003

ESTIMATE OF ASYMPTOTIC CORRELATION MATRIX

		P(1) 1	P(2) 2	P(3) 3	P(4) 4
P(1)	1	1.0000			
P(2)	2	-.8139	1.0000		
P(3)	3	.1460	-.5028	1.0000	
P(4)	4	-.1140	.4187	-.8689	1.0000

THE ESTIMATED MEAN SQUARE ERROR IS 7.5561-004

ESTIMATES OF ASYMPTOTIC STANDARD DEVIATIONS OF PARAMETER ESTIMATES WITH 17 DEGREES OF FREEDOM ARE

1 P(1)	2 P(2)	3 P(3)	4 P(4)
8.657886-001	1.873086-002	1.065936-001	1.362987-004

CASE NO.	NAME	RESIDUAL	OBSERVED 1 COUNT	PREDICTED 1 COUNT	STD. DEV. PREDICTED	2 CASEWT	3 TIME
1		.603006	15.111700	14.508694	.362641	.004379	2.000000
2		-.461385	11.360100	11.821485	.171988	.007749	4.000000
3		-.341157	9.765200	10.106357	.144654	.010487	6.000000
4		.087800	9.093500	9.005700	.136212	.012093	8.000000
5		.188502	8.482000	8.293498	.118690	.013900	10.000000
6		.289585	7.689100	7.399515	.078247	.016914	15.000000
7		.293642	7.334200	7.040558	.070466	.018591	20.000000
8		.206622	7.059300	6.852678	.072006	.020067	25.000000
9		-.016188	6.704100	6.720288	.071351	.022249	30.000000
10		-.068827	6.431300	6.500127	.065070	.024177	40.000000
11		-.140532	6.155400	6.295932	.057666	.026393	50.000000
12		-.105035	5.994000	6.099035	.051120	.027833	60.000000
13		-.138586	5.769800	5.908386	.045843	.030039	70.000000
14		-.079705	5.644000	5.723705	.042004	.031392	80.000000
15		-.153298	5.391500	5.544798	.039684	.034402	90.000000
16		-.109785	5.093800	5.203585	.039322	.038540	110.000000
17		-.011669	4.871700	4.883369	.043086	.042135	130.000000
18		.016741	4.599600	4.582859	.048814	.047267	150.000000
19		.057189	4.496800	4.439611	.051932	.049453	160.000000
20		.059359	4.360200	4.300841	.055084	.052600	170.000000
21		.100391	4.266800	4.166409	.058141	.054928	180.000000

```
BMDPAR--DERIVATIVE-FREE NONLINEAR REGRESSION          PROGRAM REVISED OCTOBER 25, 1978          5
HEALTH SCIENCES COMPUTING FACILITY                    MANUAL DATE  --  1977
UNIVERSITY OF CALIFORNIA, LOS ANGELES
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  PROGRAM TERMINATED NORMALLY.

@BRKPT PRINT$
```

```
@PRT NLR.RUN'AR77INSULIN
PASS•NLR(1).RUN/AR77INSULIN(0)
      @OLD•FTN.FTN,SI PARFUN
            SUBROUTINE FUN(F,P,X,N,KASE,NVAR,NPAR,IP,XLOSS)
            IMPLICIT DOUBLE PRECISION (A-H,O-Z)
            DIMENSION P(NPAR),X(NVAR)
            A = P(1)*X(1) + P(2)
            IF(A.LE.0.0) A = 0.000001
            F = 1.0/A + P(3)
            RETURN
            END
      @MAP,I
       IN TPF$.
       IN N-BMDP77.ARREL
       LIB OLD•FTN.
       IN MEMORY
      END
      @XQT
      /PROBLEM
                TITLE IS 'INSULIN DATA'.
      /INPUT
                VARIABLES ARE 2.
                FORMAT IS '(F6.0,F6.3)'.
      /VARIABLE
                NAMES ARE STANDARD,COUNT.
      /REGRESS
                DEPENDENT IS COUNT.
                PARAMETERS ARE 3.
      /PARAMETER
                INITIAL ARE 0.01, 0.1, 5.
      /END
           0 9.274
           0 9.522
           5 8.082
           5 8.354
          10 7.296
          10 7.518
          25 5.864
          25 5.974
          50 4.396
          50 4.110
         100 2.830
         100 2.674
         200 1.798
         200 1.566
      @EOF
```

```
@OLD*FTN.FTN,SI PARFUN
FTN 8R1X *09/14/82-15:20(,0)
            SUBROUTINE FUN(F,P,X,N,KASE,NVAR,NPAR,IP,XLOSS)
            IMPLICIT DOUBLE PRECISION (A-H,O-Z)
            DIMENSION P(NPAR),X(NVAR)
            A = P(1)*X(1) + P(2)
            IF(A.LE.0.0) A = 0.000001
            F = 1.0/A + P(3)
            RETURN
            END

END FTN 40 IBANK 20 DBANK
```

```
@MAP,I
MAP 30R1 S74T11 09/14/82 15:20:13
START=032240, PROG SIZE(I/D)=22553/32955
SYS$*RLIB$. LEVEL 74R1A
END MAP.  ERRORS: 0  TIME: 20.962  STORAGE: 19840/6/040777/077777

@XQT
```

```
BMDPAR--DERIVATIVE-FREE NONLINEAR REGRESSION          PROGRAM REVISED OCTOBER 25, 1978        1
HEALTH SCIENCES COMPUTING FACILITY                    MANUAL DATE  --  1977
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 PROGRAM CONTROL INFORMATION

       /PROBLEM
                 TITLE IS 'INSULIN DATA'.
       /INPUT
                 VARIABLES ARE 2.
                 FORMAT IS '(F6.0,F6.3)'.
       /VARIABLE
                 NAMES ARE STANDARD,COUNT.
       /REGRESS
                 DEPENDENT IS COUNT.
                 PARAMETERS ARE 3.
       /PARAMETER
                 INITIAL ARE 0.01, 0.1, 5.
       /END

 PROBLEM TITLE . . . . . . .INSULIN DATA

 NUMBER OF VARIABLES TO READ IN. . . . . . . . .        2
 NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. .        0
 TOTAL NUMBER OF VARIABLES . . . . . . . . . . .        2
 NUMBER OF CASES TO READ IN. . . . . . . . . . .  1000000
 CASE LABELING VARIABLES . . . . . . . . . . . .
 LIMITS AND MISSING VALUE CHECKED BEFORE TRANSFORMATIONS
 BLANKS ARE. . . . . . . . . . . . . . . . . . .   ZEROS
 INPUT UNIT NUMBER . . . . . . . . . . . . . . .        5
 REWIND INPUT UNIT PRIOR TO READING. . DATA. . .       NO

 INPUT FORMAT
       (F6.0,F6.3)

 VARIABLES TO BE USED
            1  STANDARD      2  COUNT
```

REGRESSION TITLE

```
REGRESSION NUMBER . . . . . . . . . . . . . . . . . .        0
DEPENDENT VARIABLE. . . . . . . . . . . . . . . . . .    COUNT
WEIGHTING VARIABLE. . . . . . . . . . . . . . . . . .    thhh
NUMBER OF PARAMETERS. . . . . . . . . . . . . . . . .        3
NUMBER OF CONSTRAINTS . . . . . . . . . . . . . . . .        0
TOLERANCE FOR PIVOTING. . . . . . . . . . . . . . . .  1.0-008
TOLERANCE FOR CONVERGENCE . . . . . . . . . . . . . .  1.0-005
MAXIMUM NUMBER OF ITERATIONS. . . . . . . . . . . . .       50
MAXIMUM NUMBER OF INCREMENT HALVINGS. . . . . . . . .        5
```

PARAMETERS TO BE ESTIMATED

	1 P(1)	2 P(2)	3 P(3)
MINIMUM	****************	****************	****************
MAXIMUM	****************	****************	****************
INITIAL	.010000	.100000	5.000000

USING THE ABOVE SPECIFICATIONS THIS PROGRAM COULD USE UP TO 647 CASES.

NUMBER OF CASES READ. 14

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
1	STANDARD	55.714285	69.637996	.000000	200.000000
2	COUNT	5.661286	2.773082	1.566000	9.522000

ITER. NO.	INCR. HALV.	RESIDUAL SUM OF SQUARES	PARAMETERS 1 P(1)	2 P(2)	3 P(3)
0	0	2.174612+002	1.000000-002	1.000000-001	5.500000+000
0	0	1.680677+002	1.000000-002	1.000000-001	5.000000+000
0	0	1.586582+002	1.100000-002	1.000000-001	5.000000+000
0	0	1.405905+002	1.000000-002	1.100000-001	5.000000+000
1	0	9.919684+000	2.656120-003	1.233166-001	1.349150+000
2	3	9.483559+000	2.401169-003	1.210136-001	1.124497+000
3	0	3.449127+000	1.704012-003	1.070051-001	-2.229415-001
4	0	3.157730+000	3.174185-003	1.102350-001	-2.983919-002
5	0	2.250220+000	3.093902-003	1.090535-001	-2.701893-002
6	0	2.591084-001	2.668004-003	1.083618-001	7.809211-002
7	0	2.509365-001	2.635365-003	1.085001-001	8.525068-002
8	2	2.506092-001	2.641965-003	1.085765-001	9.125333-002
9	0	2.492087-001	2.687407-003	1.089905-001	1.361274-001
10	0	2.491448-001	2.692851-003	1.089737-001	1.374295-001
11	2	2.491448-001	2.692838-003	1.089739-001	1.374293-001
12	0	2.491446-001	2.693051-003	1.089759-001	1.375504-001
13	0	2.491446-001	2.693953-003	1.089842-001	1.384095-001

14	0	2.491445-001	2.693590-003	1.089808-001	1.380458-001
15	4	2.491445-001	2.693592-003	1.089807-001	1.380460-001

THE RESIDUAL SUM OF SQUARES (= .249144) WAS SMALLEST WITH THE FOLLOWING PARAMETER VALUES

1 P(1)	2 P(2)	3 P(3)
2.693592-003	1.089807-001	1.380460-001

ESTIMATE OF ASYMPTOTIC CORRELATION MATRIX

		P(1) 1	P(2) 2	P(3) 3
P(1)	1	1.0000		
P(2)	2	.7459	1.0000	
P(3)	3	.9365	.8828	1.0000

THE ESTIMATED MEAN SQUARE ERROR IS 2.2649-002

ESTIMATES OF ASYMPTOTIC STANDARD DEVIATIONS OF PARAMETER ESTIMATES WITH 11 DEGREES OF FREEDOM ARE

1 P(1)	2 P(2)	3 P(3)
2.202092-004	2.070125-003	1.863640-001

CASE NO. NAME	RESIDUAL	OBSERVED 2 COUNT	PREDICTED 2 COUNT	STD. DEV. PREDICTED	1 STANDARD
1	-.039980	9.274000	9.313980	.087987	.000000
2	.208020	9.522000	9.313980	.087987	.000000
3	-.222732	8.082000	8.304732	.056890	5.000000
4	.049268	8.354000	8.304732	.056890	5.000000
5	-.199496	7.296000	7.495496	.054249	10.000000
6	.022504	7.518000	7.495496	.054249	10.000000
7	.054465	5.864000	5.809535	.066492	25.000000
8	.164465	5.974000	5.809535	.066492	25.000000
9	.153880	4.396000	4.242120	.061860	50.000000
10	-.132120	4.110000	4.242120	.061860	50.000000
11	.048828	2.830000	2.781172	.059216	100.000000
12	-.107172	2.674000	2.781172	.059216	100.000000
13	.116027	1.798000	1.681973	.091098	200.000000
14	-.115973	1.566000	1.681973	.091098	200.000000

HEALTH SCIENCES COMPUTING FACILITY MANUAL DATE -- 1977
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  PROGRAM TERMINATED NORMALLY.

@BRKPT PRINT$
```

```
@PRT NLR.RUN/AR77SMITHEX
PASS*NLR(1).RUN/AR77SMITHEX(0)
      @OLD*FTN.FTN,SI PARFUN
            SUBROUTINE FUN(F,P,X,N,KASE,NVAR,NPAR,IP,XLOSS)
            IMPLICIT DOUBLE PRECISION (A-H,O-Z)
            DIMENSION P(NPAR),X(NVAR)
            F=P(1)+(0.49D0-P(1))*DEXP(-P(2)*(X(3)-8.0D0))
            RETURN
            END
      @MAP,I
       IN IPF$.
       IN N*BMDP77.ARREL
       LIB OLD*FTN.
       IN MEMORY
      END
      @XQT
      /PROBLEM
                TITLE IS 'AN EXAMPLE NONLINEAR REGRESSION - H. SMITH'.
      /INPUT
                VARIABLES ARE 3.
                FORMAT IS '(F5.3,F5.1,F5.1)'.
      /VARIABLE
                NAMES ARE CHLOR,CASEWT,TIME.
      /REGRESS
          TITLE IS'% CHLORINE/UNIT OF PRODUCT RES ON TIME ELAPSED'.
                DEPENDENT IS CHLOR.
                PARAMETERS ARE 2.
                WEIGHT IS CASEWT.
                HALVING IS 20
      /PARAMETER
                INITIAL ARE 0.30,0.02.
      /END
      0.490   1.0   8.0
      0.490   1.0   8.0
      0.480   1.0  10.0
      0.470   1.0  10.0
      0.480   1.0  10.0
      0.470   1.0  10.0
      0.460   1.0  12.0
      0.460   1.0  12.0
      0.450   1.0  12.0
      0.430   1.0  12.0
      0.450   1.0  14.0
      0.430   1.0  14.0
      0.430   1.0  14.0
      0.440   1.0  16.0
      0.430   1.0  16.0
      0.430   1.0  16.0
      0.460   1.0  18.0
      0.450   1.0  18.0
      0.420   1.0  20.0
      0.420   1.0  20.0
      0.430   1.0  20.0
      0.410   1.0  22.0
      0.410   1.0  22.0
      0.400   1.0  22.0
      0.420   1.0  24.0
```

56	0.400	1.0	24.0
57	0.400	1.0	24.0
58	0.410	1.0	26.0
59	0.400	1.0	26.0
60	0.410	1.0	26.0
61	0.410	1.0	28.0
62	0.400	1.0	28.0
63	0.400	1.0	30.0
64	0.400	1.0	30.0
65	0.390	1.0	30.0
66	0.410	1.0	32.0
67	0.400	1.0	32.0
68	0.400	1.0	34.0
69	0.410	1.0	36.0
70	0.380	1.0	36.0
71	0.400	1.0	38.0
72	0.400	1.0	38.0
73	0.390	1.0	40.0
74	0.390	1.0	42.0
75	@EOF		

```
@OLD*FTN.FTN,SI PARFUN
FTN 8R1X *09/14/82-15:26(,0)
          SUBROUTINE FUN(F,P,X,N,KASE,NVAR,NPAR,IP,XLOSS)
          IMPLICIT DOUBLE PRECISION (A-H,O-Z)
          DIMENSION P(NPAR),X(NVAR)
          F=P(1)+(0.49D0-P(1))*DEXP(-P(2)*(X(3)-8.0D0))
          RETURN
          END

END FTN 46 IBANK 25 DBANK
```

```
@MAP,I
MAP 30R1 S74T11 09/14/82 15:26:09
START=032246, PROG SIZE(I/D)=22559/32960
SYS$*RLIB$. LEVEL 74R1A
END MAP.  ERRORS: 0  TIME: 20.324  STORAGE: 19328/6/040777/076777

@XQT
```

```
BMDPAR--DERIVATIVE-FREE NONLINEAR REGRESSION                PROGRAM REVISED OCTOBER 25, 1978        1
HEALTH SCIENCES COMPUTING FACILITY                          MANUAL DATE  --  1977
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 PROGRAM CONTROL INFORMATION

        /PROBLEM
                   TITLE IS 'AN EXAMPLE NONLINEAR REGRESSION - H. SMITH'.
        /INPUT
                   VARIABLES ARE 3.
                   FORMAT IS '(F5.3,F5.1,F5.1)'.
        /VARIABLE
                   NAMES ARE CHLOR,CASEWT,TIME.
        /REGRESS
              TITLE IS'% CHLORINE/UNIT OF PRODUCT RES ON TIME ELAPSED'.
                   DEPENDENT IS CHLOR.
                   PARAMETERS ARE 2.
                   WEIGHT IS CASEWT.
                   HALVING IS 20
        /PARAMETER
                   INITIAL ARE 0.30,0.02.
        /END

 PROBLEM TITLE . . . . . . .AN EXAMPLE NONLINEAR REGRESSION - H. SMITH

 NUMBER OF VARIABLES TO READ IN. . . . . . . . .       3
 NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. .       0
 TOTAL NUMBER OF VARIABLES . . . . . . . . . . .       3
 NUMBER OF CASES TO READ IN. . . . . . . . . . . 1000000
 CASE LABELING VARIABLES . . . . . . . . . . . .
 LIMITS AND MISSING VALUE CHECKED BEFORE TRANSFORMATIONS
 BLANKS ARE. . . . . . . . . . . . . . . . . . .   ZEROS
 INPUT UNIT NUMBER . . . . . . . . . . . . . . .       5
 REWIND INPUT UNIT PRIOR TO READING. . DATA. . .      NO

 INPUT FORMAT
        (F5.3,F5.1,F5.1)

 VARIABLES TO BE USED
             1  CHLOR          2  CASEWT         3  TIME
```

```
REGRESSION TITLE
      % CHLORINE/UNIT OF PRODUCT RES ON TIME ELAPSED

REGRESSION NUMBER . . . . . . . . . . . . . . . .        0
DEPENDENT VARIABLE. . . . . . . . . . . . . . . .    CHLOR
WEIGHTING VARIABLE. . . . . . . . . . . . . . . .   CASEWT
NUMBER OF PARAMETERS. . . . . . . . . . . . . . .        2
NUMBER OF CONSTRAINTS . . . . . . . . . . . . . .        0
TOLERANCE FOR PIVOTING. . . . . . . . . . . . . . 1.0-008
TOLERANCE FOR CONVERGENCE . . . . . . . . . . . . 1.0-005
MAXIMUM NUMBER OF ITERATIONS. . . . . . . . . . .       50
MAXIMUM NUMBER OF INCREMENT HALVINGS. . . . . . .       20
```

PARAMETERS TO BE ESTIMATED

	1 P(1)	2 P(2)
MINIMUM	****************	****************
MAXIMUM	****************	****************
INITIAL	.300000	.020000

USING THE ABOVE SPECIFICATIONS THIS PROGRAM COULD USE UP TO 649 CASES.

NUMBER OF CASES READ.   44

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
1	CHLOR	.425000	.030309	.380000	.490000
3	TIME	22.272725	9.650555	8.000000	42.000000
2	CASEWT	NOT COMPUTED		1.000000	1.000000

ITER. NO.	INCR. HALV.	RESIDUAL SUM OF SQUARES	PARAMETERS 1 P(1)	2 P(2)
0	0	.041869	.330000	.020000
0	0	.026315	.300000	.020000
0	0	.020475	.300000	.022000
1	7	.020400	.303829	.022574
2	5	.020126	.317429	.024878
3	6	.011992	.275411	.024164
4	3	.010959	.326241	.033406
5	7	.010956	.328083	.033833
6	6	.010282	.320096	.033363
7	3	.009378	.342505	.040422
8	3	.009287	.358635	.046623
9	4	.008612	.348981	.044344
10	3	.008089	.360444	.050298
11	3	.007699	.368365	.055696
12	3	.006520	.364611	.062542
13	1	.006421	.387461	.078662

14	0	.006348	.397270	.099523
15	0	.005743	.386329	.107315
16	0	.005003	.389768	.101267
17	0	.005002	.390158	.101680
18	0	.005002	.390146	.101656
19	0	.005002	.390141	.101635
20	0	.005002	.390140	.101633
21	0	.005002	.390140	.101633
22	0	.005002	.390140	.101633

% CHLORINE/UNIT OF PRODUCT RES ON TIME ELAPSED

THE RESIDUAL SUM OF SQUARES (= 5.001680-003) WAS SMALLEST WITH THE FOLLOWING PARAMETER VALUES

1 P(1)	2 P(2)
3.901400-001	1.016327-001

ESTIMATE OF ASYMPTOTIC CORRELATION MATRIX

		P(1) 1	P(2) 2
P(1)	1	1.0000	
P(2)	2	.8879	1.0000

THE ESTIMATED MEAN SQUARE ERROR IS 1.1909-004

ESTIMATES OF ASYMPTOTIC STANDARD DEVIATIONS OF PARAMETER ESTIMATES WITH 42 DEGREES OF FREEDOM ARE

1 P(1)	2 P(2)
5.044873-003	1.336034-002

% CHLORINE/UNIT OF PRODUCT RES ON TIME ELAPSED

CASE NO. NAME	RESIDUAL	OBSERVED 1 CHLOR	PREDICTED 1 CHLOR	STD. DEV. PREDICTED	2 CASEWT	3 TIME
1	.000000	.490000	.490000	.000000	1.000000	8.000000
2	.000000	.490000	.490000	.000000	1.000000	8.000000
3	.008368	.480000	.471632	.001419	1.000000	10.000000
4	-.001632	.470000	.471632	.001419	1.000000	10.000000
5	.008368	.480000	.471632	.001419	1.000000	10.000000
6	-.001632	.470000	.471632	.001419	1.000000	10.000000
7	.003358	.460000	.456642	.002199	1.000000	12.000000
8	.003358	.460000	.456642	.002199	1.000000	12.000000
9	-.006642	.450000	.456642	.002199	1.000000	12.000000
10	-.026642	.430000	.456642	.002199	1.000000	12.000000
11	.005590	.450000	.444410	.002537	1.000000	14.000000
12	-.014410	.430000	.444410	.002537	1.000000	14.000000
13	-.014410	.430000	.444410	.002537	1.000000	14.000000
14	.005572	.440000	.434428	.002587	1.000000	16.000000
15	-.004428	.430000	.434428	.002587	1.000000	16.000000
16	-.004428	.430000	.434428	.002587	1.000000	16.000000
17	.033718	.460000	.426282	.002465	1.000000	18.000000
18	.023718	.450000	.426282	.002465	1.000000	18.000000
19	.000366	.420000	.419634	.002269	1.000000	20.000000
20	.000366	.420000	.419634	.002269	1.000000	20.000000
21	.010366	.430000	.419634	.002269	1.000000	20.000000
22	-.004209	.410000	.414209	.002078	1.000000	22.000000
23	-.004209	.410000	.414209	.002078	1.000000	22.000000
24	-.014209	.400000	.414209	.002078	1.000000	22.000000
25	.010218	.420000	.409782	.001959	1.000000	24.000000
26	-.009782	.400000	.409782	.001959	1.000000	24.000000
27	-.009782	.400000	.409782	.001959	1.000000	24.000000
28	.003831	.410000	.406169	.001951	1.000000	26.000000
29	-.006169	.400000	.406169	.001951	1.000000	26.000000
30	.003831	.410000	.406169	.001951	1.000000	26.000000
31	.006780	.410000	.403220	.002056	1.000000	28.000000
32	-.003220	.400000	.403220	.002056	1.000000	28.000000
33	-.000814	.400000	.400814	.002246	1.000000	30.000000
34	-.000814	.400000	.400814	.002246	1.000000	30.000000
35	-.020814	.380000	.400814	.002246	1.000000	30.000000
36	.011149	.410000	.398851	.002483	1.000000	32.000000
37	.001149	.400000	.398851	.002483	1.000000	32.000000
38	.002751	.400000	.397249	.002740	1.000000	34.000000
39	.014059	.410000	.395941	.002996	1.000000	36.000000
40	-.015941	.380000	.395941	.002996	1.000000	36.000000
41	.005126	.400000	.394874	.003241	1.000000	38.000000
42	.005126	.400000	.394874	.003241	1.000000	38.000000
43	-.004003	.390000	.394003	.003468	1.000000	40.000000
44	-.003293	.390000	.393293	.003674	1.000000	42.000000

PROGRAM TERMINATED NORMALLY.

@BRKPT PRINTS

P3R77

H0FM0CK

7213

22SEP82

FILENAME + PRT1 USERID + HOFMUCKEL-UL ACCOUNT + DIA7213O230A CREATED AT: 18:10:47 22 SEP 82

1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012

```
@ELT,L NLR.RUN/P3R77
ELT0T7 RLIB70 09/22-16:39:12-(3,)
001 @RUN,X/NR P3R77,DLK7213030A/HOFMOCKEL-JL,PASS,6,100
001 @ASG,A PRT1.
001 @USE PRT,PRT1
000 @PRX,U PRT.
001 @PASS+NLR.P3R77
001 /PROBLEM
001             TITLE IS ' REGRESSION ON REAL PI DATA'.
001 /INPUT
001             VARIABLES ARE 9.
001             FORMAT IS '(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))'.
001 /VARIABLE
001             NAMES ARE PERF,HOLD,CASEWT,TIMEWT,I1,I2,I3,I4,I5.
001 /REGRESS
001             TITLE IS ' PARAMETERS FROM REAL DATA SET # 1( 6 SOURCES )'.
001             INDEPENDENT IS PERF.
001             DEPENDENT IS HOLD.
001             NUMBER IS 2.
001             PARAMETERS ARE 7.
001             WEIGHT IS CASEWT.
001             ITERATIONS ARE 10.
001             HALVING IS 50.
001 /PARAMETER
001             INITIAL ARE -20.0, 0.125,0.0,0.0,0.0,0.0,0.0.
001 /PLOT
001             RESIDUAL.
001             VARIABLE IS PERF.
001             NORMAL.
001             SIZE IS 50,40.
001 /END
003 @ADD,P NLRDAT.A1
001 @EOF
001 @PASS+NLR.P3R77
001 /PROBLEM
001             TITLE IS ' REGRESSION ON REAL PI DATA'.
001 /INPUT
001             VARIABLES ARE 8.
001             FORMAT IS '(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))'.
001 /VARIABLE
001             NAMES ARE PERF,HOLD,CASEWT,TIMEWT,I1,I2,I3,I4.
001 /REGRESS
001             TITLE IS ' PARAMETERS FROM REAL DATA SET # 2( 5 SOURCES )'.
001             INDEPENDENT IS PERF.
001             DEPENDENT IS HOLD.
001             NUMBER IS 2.
001             PARAMETERS ARE 6.
001             WEIGHT IS CASEWT.
001             ITERATIONS ARE 10.
001             HALVING IS 50.
001 /PARAMETER
001             INITIAL ARE -20.0, 0.125,0.0,0.0,0.0,0.0.
001 /PLOT
001             RESIDUAL.
001             VARIABLE IS PERF.
001             NORMAL.
001             SIZE IS 50,40.
```

```
001 /END
003 @ADD,P NLRDAT.A2
001 @EOF
001 @PASS*NLR.P3R77
001 /PROBLEM
001           TITLE IS ' REGRESSION ON REAL PI DATA'.
001 /INPUT
001           VARIABLES ARE 8.
001           FORMAT IS '(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))'.
001 /VARIABLE
001           NAMES ARE PERF,HOLD,CASEWT,TIMEWT,I1,I2,I3,I4.
001 /REGRESS
001           TITLE IS ' PARAMETERS FROM REAL DATA SET # 3( 5 SOURCES )'.
001           INDEPENDENT IS PERF.
001           DEPENDENT IS HOLD.
001           NUMBER IS 2.
001           PARAMETERS ARE 6.
001           WEIGHT IS CASEWT.
001           ITERATIONS ARE 10.
001           HALVING IS 50.
001 /PARAMETER
001           INITIAL ARE -20.0. 0.125,0.0,0.0,0.0,0.0.
001 /PLOT
001           RESIDUAL.
001           VARIABLE IS PERF.
001           NORMAL.
001           SIZE IS 50,40.
001 /END
003 @ADD,P NLRDAT.A3
001 @EOF
000 @BRKPT PRINT$
000 @SYM,U PRT,,,PR
000 @FIN

END ELT.
```

```
@ELT,L NLRDAT.A1
ELTOT7 RLIB70 09/22-16:39:40-(0,)
000001      000 172.75   .00000    634.00907  154. 0 0 0 0 0
000002      000 174.25   .00923   2130.33652  368. 0 0 0 0 0
000003      000 175.75   .00000   3206.75296  374. 0 0 0 0 0
000004      000 177.25   .00000   3386.82523  256. 0 0 0 0 0
000005      000 178.75   .00000   2053.32242   95. 0 0 0 0 0
000006      000 180.25   .00000   1547.43471   41. 0 0 0 0 0
000007      000 181.75   .00000   6557.75958  109. 0 0 0 0 0
000008      000 183.25   .00000   4531.68317   40. 0 0 0 0 0
000009      000 184.75   .00000   8975.75354   44. 0 0 0 0 0
000010      000 186.25   .00000  13092.22632   33. 0 0 0 0 0
000011      000 187.75   .00000   6856.22125    3. 0 0 0 0 0
000012      000 171.25   .00000     72.79577   20. 1 0 0 0 0
000013      000 172.75   .01702    950.65219  233. 1 0 0 0 0
000014      000 174.25   .00000   3481.58160  604. 1 0 0 0 0
000015      000 175.75   .00000   1332.66386  153. 1 0 0 0 0
000016      000 177.25   .00000   1421.57776  105. 1 0 0 0 0
000017      000 178.75   .00000    556.19869   22. 1 0 0 0 0
000018      000 180.25   .00000   5010.77924  143. 1 0 0 0 0
000019      000 181.75   .00000   5747.74658   95. 1 0 0 0 0
000020      000 183.25   .00000   4733.23401   42. 1 0 0 0 0
000021      000 184.75   .00000  38588.38672  204. 1 0 0 0 0
000022      000 186.25   .00000  25537.83569   69. 1 0 0 0 0
000023      000 187.75   .00000   7893.65527    5. 1 0 0 0 0
000024      000 168.25   .00000     23.04027    7. 0 1 0 0 0
000025      000 169.75   .02886    209.99318   91. 0 1 0 0 0
000026      000 171.25   .02661    373.73109  124. 0 1 0 0 0
000027      000 172.75   .00000    597.94630  145. 0 1 0 0 0
000028      000 174.25   .00000    516.46037   86. 0 1 0 0 0
000029      000 175.75   .00000   1002.16917  114. 0 1 0 0 0
000030      000 177.25   .00000   1395.57329  103. 0 1 0 0 0
000031      000 178.75   .00000   2818.31302  132. 0 1 0 0 0
000032      000 180.25   .00000   5827.64832  167. 0 1 0 0 0
000033      000 181.75   .00000   8583.98083  144. 0 1 0 0 0
000034      000 183.25   .00000  15611.64893  149. 0 1 0 0 0
000035      000 184.75   .00000  73445.75391  392. 0 1 0 0 0
000036      000 186.25   .00000  24496.01538   66. 0 1 0 0 0
000037      000 168.25   .97667     16.30957    2. 0 0 1 0 0
000038      000 169.75   .50596     59.26800   22. 0 0 1 0 0
000039      000 171.25   .56926     36.30138    6. 0 0 1 0 0
000040      000 172.75   .06504    850.43632  208. 0 0 1 0 0
000041      000 174.25   .07638   2262.02036  391. 0 0 1 0 0
000042      000 175.75   .04326   2112.70639  245. 0 0 1 0 0
000043      000 177.25   .00000   3373.80548  255. 0 0 1 0 0
000044      000 178.75   .00340   4866.86658  231. 0 0 1 0 0
000045      000 180.25   .00000   1013.32571   25. 0 0 1 0 0
000046      000 181.75   .00000   4129.53210   67. 0 0 1 0 0
000047      000 183.25   .00000   4834.09961   43. 0 0 1 0 0
000048      000 184.75   .00000  14507.47009   74. 0 0 1 0 0
000049      000 186.25   .00000  11727.51270   29. 0 0 1 0 0
000050      000 187.75   .00000   6360.58649    2. 0 0 1 0 0
000051      000 163.75   .00000      9.49148    1. 0 0 0 1 0
000052      000 165.25   .06000     14.23563    5. 0 0 0 1 0
000053      000 166.75   .01667     43.81716   26. 0 0 0 1 0
000054      000 168.25   .00000    116.88164   63. 0 0 0 1 0
000055      000 169.75   .07171    395.11330  175. 0 0 0 1 0
```

000056	000	171.25	.00000	344.59908	114.	0	0	0	1	0
000057	000	172.75	.00401	782.29477	191.	0	0	0	1	0
000058	000	174.25	.00000	2342.17657	405.	0	0	0	1	0
000059	000	175.75	.00000	951.34534	108.	0	0	0	1	0
000060	000	177.25	.00000	733.63285	52.	0	0	0	1	0
000061	000	178.75	.00000	676.22335	28.	0	0	0	1	0
000062	000	180.25	.00000	2834.26804	79.	0	0	0	1	0
000063	000	181.75	.00000	2862.41379	45.	0	0	0	1	0
000064	000	183.25	.00000	6960.70038	64.	0	0	0	1	0
000065	000	184.75	.00266	40256.79639	213.	0	0	0	1	0
000066	000	186.25	.00000	29360.64868	80.	0	0	0	1	0
000067	000	187.75	.00000	6856.22125	3.	0	0	0	1	0
000068	000	184.75	.00000	88094.99219	471.	0	0	0	0	1
000069	000	186.25	.00066	425715.65234	1217.	0	0	0	0	1
000070	000	187.75	.00000	5881.76160	1.	0	0	0	0	1
000071	000	189.25	.00000	11817.16187	1.	0	0	0	0	1

END ELT.

```
@ELT,L NLRDAT.A2
ELT017 RLIB70 09/22-16:39:52-(0,)
000001      000 165.25   .10954      27.04722   17. 0 0 0 0 0
000002      000 166.75   .08222      17.75272    6. 0 0 0 0 0
000003      000 168.25   .00000      17.58046    3. 0 0 0 0 0
000004      000 169.75   .14508     102.41307   42. 0 0 0 0 0
000005      000 171.25   .06174     571.92847  192. 0 0 0 0 0
000006      000 172.75   .13419     381.68828   91. 0 0 0 0 0
000007      000 174.25   .05667     220.63721   34. 0 0 0 0 0
000008      000 175.75   .28720     318.52114   33. 0 0 0 0 0
000009      000 177.25   .08698     694.85287   49. 0 0 0 0 0
000010      000 178.75   .00000     556.19869   22. 0 0 0 0 0
000011      000 180.25   .00000     423.91037    6. 0 0 0 0 0
000012      000 181.75   .00000    2633.03195   41. 0 0 0 0 0
000013      000 183.25   .00000    3529.20151   30. 0 0 0 0 0
000014      000 184.75   .00000    6600.21674   31. 0 0 0 0 0
000015      000 186.25   .00000   49202.67969  137. 0 0 0 0 0
000016      000 187.75   .00000120676.11426  174. 0 0 0 0 0
000017      000 189.25   .00000140450.82422   99. 0 0 0 0 0
000018      000 165.25   .24396      50.69377   37. 1 0 0 0 0
000019      000 166.75   .08161      94.53536   62. 1 0 0 0 0
000020      000 168.25   .23255     139.38367   76. 1 0 0 0 0
000021      000 169.75   .14763     445.83105  198. 1 0 0 0 0
000022      000 171.25   .04621     382.47181  127. 1 0 0 0 0
000023      000 172.75   .00000     257.78625   60. 1 0 0 0 0
000024      000 174.25   .00000     402.30010   66. 1 0 0 0 0
000025      000 175.75   .04505     469.42521   51. 1 0 0 0 0
000026      000 177.25   .00000    1356.56985  100. 1 0 0 0 0
000027      000 178.75   .00000     920.16695   40. 1 0 0 0 0
000028      000 180.25   .00000    1345.90224   35. 1 0 0 0 0
000029      000 181.75   .00000    2919.83124   46. 1 0 0 0 0
000030      000 183.25   .00000    4733.23401   42. 1 0 0 0 0
000031      000 184.75   .00000    9159.39746   45. 1 0 0 0 0
000032      000 186.25   .00000   14807.56763   38. 1 0 0 0 0
000033      000 187.75   .00000   86822.81543  124. 1 0 0 0 0
000034      000 189.25   .00000398959.06250  289. 1 0 0 0 0
000035      000 174.25   .00000     105.70066   13. 0 1 0 0 0
000036      000 175.75   .00000     402.15676   43. 0 1 0 0 0
000037      000 177.25   .00000    1161.62575   85. 0 1 0 0 0
000038      000 178.75   .00000    3604.46732  170. 0 1 0 0 0
000039      000 180.25   .00000    6372.31366  183. 0 1 0 0 0
000040      000 181.75   .00355   11653.78320  197. 0 1 0 0 0
000041      000 183.25   .00000   33856.87891  328. 0 1 0 0 0
000042      000 184.75   .00000    2930.46463   10. 0 1 0 0 0
000043      000 186.25   .00000   11727.51270   29. 0 1 0 0 0
000044      000 187.75   .00000    8985.49756    7. 0 1 0 0 0
000045      000 189.25   .00000392153.55469  284. 0 1 0 0 0
000046      000 160.75   .00000      12.44589    6. 0 0 1 0 0
000047      000 162.25   .00000       9.59932    2. 0 0 1 0 0
000048      000 163.75   .00000      13.60895    6. 0 0 1 0 0
000049      000 165.25   .99333      14.23563    5. 0 0 1 0 0
000050      000 166.75   .00000      15.50934    4. 0 0 1 0 0
000051      000 168.25   .66020      28.97494   11. 0 0 1 0 0
000052      000 169.75   .63000      46.77965   16. 0 0 1 0 0
000053      000 171.25   .48048      95.26556   28. 0 0 1 0 0
000054      000 172.75   .18678     401.69824   96. 0 0 1 0 0
000055      000 174.25   .25722     322.56655   52. 0 0 1 0 0
```

000056	000	175.75	.27820	832.79329	94.	0	0	1	0	0
000057	000	177.25	.45699	1187.60989	87.	0	0	1	0	0
000058	000	178.75	.33630	3790.69943	179.	0	0	1	0	0
000059	000	180.25	.25899	6917.02802	199.	0	0	1	0	0
000060	000	181.75	.28466	6789.25592	113.	0	0	1	0	0
000061	000	183.25	.14207	7671.60333	71.	0	0	1	0	0
000062	000	184.75	.19703	19502.81470	101.	0	0	1	0	0
000063	000	186.25	.08077	34578.41504	95.	0	0	1	0	0
000064	000	187.75	.09507	86822.81543	124.	0	0	1	0	0
000065	000	189.25	.11143	149964.70703	106.	0	0	1	0	0
000066	000	168.25	.00000	46.67624	22.	0	0	0	1	0
000067	000	169.75	.00000	89.34906	36.	0	0	0	1	0
000068	000	171.25	.01422	601.08328	202.	0	0	0	1	0
000069	000	172 75	.02713	742.21407	181.	0	0	0	1	0
000070	000	174.25	.01758	653.63223	110.	0	0	0	1	0
000071	000	175.75	.00000	1086.89137	124.	0	0	0	1	0
000072	000	177.25	.00000	1044.73967	76.	0	0	0	1	0
000073	000	178.75	.00000	961.09224	42.	0	0	0	1	0
000074	000	180.25	.00000	753.87708	17.	0	0	0	1	0
000075	000	181.75	.00000	4418.22546	72.	0	0	0	1	0
000076	000	183.25	.00000	14083.49646	134.	0	0	0	1	0
000077	000	184.75	.00000	18762.33154	97.	0	0	0	1	0
000078	000	186.25	.00000	33882.47705	93.	0	0	0	1	0
000079	000	187.75	.00000	124739.52539	180.	0	0	0	1	0
000080	000	189.25	.00000	120073.20215	84.	0	0	0	1	0

END ELT.

@ELT,L NLRDAT.A3
ELT0T7 RLIB70 09/22-16:40:02-(0,)

000001	000	166.75	.67605	32.90634	18.	0	0	0	0	0
000002	000	168.25	.07936	234.77729	131.	0	0	0	0	0
000003	000	169.75	.16015	74.20759	29.	0	0	0	0	0
000004	000	171.25	.06286	338.77347	112.	0	0	0	0	0
000005	000	172.75	.04777	477.76903	115	0	0	0	0	0
000006	000	174.25	.09734	288.48280	46.	0	0	0	0	0
000007	000	175.75	.03564	672.02929	75.	0	0	0	0	0
000008	000	177.25	.01386	2371.39636	178.	0	0	0	0	0
000009	000	178.75	.00000	2694.21713	126.	0	0	0	0	0
000010	000	180.25	.00000	1648.51399	44.	0	0	0	0	0
000011	000	181.75	.00000	3668.03201	59.	0	0	0	0	0
000012	000	183.25	.00000	8789.76660	82.	0	0	0	0	0
000013	000	186.25	.00000	14120.41931	36.	0	0	0	0	0
000014	000	166.75	.03356	76.10590	49.	1	0	0	0	0
000015	000	168.25	.01405	248.66408	139.	1	0	0	0	0
000016	000	169.75	.02224	333.38058	147.	1	0	0	0	0
000017	000	171.25	.00000	598.16775	201.	1	0	0	0	0
000018	000	172.75	.01775	577.91299	140.	1	0	0	0	0
000019	000	174.25	.00000	802.33888	136.	1	0	0	0	0
000020	000	175.75	.00000	511.56015	56.	1	0	0	0	0
000021	000	177.25	.00000	1603.64960	119.	1	0	0	0	0
000022	000	178.75	.00000	6046.69366	288.	1	0	0	0	0
000023	000	180.25	.00000	3208.00150	90.	1	0	0	0	0
000024	000	181.75	.00000	5458.56342	90.	1	0	0	0	0
000025	000	183.25	.00000	5541.48645	50.	1	0	0	0	0
000026	000	184.75	.00000	2160.39270	5.	1	0	0	0	0
000027	000	172.75	.26057	237.84853	55.	0	1	0	0	0
000028	000	174.25	.11484	487.90275	81.	0	1	0	0	0
000029	000	175.75	.00000	1519.16173	175.	0	1	0	0	0
000030	000	177.25	.01802	4102.94598	311.	0	1	0	0	0
000031	000	178.75	.00000	12381.47009	594.	0	1	0	0	0
000032	000	180.25	.00000	2630.53827	73.	0	1	0	0	0
000033	000	181.75	.00000	2690.32983	42.	0	1	0	0	0
000034	000	183.25	.00000	15407.87964	147.	0	1	0	0	0
000035	000	184.75	.00000	3092.65625	11.	0	1	0	0	0
000036	000	186.25	.00000	3026.46002	1.	0	1	0	0	0
000037	000	160.75	.55639	153.11034	149.	0	0	1	0	0
000038	000	162.25	.58716	110.60673	104.	0	0	1	0	0
000039	000	163.75	.71858	92.07990	80.	0	0	1	0	0
000040	000	165.25	.46889	59.14456	44.	0	0	1	0	0
000041	000	166.75	.53150	104.47772	69.	0	0	1	0	0
000042	000	168.25	.30882	111.69447	60.	0	0	1	0	0
000043	000	169.75	.72667	161.59447	69.	0	0	1	0	0
000044	000	171.25	.60883	446.58243	149.	0	0	1	0	0
000045	000	172.75	.60248	88.75602	17.	0	0	1	0	0
000046	000	174.25	.20846	911.04621	155.	0	0	1	0	0
000047	000	175.75	.10260	536.86532	59.	0	0	1	0	0
000048	000	177.25	.08953	3868.57300	293.	0	0	1	0	0
000049	000	178.75	.07786	2921.73505	137.	0	0	1	0	0
000050	000	180.25	.00000	1952.55644	53.	0	0	1	0	0
000051	000	181.75	.00000	2233.14334	34.	0	0	1	0	0
000052	000	183.25	.00000	1523.35822	9.	0	0	1	0	0
000053	000	166.75	.00000	69.03726	44.	0	0	0	1	0
000054	000	168.25	.01549	127.26297	69.	0	0	0	1	0
000055	000	169.75	.01148	540.66393	241.	0	0	0	1	0

```
000056     000 171.25   .01441   443.66793  148.  0 0 0 1 0
000057     000 172.75   .02653   469.75962  113.  0 0 0 1 0
000058     000 174.25   .02122   991.15921  169.  0 0 0 1 0
000059     000 175.75   .01229   722.77535   81.  0 0 0 1 0
000060     000 177.25   .00275  2579.66464  194.  0 0 0 1 0
000061     000 178.75   .00000  3066.53751  144.  0 0 0 1 0
000062     000 180.25   .00000  4738.53656  135.  0 0 0 1 0
000063     000 181.75   .00000 12291.03040  208.  0 0 0 1 0
000064     000 183.25   .00000  7062.21802   65.  0 0 0 1 0
000065     000 184.75   .00000  1740.81133    2.  0 0 0 1 0

END ELT.

@

@BRKPT PRINT$
```

@PASS•NLR.P3R77

```
BMDP3R - NONLINEAR REGRESSION                          PROGRAM REVISED FEBRUARY 1979        1
HEALTH SCIENCES COMPUTING FACILITY                     MANUAL DATE  --  1977
UNIVERSITY OF CALIFORNIA, LOS ANGELES
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IN THIS VERSION OF BMDP3R

   -- THE FORM OF SPECIFYING LINEAR CONSTRAINTS HAS BEEN CHANGED, SEE BMDP-77 MANUAL PAGE 480.
   -- COMPUTATIONS ARE NOW PERFORMED IN DOUBLE PRECISION.
      IF YOU USE SUBROUTINE FUN BE SURE ALL FUNCTION REFERENCES ARE IN DOUBLE PRECISION.
   -- DEFAULT TOLERANCE FOR PIVOTING IS NOW .00000001.


 PROGRAM CONTROL INFORMATION

        S    A  *SWE B ]UW(E F A,b*
        /PROBLEM
                  TITLE IS ' REGRESSION ON REAL PI DATA'.
        /INPUT
                  VARIABLES ARE 9.
                  FORMAT IS '(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))'.
        /VARIABLE
                  NAMES ARE PERF,HOLD,CASEWT,TIMEWT,I1,I2,I3,I4,I5.
        /REGRESS
                  TITLE IS ' PARAMETERS FROM REAL DATA SET # 1( 6 SOURCES )'.
                  INDEPENDENT IS PERF.
                  DEPENDENT IS HOLD.
                  NUMBER IS 2.
                  PARAMETERS ARE 7.
                  WEIGHT IS CASEWT.
                  ITERATIONS ARE 10.
                  HALVING IS 50.
        /PARAMETER
                  INITIAL ARE -20.0, 0.125,0.0,0.0,0.0,0.0,0.0.
        /PLOT
                  RESIDUAL.
                  VARIABLE IS PERF.
                  NORMAL.
                  SIZE IS 50,40.
        /END

 PROBLEM TITLE . . . . . . . . REGRESSION ON REAL PI DATA

 NUMBER OF VARIABLES TO READ IN. . . . . . . . . .         9
 NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. .          0
 TOTAL NUMBER OF VARIABLES . . . . . . . . . . . .         9
 NUMBER OF CASES TO READ IN. . . . . . . . . . . . 1000000
 CASE LABELING VARIABLES . . . . . . . . . . . . .
 LIMITS AND MISSING VALUE CHECKED BEFORE TRANSFORMATIONS
 BLANKS ARE. . . . . . . . . . . . . . . . . . . .   ZEROS
 INPUT UNIT NUMBER . . . . . . . . . . . . . . . .         5
 REWIND INPUT UNIT PRIOR TO READING. . DATA. . .         NO

 INPUT FORMAT
        (F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))
```

```
VARIABLES TO BE USED
          1  PERF          2  HOLD          3  CASEWT         4  TIMEWT         5  I1
          6  I2            7  I3            8  I4             9  I5

VARIABLES TO BE PLOTTED
          1  PERF

PLOT OF PREDICTED VALUES VERSUS RESIDUALS . . .     YES
NORMAL PROBABILITY PLOT . . . . . . . . . . . .     YES
DETRENDED NORMAL PROBABILITY PLOT . . . . . . .      NO
```

REGRESSION TITLE
PARAMETERS FROM REAL DATA SET # 1(6 SOURCES)

```
REGRESSION NUMBER . . . . . . . . . . . . . . . . . .        2
INDEPENDENT VARIABLE(FOR BUILT-IN FUNCTION) . .   PERF
DEPENDENT VARIABLE. . . . . . . . . . . . . . . . . .   HOLD
WEIGHTING VARIABLE. . . . . . . . . . . . . . . . . .   CASEWT
NUMBER OF PARAMETERS. . . . . . . . . . . . . . . . .        7
NUMBER OF CONSTRAINTS . . . . . . . . . . . . . . . .        0
TOLERANCE FOR PIVOTING. . . . . . . . . . . . . . . .  .00000001000
TOLERANCE FOR CONVERGENCE . . . . . . . . . . . . . .  .00001000000
MAXIMUM NUMBER OF ITERATIONS. . . . . . . . . . . . .       10
MAXIMUM NUMBER OF INCREMENT HALVINGS. . . . . . . . .       50
NUMBER OF DATA PASSES PER CASE. . . . . . . . . . . .        1
COMPUTE LOSS FUNCTION . . . . . . . . . . . . . . . .       NO
```

USING THE ABOVE SPECIFICATIONS THIS PROGRAM COULD PROCESS 1032 CASES.

@ADD,P NLRDAT.A1

NUMBER OF CASES READ. 71

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
1	PERF	185.095457	2.520794	163.750000	189.250000
2	HOLD	.000924	.008479	.000000	.976670
3	CASEWT	208299.554688	************	9.491480	425715.652344
4	TIMEWT	654.769562	518.261086	1.000000	1217.000000
5	I1	.098641	.300302	.000000	1.000000
6	I2	.139592	.349030	.000000	1.000000
7	I3	.058102	.235602	.000000	1.000000
8	I4	.098862	.300602	.000000	1.000000
9	I5	.549988	.501036	.000000	1.000000

PARAMETER MAXIMA. . . . . ************** ************** ************** ************** ************** **************

PARAMETER MINIMA. . . . . ************** ************** ************** ************** ************** **************

ITERATION NUMBER	INCREMENT HALVINGS	RESIDUAL SUM OF SQUARES	P(1)	P(2)	P(3)	P(4)	P(5)	P(6)
0	0	84.700371	-20.000000	.125000	.000000	.000000	.000000	.000000
1	0	35.250532	-23.103766	.145015	.027791	.048654	-.796166	.102245
2	49	35.250532	-23.103766	.145015	.027791	.048654	-.796166	.102245
3	50	35.250532	-23.103766	.145015	.027791	.048654	-.796166	.102245
4	50	35.250532	-23.103766	.145015	.027791	.048654	-.796166	.102245
5	48	35.250532	-23.103766	.145015	.027791	.048654	-.796166	.102245
3	49	35.250532	-23.103766	.145015	.027791	.048654	-.796166	.102245

PARAMETER MAXIMA. . . . . **************

PARAMETER MINIMA. . . . . **************

ITERATION NUMBER	INCREMENT HALVINGS	RESIDUAL SUM OF SQUARES	P(7)
0	0	84.700371	.000000
1	0	35.250532	-.538911
2	49	35.250532	-.538911
3	50	35.250532	-.538911
4	50	35.250532	-.538911
5	48	35.250532	-.538911
3	49	35.250532	-.538911

ITERATION 3 HAS THE SMALLEST RESIDUAL SUM OF SQUARES(SUBJECT TO CONSTRAINTS, IF ANY).
REMAINING CALCULATIONS ARE BASED ON THE RESULTS OF THIS ITERATION.

ASYMPTOTIC CORRELATION MATRIX OF THE PARAMETERS

		P(1) 1	P(2) 2	P(3) 3	P(4) 4	P(5) 5	P(6) 6	P(7) 7
P(1)	1	1.0000						
P(2)	2	-.9990	1.0000					
P(3)	3	-.0974	.0657	1.0000				
P(4)	4	-.2397	.2097	.5161	1.0000			
P(5)	5	-.0424	.0035	.6488	.6160	1.0000		
P(6)	6	-.4058	.3739	.5624	.5887	.6601	1.0000	
P(7)	7	.3927	-.4057	.1825	.1133	.2548	.0608	1.0000

RESIDUAL MEAN SQUARE .5507895648

DEGREES OF FREEDOM 64

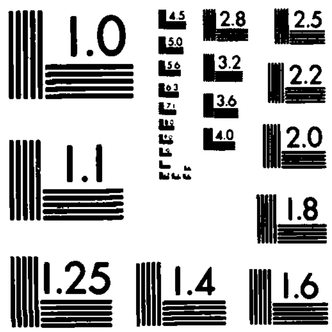
PARAMETER	ESTIMATE	ASYMPTOTIC STANDARD DEVIATION	TOLERANCE
P(1)	-23.103766	3.439187	.0002158143
P(2)	.145015	.019653	.0002186194
P(3)	.027791	.206485	.4661567882
P(4)	.048654	.217663	.4794912711
P(5)	-.796166	.168583	.2055876888
P(6)	.102245	.203278	.3138330206
P(7)	-.538911	.522785	.7528318837

4

CASE NO.	LABEL	PREDICTED HOLD	STD DEV OF PRED VALUE	OBSERVED HOLD	RESIDUAL	CASEWT	PERF	TIMEWT	I1
1		.025732	.009322	.000000	-.025732	1576.688217	172.750000	154.000000	.000000
2		.015189	.005768	.009230	-.005959	6217.933044	174.250000	368.000000	.000000
3		.008594	.003533	.000000	-.008594	11092.099609	175.750000	374.000000	.000000
4		.004659	.002140	.000000	-.004659	14020.425049	177.250000	256.000000	.000000
5		.002419	.001272	.000000	-.002419	10276.506470	178.750000	95.000000	.000000
6		.001202	.000734	.000000	-.001202	9461.974609	180.250000	41.000000	.000000
7		.000572	.000408	.000000	-.000572	49526.144531	181.750000	109.000000	.000000
8		.000260	.000216	.000000	-.000260	42749.180176	183.250000	40.000000	.000000
9		.000113	.000109	.000000	-.000113	106987.732422	184.750000	44.000000	.000000
10		.000047	.000053	.000000	-.000047	199511.974609	186.250000	33.000000	.000000
11		.000019	.000024	.000000	-.000019	135181.860859	187.750000	3.000000	.000000
12		.039385	.012931	.000000	-.039385	164.917782	171.250000	20.000000	1.000000
13		.024112	.008141	.017020	-.007092	2518.737976	172.750000	233.000000	1.000000
14		.014157	.005080	.000000	-.014157	10891.496826	174.250000	604.000000	1.000000
15		.007967	.003156	.000000	-.007967	4969.677673	175.750000	153.000000	1.000000
16		.004295	.001940	.000000	-.004295	6381.263611	177.250000	105.000000	1.000000
17		.002217	.001167	.000000	-.002217	3035.793243	178.750000	22.000000	1.000000
18		.001096	.000678	.000000	-.001096	33601.091309	180.250000	143.000000	1.000000
19		.000518	.000378	.000000	-.000518	47883.120605	181.750000	95.000000	1.000000
20		.000234	.000200	.000000	-.000234	49534.977539	183.250000	42.000000	1.000000
21		.000101	.000101	.000000	-.000101	513207.386719	184.750000	204.000000	1.000000
22		.000042	.000048	.000000	-.000042	436736.97656	186.250000	69.000000	1.000000
23		.000017	.000022	.000000	-.000017	175668.210938	187.750000	5.000000	1.000000
24		.089525	.027879	.000000	-.089525	40.672079	168.250000	7.000000	.000000
25		.059238	.018886	.028860	-.030378	426.998589	169.750000	91.000000	.000000
26		.037642	.012525	.026610	-.011032	881.283569	171.250000	124.000000	.000000
27		.022953	.008203	.000000	-.022953	1662.252350	172.750000	145.000000	.000000
28		.013422	.005319	.000000	-.013422	1702.822600	174.250000	86.000000	.000000
29		.007522	.003398	.000000	-.007522	3956.195038	175.750000	114.000000	.000000
30		.004039	.002118	.000000	-.004039	6660.369934	177.250000	103.000000	.000000
31		.002076	.001275	.000000	-.002076	16425.033447	178.750000	132.000000	.000000
32		.001022	.000736	.000000	-.001022	41916.668164	180.250000	167.000000	.000000
33		.000481	.000405	.000000	-.000481	77013.278320	181.750000	144.000000	.000000
34		.000217	.000212	.000000	-.000217	176708.339844	183.250000	149.000000	.000000
35		.000093	.000105	.000000	-.000093	*************	184.750000	392.000000	.000000
36		.000038	.000050	.000000	-.000038	457012.804688	186.250000	66.000000	.000000
37		.308937	.052717	.976670	.667733	16.992019	168.250000	2.000000	.000000
38		.236876	.038648	.505960	.269084	37.153712	169.750000	22.000000	.000000
39		.175175	.026682	.569260	.394085	21.534345	171.250000	6.000000	.000000
40		.124777	.017758	.085040	-.039737	485.492699	172.750000	208.000000	.000000
41		.085507	.012065	.076380	-.009127	1262.996460	174.250000	391.000000	.000000
42		.056315	.008920	.043260	-.013055	1171.657166	175.750000	245.000000	.000000
43		.035616	.007084	.000000	-.035616	1886.628357	177.250000	255.000000	.000000
44		.021613	.005636	.003400	-.018213	2779.176056	178.750000	231.000000	.000000
45		.012576	.004282	.000000	-.012576	598.934174	180.250000	25.000000	.000000
46		.007014	.003057	.000000	-.007014	2557.807617	181.750000	67.000000	.000000
47		.003747	.002043	.000000	-.003747	3175.440887	183.250000	43.000000	.000000
48		.001916	.001281	.000000	-.001916	10225.049683	184.750000	74.000000	.000000
49		.000938	.000755	.000000	-.000938	8971.619019	186.250000	29.000000	.000000
50		.000439	.000419	.000000	-.000439	5342.302917	187.750000	2.000000	.000000
51		.228225	.054955	.000000	-.228225	12.320333	163.750000	1.000000	.000000
52		.167967	.040142	.060000	-.107967	20.839223	165.250000	5.000000	.000000

AD-A134 078 NONLINEAR REGRESSION ANALYSIS METHODOLOGY FOR THE ESTIMATION OF DETECTION..(U) COMPUTER SCIENCES CORP SAN DIEGO CALIF J L HOFMOCKEL SEP 82 NOSC-CR-153 2/5

UNCLASSIFIED N00123-79-D-0272 F/G 9/2 NL



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

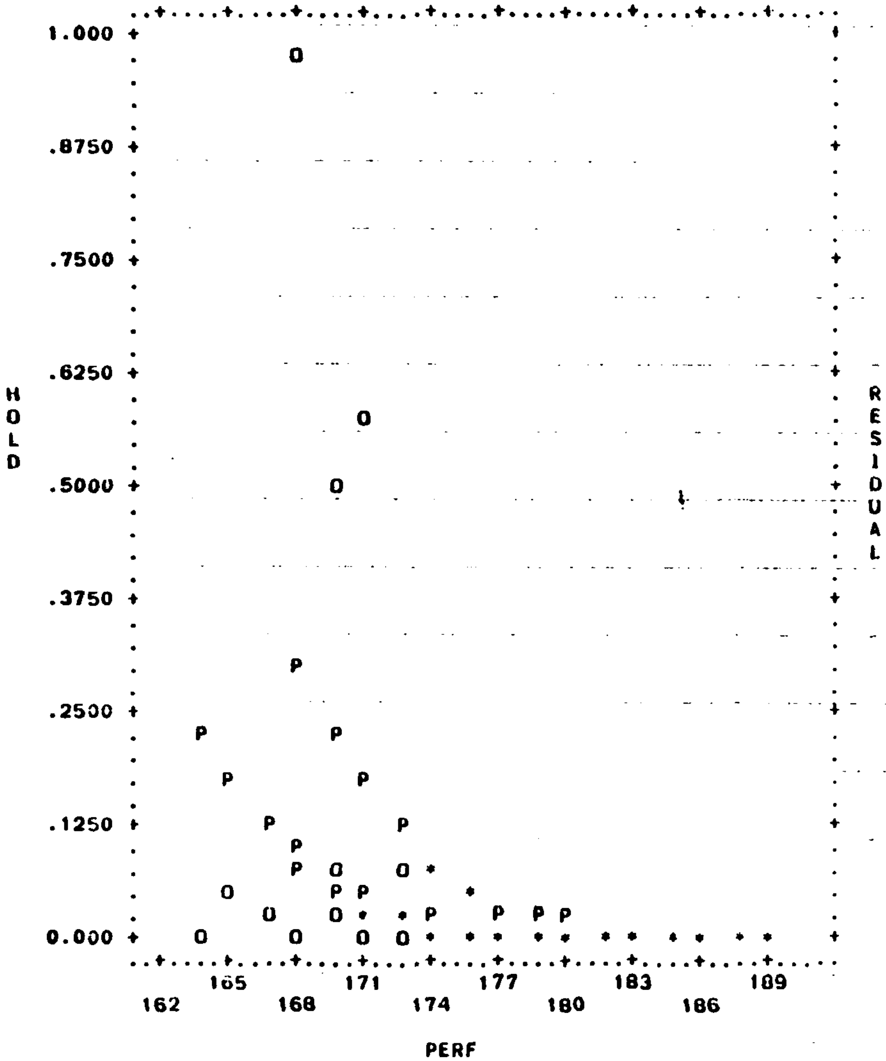
53	.119049	.027998	.016670	-.102379	73.226209	166.750000	26.000000	.000000
54	.081165	.018894	.000000	-.081165	225.507240	168.250000	63.000000	.000000
55	.053177	.012600	.071710	.018533	889.252861	169.750000	175.000000	.000000
56	.033452	.008489	.000000	-.033452	913.509911	171.250000	114.000000	.000000
57	.020190	.005818	.004010	-.016180	2465.411987	172.750000	191.000000	.000000
58	.011684	.003997	.000000	-.011684	8855.644897	174.250000	405.000000	.000000
59	.006480	.002690	.000000	-.006480	4355.409302	175.750000	108.000000	.000000
60	.003442	.001740	.000000	-.003442	4105.828003	177.250000	52.000000	.000000
61	.001751	.001072	.000000	-.001751	4672.727539	178.750000	28.000000	.000000
62	.000852	.000626	.000000	-.000852	24431.931152	180.250000	79.000000	.000000
63	.000397	.000345	.000000	-.000397	31125.861816	181.750000	45.000000	.000000
64	.000177	.000180	.000000	-.000177	96551.553711	183.250000	64.000000	.000000
65	.000075	.000089	.002660	.002585	720601.062500	184.750000	213.000000	.000000
66	.000031	.000042	.000000	-.000031	686304.539063	186.250000	80.000000	.000000
67	.000012	.000019	.000000	-.000012	211803.406203	187.750000	3.000000	.000000
68	.000820	.001273	.000000	-.000820	145031.210938	184.750000	471.000000	.000000
69	.000381	.000626	.000660	.000279	801930.171875	186.250000	1217.000000	.000000
70	.000169	.000295	.000000	-.000169	12824.525269	187.750000	1.000000	.000000
71	.000072	.000133	.000000	-.000072	30171.582520	189.250000	1.000000	.000000

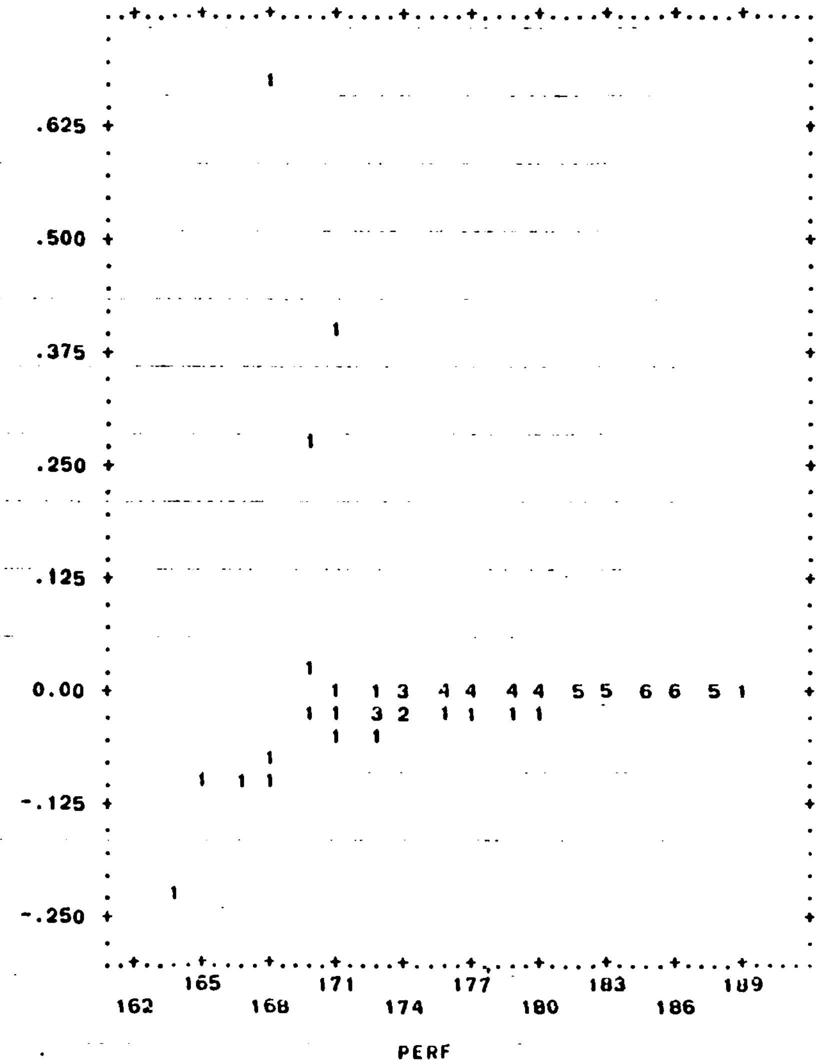
CASE	I2	I3	I4	I5
1	.000000	.000000	.000000	.000000
2	.000000	.000000	.000000	.000000
3	.000000	.000000	.000000	.000000
4	.000000	.000000	.000000	.000000
5	.000000	.000000	.000000	.000000
6	.000000	.000000	.000000	.000000
7	.000000	.000000	.000000	.000000
8	.000000	.000000	.000000	.000000
9	.000000	.000000	.000000	.000000
10	.000000	.000000	.000000	.000000
11	.000000	.000000	.000000	.000000
12	.000000	.000000	.000000	.000000
13	.000000	.000000	.000000	.000000
14	.000000	.000000	.000000	.000000
15	.000000	.000000	.000000	.000000
16	.000000	.000000	.000000	.000000
17	.000000	.000000	.000000	.000000
18	.000000	.000000	.000000	.000000
19	.000000	.000000	.000000	.000000
20	.000000	.000000	.000000	.000000
21	.000000	.000000	.000000	.000000
22	.000000	.000000	.000000	.000000
23	.000000	.000000	.000000	.000000
24	1.000000	.000000	.000000	.000000
25	1.000000	.000000	.000000	.000000
26	1.000000	.000000	.000000	.000000
27	1.000000	.000000	.000000	.000000
28	1.000000	.000000	.000000	.000000
29	1.000000	.000000	.000000	.000000
30	1.000000	.000000	.000000	.000000
31	1.000000	.000000	.000000	.000000
32	1.000000	.000000	.000000	.000000
33	1.000000	.000000	.000000	.000000
34	1.000000	.000000	.000000	.000000
35	1.000000	.000000	.000000	.000000

36	1.000000	.000000	.000000	.000000
37	.000000	1.000000	.000000	.000000
38	.000000	1.000000	.000000	.000000
39	.000000	1.000000	.000000	.000000
40	.000000	1.000000	.000000	.000000
41	.000000	1.000000	.000000	.000000
42	.000000	1.000000	.000000	.000000
43	.000000	1.000000	.000000	.000000
44	.000000	1.000000	.000000	.000000
45	.000000	1.000000	.000000	.000000
46	.000000	1.000000	.000000	.000000
47	.000000	1.000000	.000000	.000000
48	.000000	1.000000	.000000	.000000
49	.000000	1.000000	.000000	.000000
50	.000000	1.000000	.000000	.000000
51	.000000	.000000	1.000000	.000000
52	.000000	.000000	1.000000	.000000
53	.000000	.000000	1.000000	.000000
54	.000000	.000000	1.000000	.000000
55	.000000	.000000	1.000000	.000000
56	.000000	.000000	1.000000	.000000
57	.000000	.000000	1.000000	.000000
58	.000000	.000000	1.000000	.000000
59	.000000	.000000	1.000000	.000000
60	.000000	.000000	1.000000	.000000
61	.000000	.000000	1.000000	.000000
62	.000000	.000000	1.000000	.000000
63	.000000	.000000	1.000000	.000000
64	.000000	.000000	1.000000	.000000
65	.000000	.000000	1.000000	.000000
66	.000000	.000000	1.000000	.000000
67	.000000	.000000	1.000000	.000000
68	.000000	.000000	.000000	1.000000
69	.000000	.000000	.000000	1.000000
70	.000000	.000000	.000000	1.000000
71	.000000	.000000	.000000	1.000000

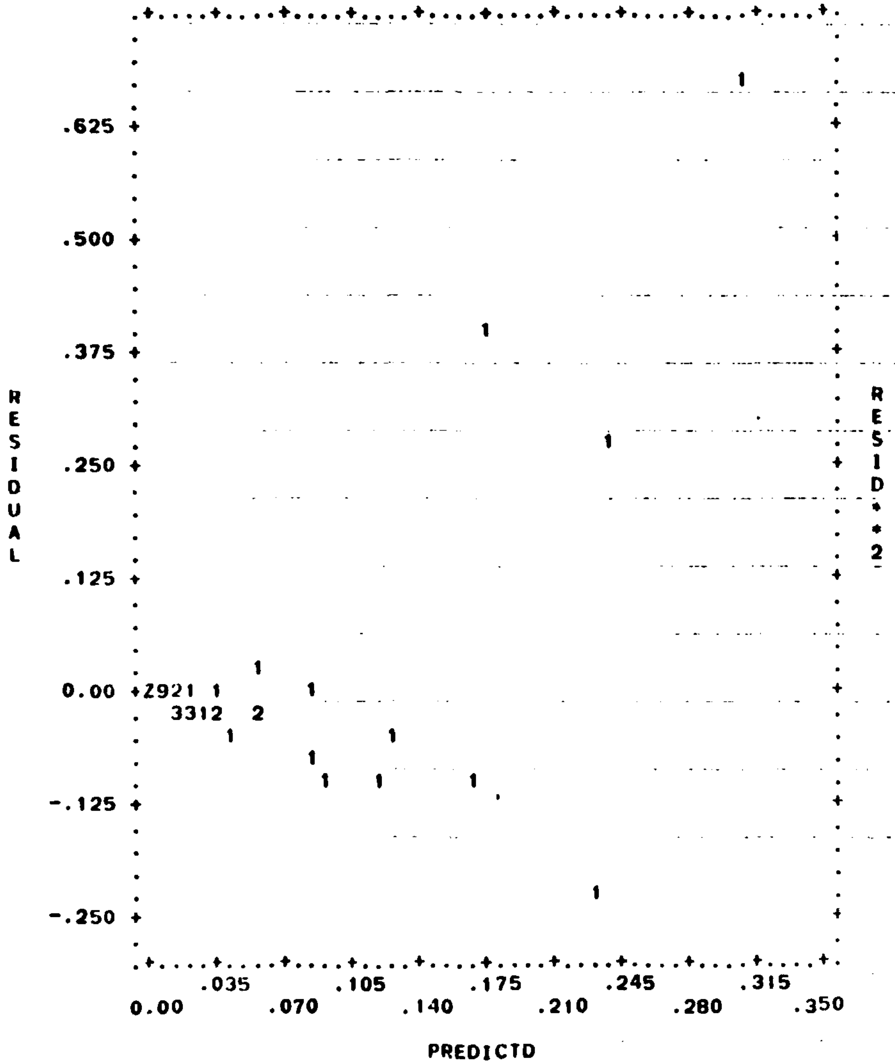
SERIAL CORRELATION .48069

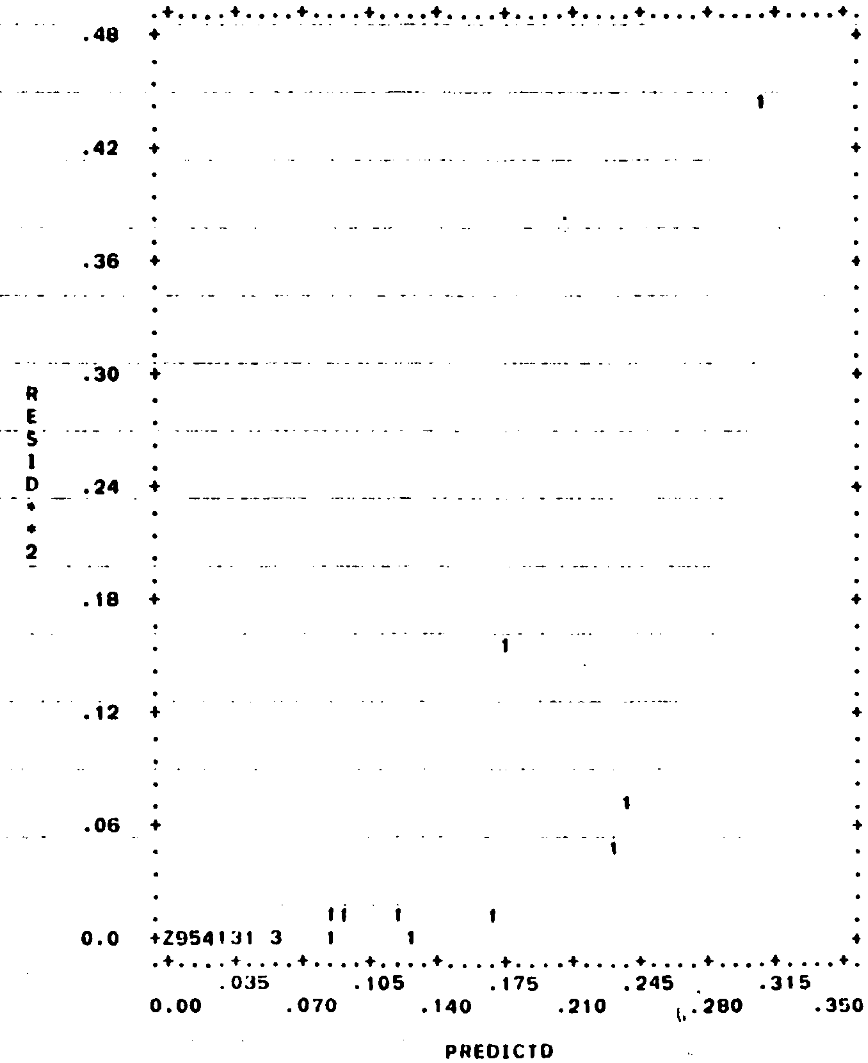
PLOTS OF VARIABLE(1) VERSUS PREDICTED AND OBSERVED VARIABLE(2) AND VERSUS RESIDUALS.





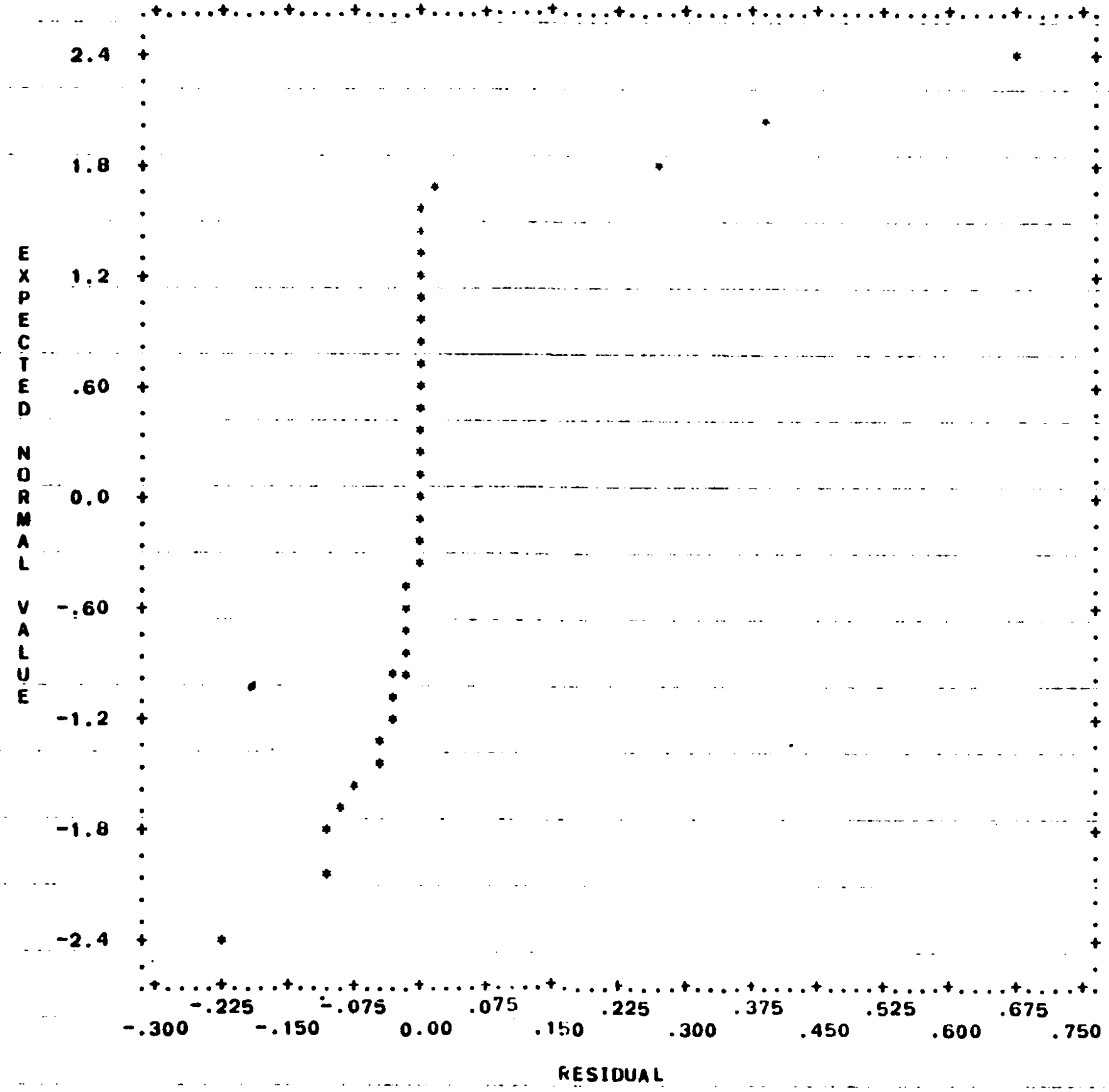
PLOTS OF PREDICTED VARIABLE HOLD VERSUS RESIDUALS AND VERSUS RESIDUALS SQUARED





NORMAL PROBABILITY PLOT OF RESIDUALS

7



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BMDP3R - NONLINEAR REGRESSION                              PROGRAM REVISED FEBRUARY 1979              8
HEALTH SCIENCES COMPUTING FACILITY                         MANUAL DATE  --  1977
UNIVERSITY OF CALIFORNIA, LOS ANGELES
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IN THIS VERSION OF BMDP3R

   -- THE FORM OF SPECIFYING LINEAR CONSTRAINTS HAS BEEN CHANGED, SEE BMDP-77 MANUAL PAGE 480.
   -- COMPUTATIONS ARE NOW PERFORMED IN DOUBLE PRECISION.
      IF YOU USE SUBROUTINE FUN BE SURE ALL FUNCTION REFERENCES ARE IN DOUBLE PRECISION.
   -- DEFAULT TOLERANCE FOR PIVOTING IS NOW .00000001.

 PROGRAM TERMINATED NORMALLY.
```

●PASS●NLR.P3R77

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BMDP3R - NONLINEAR REGRESSION                          PROGRAM REVISED FEBRUARY 1979                  1
HEALTH SCIENCES COMPUTING FACILITY                     MANUAL DATE  --  1977
UNIVERSITY OF CALIFORNIA, LOS ANGELES
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     IF YOU USE SUBROUTINE FUN BE SURE ALL FUNCTION REFERENCES ARE IN DOUBLE PRECISION.
  -- DEFAULT TOLERANCE FOR PIVOTING IS NOW .00000001.


 PROGRAM CONTROL INFORMATION

        S    A  *SWE B ]UW(E F A,b"
        /PROBLEM
                  TITLE IS ' REGRESSION ON REAL PI DATA'.
        /INPUT
                  VARIABLES ARE 8.
                  FORMAT IS '(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))'.
        /VARIABLE
                  NAMES ARE PERF,HOLD,CASEWT,TIMEWT,I1,I2,I3,I4.
        /REGRESS
                  TITLE IS ' PARAMETERS FROM REAL DATA SET # 2( 5 SOURCES )'.
                  INDEPENDENT IS PERF.
                  DEPENDENT IS HOLD.
                  NUMBER IS 2.
                  PARAMETERS ARE 6.
                  WEIGHT IS CASEWT.
                  ITERATIONS ARE 10.
                  HALVING IS 50.
        /PARAMETER
                  INITIAL ARE -20.0, 0.125,0.0,0.0,0.0.0.0.
        /PLOT
                  RESIDUAL.
                  VARIABLE IS PERF.
                  NORMAL.
                  SIZE IS 50.40.
        /END


 PROBLEM TITLE . . . . . . . . REGRESSION ON REAL PI DATA

 NUMBER OF VARIABLES TO READ IN. . . . . . . . . .         8
 NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. .           0
 TOTAL NUMBER OF VARIABLES . . . . . . . . . . .           8
 NUMBER OF CASES TO READ IN. . . . . . . . . . . . 1000000
 CASE LABELING VARIABLES . . . . . . . . . . . .
 LIMITS AND MISSING VALUE CHECKED BEFORE TRANSFORMATIONS
 BLANKS ARE. . . . . . . . . . . . . . . . . . .       ZEROS
 INPUT UNIT NUMBER . . . . . . . . . . . . . . .           5
 REWIND INPUT UNIT PRIOR TO READING. . DATA. . .          NO

 INPUT FORMAT
       (F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))
```

```
VARIABLES TO BE USED
            1  PERF          2  HOLD          3  CASEWT        4  TIMEWT        5  I1
            6  I2            7  I3            8  I4

VARIABLES TO BE PLOTTED
            1  PERF

PLOT OF PREDICTED VALUES VERSUS RESIDUALS . . .     YES
NORMAL PROBABILITY PLOT . . . . . . . . . . . .     YES
DETRENDED NORMAL PROBABILITY PLOT . . . . . . .      NO
```

REGRESSION TITLE
PARAMETERS FROM REAL DATA SET # 2(5 SOURCES)

```
REGRESSION NUMBER . . . . . . . . . . . . . . .        2
INDEPENDENT VARIABLE(FOR BUILT-IN FUNCTION) . .     PERF
DEPENDENT VARIABLE. . . . . . . . . . . . . . .     HOLD
WEIGHTING VARIABLE. . . . . . . . . . . . . . .     CASEWT
NUMBER OF PARAMETERS. . . . . . . . . . . . . .        6
NUMBER OF CONSTRAINTS . . . . . . . . . . . . .        0
TOLERANCE FOR PIVOTING. . . . . . . . . . . . .  .0000000100O
TOLERANCE FOR CONVERGENCE . . . . . . . . . . .  .0000100000O
MAXIMUM NUMBER OF ITERATIONS. . . . . . . . . .       10
MAXIMUM NUMBER OF INCREMENT HALVINGS. . . . . .       50
NUMBER OF DATA PASSES PER CASE. . . . . . . . .        1
COMPUTE LOSS FUNCTION . . . . . . . . . . . . .       NO
```

USING THE ABOVE SPECIFICATIONS THIS PROGRAM COULD PROCESS 1116 CASES.

@ADD,P NIRDAT.A2

NUMBER OF CASES READ. 80

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
1	PERF	188.033289	2.274476	160.750000	189.250000
2	HOLD	.019983	.050401	.000000	.993330
3	CASEWT	215238.474609	************	9.599320	398959.062500
4	TIMEWT	189.973511	90.081268	2.000000	328.000000
5	I1	.266483	.444909	.000000	1.000000
6	I2	.240860	.430304	.000000	1.000000
7	I3	.162466	.371205	.000000	1.000000
8	I4	.163953	.372569	.000000	1.000000

PARAMETER MAXIMA. . . . . ************** ************** ************** ************** ************** **************

PARAMETER MINIMA. . . . . ************** ************** ************** ************** ************** **************

ITERATION NUMBER	INCREMENT HALVINGS	RESIDUAL SUM OF SQUARES	P(1)	P(2)	P(3)	P(4)	P(5)	P(6)
0	0	7598.075785	-20.000000	.125000	.000000	.000000	.000000	.000000
1	2	256.850921	3.191612	-.010508	-.097137	1.163951	-1.398860	.344431
2	0	71.037728	-3.206475	.026536	.001243	1.118125	-.924114	.506460
3	0	60.997416	-6.891854	.048034	.073468	1.172080	-1.043975	.682410
4	7	60.997312	-6.904092	.048106	.073758	1.173642	-1.044519	.683404
5	50	60.997312	-6.904092	.048106	.073758	1.173642	-1.044519	.683404
6	43	60.997312	-6.904092	.048106	.073758	1.173642	-1.044519	.683404
7	43	60.997312	-6.904092	.048106	.073758	1.173642	-1.044519	.683404
4	44	60.997312	-6.904092	.048106	.073758	1.173642	-1.044519	.683404

```
ITERATION    4 HAS THE SMALLEST RESIDUAL SUM OF SQUARES(SUBJECT TO CONSTRAINTS, IF ANY).
 REMAINING CALCULATIONS ARE BASED ON THE RESULTS OF THIS ITERATION.
```

ASYMPTOTIC CORRELATION MATRIX OF THE PARAMETERS

		P(1) 1	P(2) 2	P(3) 3	P(4) 4	P(5) 5	P(6) 6
P(1)	1	1.0000					
P(2)	2	-.9958	1.0000				
P(3)	3	-.1553	.0863	1.0000			
P(4)	4	.0563	-.0823	.2052	1.0000		
P(5)	5	.0940	-.1738	.6413	.2560	1.0000	
P(6)	6	-.0724	.0203	.4354	.1580	.4902	1.0000

RESIDUAL MEAN SQUARE .8242880031

DEGREES OF FREEDOM 74

PARAMETER	ESTIMATE	ASYMPTOTIC STANDARD DEVIATION	TOLERANCE
P(1)	-6.904092	1.310879	.0013238843
P(2)	.048106	.007419	.0013129444
P(3)	.073758	.157829	.4160501249
P(4)	1.173642	.428620	.9150663838
P(5)	-1.044519	.138632	.2225828674
P(6)	.683404	.209826	.6734089777

4

CASE NO.	LABEL	PREDICTED HOLD	STD DEV OF PRED VALUE	OBSERVED HOLD	RESIDUAL	CASEWT	PERF	TIMEWT	I1
1		.147924	.033209	.109540	-.038384	43.901116	165.250000	17.000000	.000000
2		.131882	.029469	.082220	-.049662	27.176954	166.750000	6.000000	.000000
3		.117083	.026102	.000000	-.117083	24.470305	168.250000	3.000000	.000000
4		.103501	.023101	.145080	.041579	125.072227	169.750000	42.000000	.000000
5		.091100	.020453	.061740	-.029360	592.039902	171.250000	192.000000	.000000
6		.079837	.018135	.134190	.054353	323.919113	172.750000	91.000000	.000000
7		.069660	.016119	.056670	-.012990	148.641907	174.250000	34.000000	.000000
8		.060512	.014372	.287200	.226688	165.127962	175.750000	33.000000	.000000
9		.052332	.012857	.083980	.031648	268.963097	177.250000	49.000000	.000000
10		.045056	.011539	.000000	-.045056	156.094263	178.750000	22.000000	.000000
11		.038617	.010384	.000000	-.038617	83.808893	180.250000	6.000000	.000000
12		.032949	.009361	.000000	-.032949	356.466331	181.750000	41.000000	.000000
13		.027984	.008444	.000000	-.027984	318.116367	183.250000	30.000000	.000000
14		.023659	.007614	.000000	-.023659	385.186905	184.750000	31.000000	.000000
15		.019911	.006854	.000000	-.019911	1807.920898	186.250000	137.000000	.000000
16		.016679	.006155	.000000	-.016679	2714.778778	187.750000	174.000000	.000000
17		.013906	.005507	.000000	-.013906	1880.845184	189.250000	99.000000	.000000
18		.131541	.025852	.243960	.112419	90.784989	165.250000	37.000000	1.000000
19		.116769	.022674	.081610	-.035159	160.654844	166.750000	62.000000	1.000000
20		.103213	.019884	.232550	.129337	216.675875	168.250000	76.000000	1.000000
21		.090838	.017469	.147630	.056792	611.729797	169.750000	198.000000	1.000000
22		.079599	.015403	.046210	-.033389	447.461025	171.250000	127.000000	1.000000
23		.069446	.013653	.000000	-.069446	248.694006	172.750000	60.000000	1.000000
24		.060321	.012178	.000000	-.060321	309.878063	174.250000	66.000000	1.000000
25		.052162	.010936	.045050	-.007112	279.831833	175.750000	51.000000	1.000000
26		.044905	.009881	.000000	-.044905	607.199203	177.250000	100.000000	1.000000
27		.038483	.008972	.000000	-.038483	300.279362	178.750000	40.000000	1.000000
28		.032831	.008174	.000000	-.032831	311.112366	180.250000	35.000000	1.000000
29		.027882	.007458	.000000	-.027882	461.695255	181.750000	46.000000	1.000000
30		.023570	.006802	.000000	-.023570	501.257336	183.250000	42.000000	1.000000
31		.019834	.006191	.000000	-.019834	635.154533	184.750000	45.000000	1.000000
32		.016612	.005617	.000000	-.016612	641.931671	186.250000	38.000000	1.000000
33		.013850	.005073	.000000	-.013850	2345.354592	187.750000	124.000000	1.000000
34		.011493	.004559	.000000	-.011493	6448.889404	189.250000	289.000000	1.000000
35		.004001	.004892	.000000	-.004001	1150.027786	174.250000	13.000000	.000000
36		.003224	.004018	.000000	-.003224	3683.747681	175.750000	43.000000	.000000
37		.002585	.003286	.000000	-.002585	8649.954590	177.250000	85.000000	.000000
38		.002062	.002675	.000000	-.002062	21140.641846	178.750000	170.000000	.000000
39		.001638	.002168	.000000	-.001638	28603.951172	180.250000	183.000000	.000000
40		.001294	.001749	.003550	.002256	38887.501465	181.750000	197.000000	.000000
41		.001018	.001405	.000000	-.001018	81625.798828	183.250000	328.000000	.000000
42		.000797	.001123	.000000	-.000797	4961.996643	184.750000	10.000000	.000000
43		.000621	.000894	.000000	-.000621	13558.336792	186.250000	29.000000	.000000
44		.000481	.000709	.000000	-.000481	6895.354065	187.750000	7.000000	.000000
45		.000371	.000559	.000000	-.000371	194171.500000	189.250000	284.000000	.000000
46		.585357	.059136	.000000	-.585357	12.819491	160.750000	6.000000	.000000
47		.557036	.055974	.000000	-.557036	9.510725	162.250000	2.000000	.000000
48		.528420	.052520	.000000	-.528420	12.486233	163.750000	6.000000	.000000
49		.499657	.048848	.993330	.493673	11.649482	165.250000	5.000000	.000000
50		.470896	.045037	.000000	-.470896	10.910092	166.750000	4.000000	.000000
51		.442286	.041176	.660200	.217914	16.901711	168.250000	11.000000	.000000
52		.413974	.037363	.630000	.216026	21.850706	169.750000	16.000000	.000000

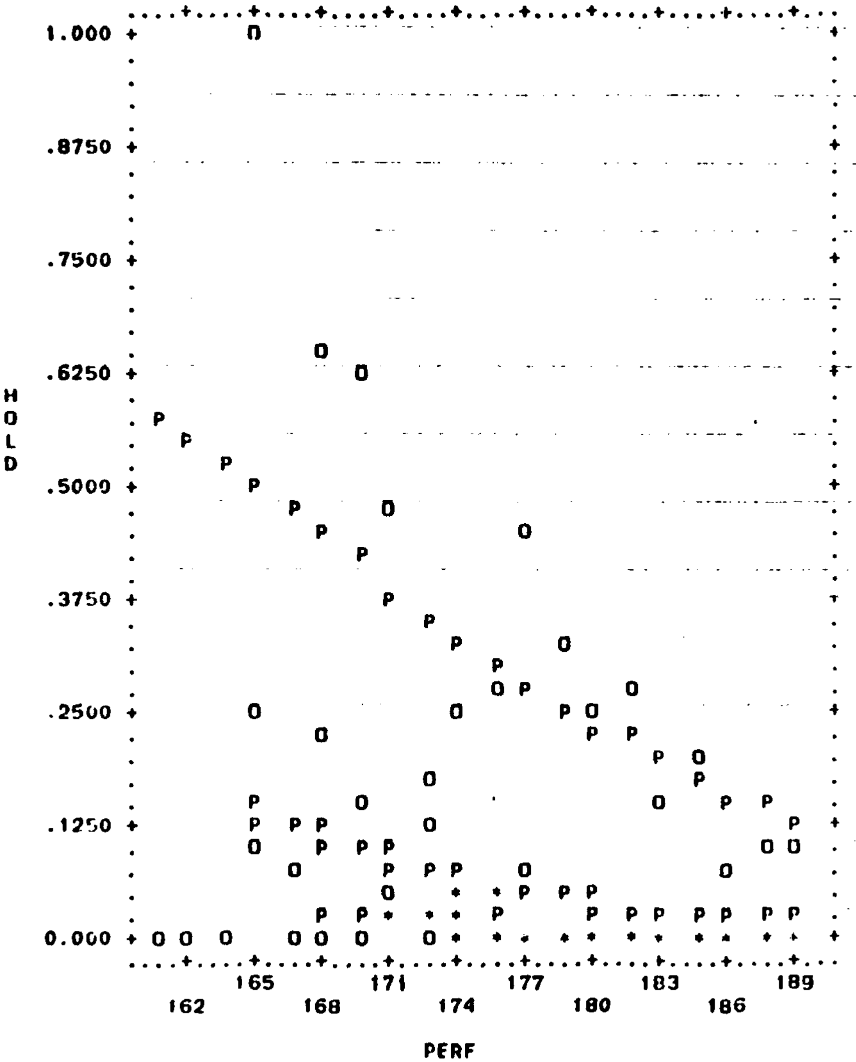
53	.386102	.033698	.480180	.094378	31.449317	171.250000	28.000000	.000000
54	.358806	.030288	.186780	-.172026	108.854275	172.750000	96.000000	.000000
55	.332213	.027240	.257220	-.074993	63.482031	174.250000	52.000000	.000000
56	.306439	.024655	.278200	-.028239	115.464689	175.750000	94.000000	.000000
57	.281589	.022612	.456990	.175401	117.696867	177.250000	87.000000	.000000
58	.257754	.021148	.336300	.078546	239.251772	178.750000	179.000000	.000000
59	.235010	.020241	.258990	.023980	287.402702	180.250000	199.000000	.000000
60	.213422	.019608	.284660	.071238	174.457367	181.750000	113.000000	.000000
61	.193036	.019721	.142070	-.050966	120.750557	183.250000	71.000000	.000000
62	.173886	.019840	.197030	.023144	183.023550	184.750000	101.000000	.000000
63	.155989	.020037	.080770	-.075219	187.322937	186.250000	95.000000	.000000
64	.139351	.020213	.095070	-.044281	267.094460	187.750000	124.000000	.000000
65	.123964	.020296	.111430	-.012534	253.591028	189.250000	106.000000	.000000
66	.030527	.012435	.000000	-.030527	225.931595	168.250000	22.000000	.000000
67	.025872	.010657	.000000	-.025872	401.738613	169.750000	36.000000	.000000
68	.021826	.009118	.014220	-.007606	2413.167603	171.250000	202.000000	.000000
69	.018328	.007790	.027130	.008802	2571.836975	172.750000	181.000000	.000000
70	.015319	.006648	.017580	.002261	1891.840485	174.250000	110.000000	.000000
71	.012745	.005667	.000000	-.012745	2545.840088	175.750000	124.000000	.000000
72	.010554	.004826	.000000	-.010554	1920.572433	177.250000	76.000000	.000000
73	.008698	.004105	.000000	-.008698	1345.878937	178.750000	42.000000	.000000
74	.007135	.003487	.000000	-.007135	781.049072	180.250000	17.000000	.000000
75	.005826	.002958	.000000	-.005826	3290.654083	181.750000	72.000000	.000000
76	.004734	.002504	.000000	-.004734	7329.103271	183.250000	134.000000	.000000
77	.003828	.002115	.000000	-.003828	6632.149719	184.750000	97.000000	.000000
78	.003081	.001782	.000000	-.003081	7909.039124	186.250000	93.000000	.000000
79	.002468	.001497	.000000	-.002468	18692.799805	187.750000	180.000000	.000000
80	.001968	.001253	.000000	-.001968	11229.008423	189.250000	84.000000	.000000

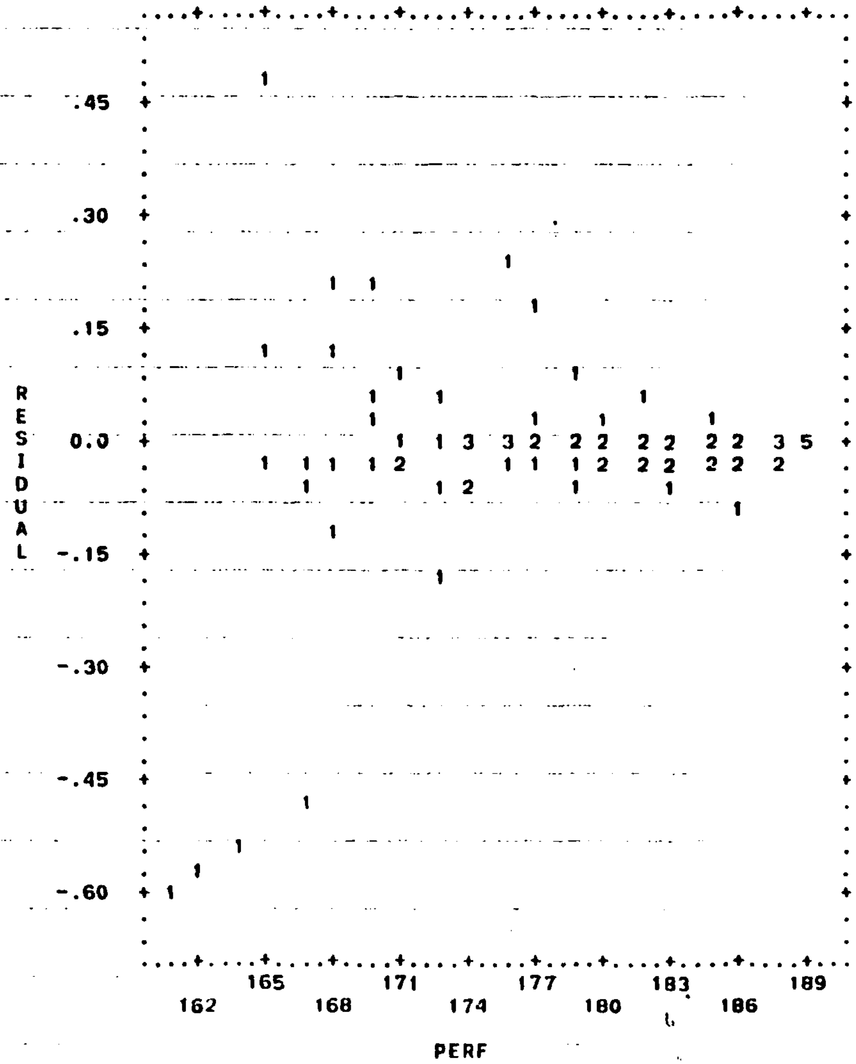
CASE	I2	I3	I4
1	.000000	.000000	.000000
2	.000000	.000000	.000000
3	.000000	.000000	.000000
4	.000000	.000000	.000000
5	.000000	.000000	.000000
6	.000000	.000000	.000000
7	.000000	.000000	.000000
8	.000000	.000000	.000000
9	.000000	.000000	.000000
10	.000000	.000000	.000000
11	.000000	.000000	.000000
12	.000000	.000000	.000000
13	.000000	.000000	.000000
14	.000000	.000000	.000000
15	.000000	.000000	.000000
16	.000000	.000000	.000000
17	.000000	.000000	.000000
18	.000000	.000000	.000000
19	.000000	.000000	.000000
20	.000000	.000000	.000000
21	.000000	.000000	.000000
22	.000000	.000000	.000000
23	.000000	.000000	.000000
24	.000000	.000000	.000000
25	.000000	.000000	.000000
26	.000000	.000000	.000000

27	.000000	.000000	.000000
28	.000000	.000000	.000000
29	.000000	.000000	.000000
30	.000000	.000000	.000000
31	.000000	.000000	.000000
32	.000000	.000000	.000000
33	.000000	.000000	.000000
34	.000000	.000000	.000000
35	1.000000	.000000	.000000
36	1.000000	.000000	.000000
37	1.000000	.000000	.000000
38	1.000000	.000000	.000000
39	1.000000	.000000	.000000
40	1.000000	.000000	.000000
41	1.000000	.000000	.000000
42	1.000000	.000000	.000000
43	1.000000	.000000	.000000
44	1.000000	.000000	.000000
45	1.000000	.000000	.000000
46	.000000	1.000000	.000000
47	.000000	1.000000	.000000
48	.000000	1.000000	.000000
49	.000000	1.000000	.000000
50	.000000	1.000000	.000000
51	.000000	1.000000	.000000
52	.000000	1.000000	.000000
53	.000000	1.000000	.000000
54	.000000	1.000000	.000000
55	.000000	1.000000	.000000
56	.000000	1.000000	.000000
57	.000000	1.000000	.000000
58	.000000	1.000000	.000000
59	.000000	1.000000	.000000
60	.000000	1.000000	.000000
61	.000000	1.000000	.000000
62	.000000	1.000000	.000000
63	.000000	1.000000	.000000
64	.000000	1.000000	.000000
65	.000000	1.000000	.000000
66	.000000	.000000	1.000000
67	.000000	.000000	1.000000
68	.000000	.000000	1.000000
69	.000000	.000000	1.000000
70	.000000	.000000	1.000000
71	.000000	.000000	1.000000
72	.000000	.000000	1.000000
73	.000000	.000000	1.000000
74	.000000	.000000	1.000000
75	.000000	.000000	1.000000
76	.000000	.000000	1.000000
77	.000000	.000000	1.000000
78	.000000	.000000	1.000000
79	.000000	.000000	1.000000
80	.000000	.000000	1.000000

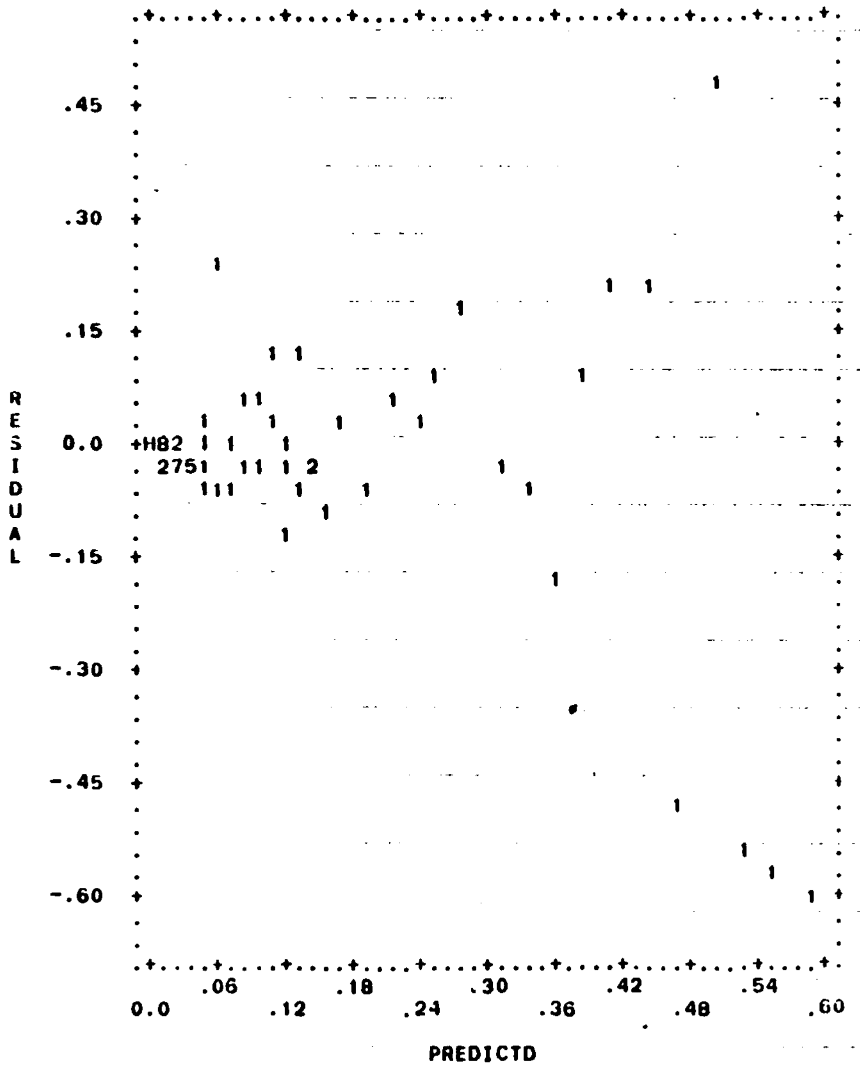
SERIAL CORRELATION .10412

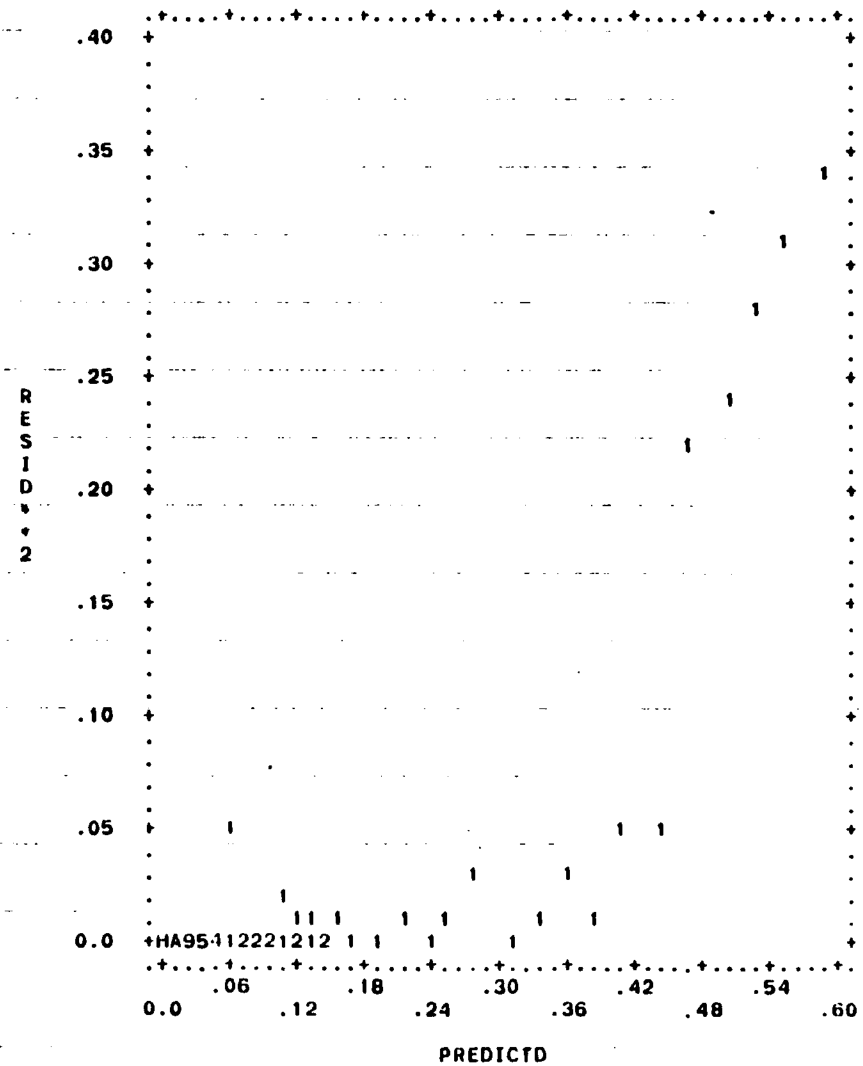
PLOTS OF VARIABLE(1) VERSUS PREDICTED AND OBSERVED VARIABLE(2) AND VERSUS RESIDUALS.





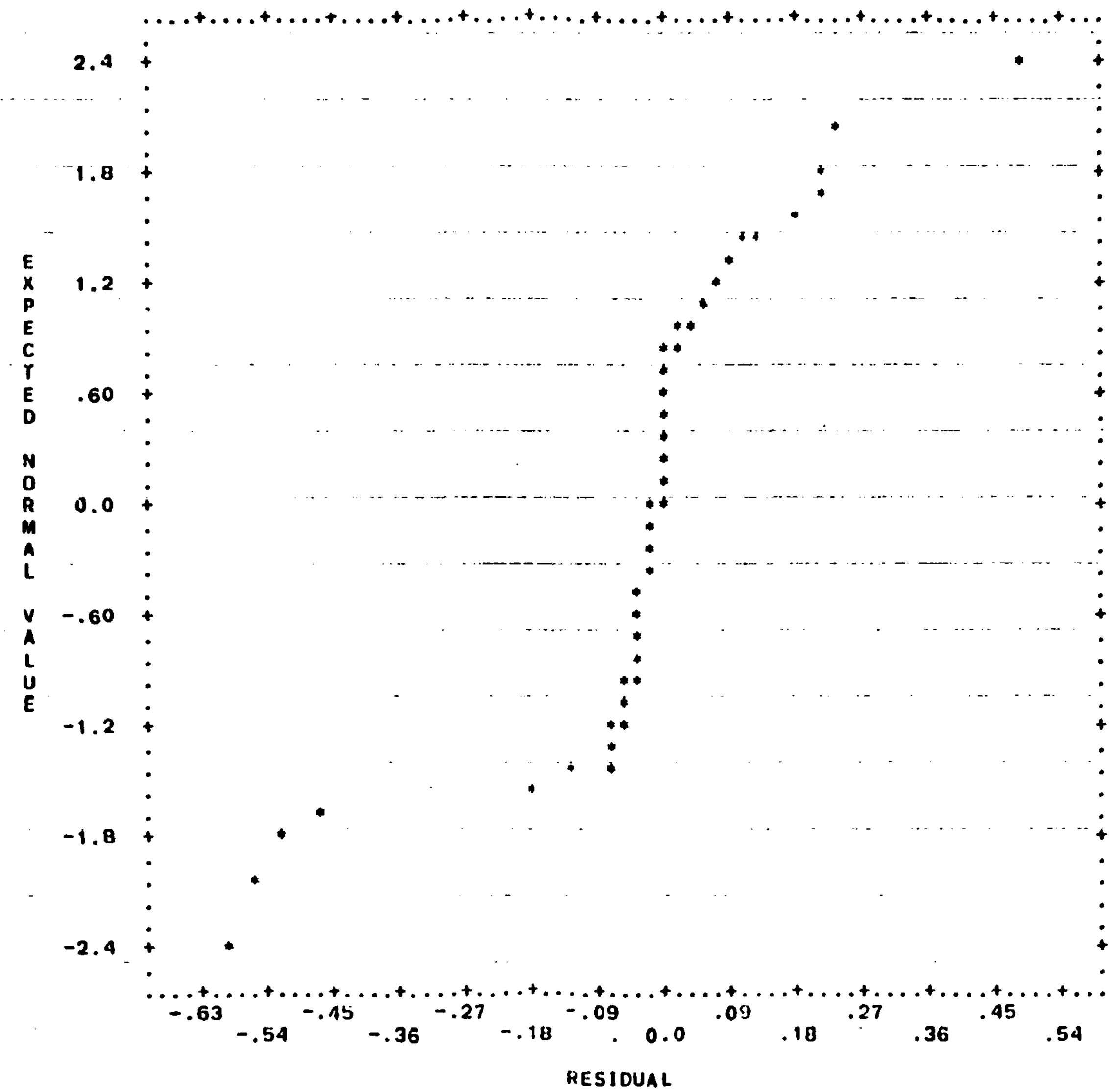
PLOTS OF PREDICTED VARIABLE HOLD VERSUS RESIDUALS AND VERSUS RESIDUALS SQUARED





7

NORMAL PROBABILITY PLOT OF RESIDUALS



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BMDP3R - NONLINEAR REGRESSION                        PROGRAM REVISED FEBRUARY 1979          8
HEALTH SCIENCES COMPUTING FACILITY                   MANUAL DATE  --  1977
UNIVERSITY OF CALIFORNIA, LOS ANGELES
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IN THIS VERSION OF BMDP3R

   -- THE FORM OF SPECIFYING LINEAR CONSTRAINTS HAS BEEN CHANGED, SEE BMDP-77 MANUAL PAGE 480.
   -- COMPUTATIONS ARE NOW PERFORMED IN DOUBLE PRECISION.
      IF YOU USE SUBROUTINE FUN BE SURE ALL FUNCTION REFERENCES ARE IN DOUBLE PRECISION.
   -- DEFAULT TOLERANCE FOR PIVOTING IS NOW .00000001.


  PROGRAM TERMINATED NORMALLY.
```

••PASS•NLR.P3R77

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BMDP3R - NONLINEAR REGRESSION                          PROGRAM REVISED FEBRUARY 1979          1
HEALTH SCIENCES COMPUTING FACILITY                     MANUAL DATE  --  1977
UNIVERSITY OF CALIFORNIA, LOS ANGELES
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IN THIS VERSION OF BMDP3R

  -- THE FORM OF SPECIFYING LINEAR CONSTRAINTS HAS BEEN CHANGED, SEE BMDP-77 MANUAL PAGE 480.
  -- COMPUTATIONS ARE NOW PERFORMED IN DOUBLE PRECISION.
     IF YOU USE SUBROUTINE FUN BE SURE ALL FUNCTION REFERENCES ARE IN DOUBLE PRECISION.
  -- DEFAULT TOLERANCE FOR PIVOTING IS NOW .00000001.


 PROGRAM CONTROL INFORMATION

        S    A  •SWE B ]UW(E F A,b"
        /PROBLEM
                  TITLE IS ' REGRESSION ON REAL PI DATA'.
        /INPUT
                  VARIABLES ARE 8.
                  FORMAT IS '(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))'.
        /VARIABLE
                  NAMES ARE PERF,HOLD,CASEWT,TIMEWT,I1,I2,I3,I4.
        /REGRESS
                  TITLE IS ' PARAMETERS FROM REAL DATA SET # 3( 5 SOURCES )'.
                  INDEPENDENT IS PERF.
                  DEPENDENT IS HOLD.
                  NUMBER IS 2.
                  PARAMETERS ARE 6.
                  WEIGHT IS CASEWT.
                  ITERATIONS ARE 10.
                  HALVING IS 50.
        /PARAMETER
                  INITIAL ARE -20.0, 0.125,0.0,0.0,0.0,0.0.
        /PLOT
                  RESIDUAL.
                  VARIABLE IS PERF.
                  NORMAL.
                  SIZE IS 50,40.
        /END

 PROBLEM TITLE . . . . . . . . REGRESSION ON REAL PI DATA

 NUMBER OF VARIABLES TO READ IN. . . . . . . . .          8
 NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. .          0
 TOTAL NUMBER OF VARIABLES . . . . . . . . . . .          8
 NUMBER OF CASES TO READ IN. . . . . . . . . . . . 1000000
 CASE LABELING VARIABLES . . . . . . . . . . . .
 LIMITS AND MISSING VALUE CHECKED BEFORE TRANSFORMATIONS
 BLANKS ARE. . . . . . . . . . . . . . . . . . .      ZEROS
 INPUT UNIT NUMBER . . . . . . . . . . . . . . .          5
 REWIND INPUT UNIT PRIOR TO READING. . DATA. . .         NO

 INPUT FORMAT
        (F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))
```

```
VARIABLES TO BE USED
          1  PERF          2  HOLD          3  CASEWT        4  TIMEWT        5  I1
          6  I2            7  I3            8  I4

VARIABLES TO BE PLOTTED
          1  PERF

PLOT OF PREDICTED VALUES VERSUS RESIDUALS . . .      YES
NORMAL PROBABILITY PLOT . . . . . . . . . . . . .    YES
DETRENDED NORMAL PROBABILITY PLOT . . . . . . . .     NO
```

```
REGRESSION TITLE
      PARAMETERS FROM REAL DATA SET # 3( 5 SOURCES )

REGRESSION NUMBER . . . . . . . . . . . . . . . . .          2
INDEPENDENT VARIABLE(FOR BUILT-IN FUNCTION) . .   PERF
DEPENDENT VARIABLE. . . . . . . . . . . . . . . . .   HOLD
WEIGHTING VARIABLE. . . . . . . . . . . . . . . . .   CASEWT
NUMBER OF PARAMETERS. . . . . . . . . . . . . . . .       6
NUMBER OF CONSTRAINTS . . . . . . . . . . . . . . .       0
TOLERANCE FOR PIVOTING. . . . . . . . . . . . . . .  .0000000001000
TOLERANCE FOR CONVERGENCE . . . . . . . . . . . . .  .00001000000
MAXIMUM NUMBER OF ITERATIONS. . . . . . . . . . . .      10
MAXIMUM NUMBER OF INCREMENT HALVINGS. . . . . . . .      50
NUMBER OF DATA PASSES PER CASE. . . . . . . . . . .       1
COMPUTE LOSS FUNCTION . . . . . . . . . . . . . . .      NO

USING THE ABOVE SPECIFICATIONS THIS PROGRAM COULD PROCESS 1116 CASES.


@ADD,P NLRDAT.A3

NUMBER OF CASES READ. . . . . . . . . . . . . . . .      65
```

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
1	PERF	180.907249	3.718233	160.750000	186.250000
2	HOLD	.012998	.061371	.000000	.726670
3	CASEWT	7245.684509	5112.085266	32.906340	15407.879639
4	TIMEWT	155.281633	151.562706	1.000000	594.000000
5	I1	.171645	.380006	.000000	1.000000
6	I2	.287964	.456338	.000000	1.000000
7	I3	.096512	.297590	.000000	1.000000
8	I4	.220145	.417569	.000000	1.000000

```
PARAMETER MAXIMA. . . . . . . . . . . . . **************  **************  **************  **************  **************  **************

PARAMETER MINIMA. . . . . . . . . . . . . **************  **************  **************  **************  **************  **************
```

ITERATION NUMBER	INCREMENT HALVINGS	RESIDUAL SUM OF SQUARES	P(1)	P(2)	P(3)	P(4)	P(5)	P(6)
0	0	433.157671	-20.000000	.125000	.000000	.000000	.000000	.000000
1	0	212.884702	-6.935385	.048928	.471733	.285710	-1.710622	.446901
2	0	81.441831	-13.093203	.084623	.756075	.113337	-1.014663	.656335
3	0	77.789029	-16.453603	.104266	.927957	.011956	-.945776	.755732
4	50	77.789029	-16.453603	.104266	.927957	.011956	-.945776	.755732
5	50	77.789029	-16.453603	.104266	.927957	.011956	-.945776	.755732
6	50	77.789029	-16.4536[illegible]	.104266	.927957	.011956	-.945776	.755732
7	50	77.789029	-16.453603	.104266	.927957	.011956	-.945776	.755732
3	50	77.789029	-16.453603	.104266	.927957	.011956	-.945776	.755732

```
ITERATION    3 HAS THE SMALLEST RESIDUAL SUM OF SQUARES(SUBJECT TO CONSTRAINTS, IF ANY).
 REMAINING CALCULATIONS ARE BASED ON THE RESULTS OF THIS ITERATION.
```

ASYMPTOTIC CORRELATION MATRIX OF THE PARAMETERS

		P(1) 1	P(2) 2	P(3) 3	P(4) 4	P(5) 5	P(6) 6
P(1)	1	1.0000					
P(2)	2	-.9970	1.0000				
P(3)	3	-.1017	.0622	1.0000			
P(4)	4	.1811	-.2316	.3185	1.0000		
P(5)	5	-.1952	.1279	.4607	.5394	1.0000	
P(6)	6	-.0896	.0458	.2961	.3579	.5070	1.0000

RESIDUAL MEAN SQUARE 1.3184581101

DEGREES OF FREEDOM 59

PARAMETER	ESTIMATE	ASYMPTOTIC STANDARD DEVIATION	TOLERANCE
P(1)	-16.453603	2.053434	.0009375320
P(2)	.104266	.011876	.0009498237
P(3)	.927957	.307185	.7312296033
P(4)	.011956	.244407	.5278922170
P(5)	-.945776	.179740	.2099044304
P(6)	.755732	.277510	.6733147278

CASE NO.	LABEL	PREDICTED HOLD	STD DEV OF PRED VALUE	OBSERVED HOLD	RESIDUAL	CASEWT	PERF	TIMEWT	I1
1		.175491	.044341	.670050	.500559	39.859454	166.750000	18.000000	.000000
2		.138058	.036504	.079360	-.058698	283.883095	168.250000	131.000000	.000000
3		.106477	.029606	.160150	.053673	88.386477	169.750000	29.000000	.000000
4		.080475	.023697	.062860	-.017615	392.398617	171.250000	112.000000	.000000
5		.059583	.018738	.047770	-.011813	531.579422	172.750000	115.000000	.000000
6		.043202	.014642	.097340	.054138	304.706917	174.250000	46.000000	.000000
7		.030667	.011299	.035640	.004973	666.282616	175.750000	75.000000	.000000
8		.021307	.008598	.013860	-.007447	2183.058136	177.250000	178.000000	.000000
9		.014486	.006439	.000000	-.014486	2278.865326	178.750000	126.000000	.000000
10		.009635	.004737	.000000	-.009635	1263.078979	180.250000	44.000000	.000000
11		.006268	.003416	.000000	-.006268	2540.191803	181.750000	59.000000	.000000
12		.003988	.002411	.000000	-.003988	5425.453430	183.250000	82.000000	.000000
13		.001509	.001120	.000000	-.001509	6719.097595	186.250000	36.000000	.000000
14		.031397	.018866	.033560	.002163	434.614502	166.750000	49.000000	1.000000
15		.021846	.013795	.014050	-.007796	1674.426910	168.250000	139.000000	1.000000
16		.014874	.009886	.022240	.007366	2578.290985	169.750000	147.000000	1.000000
17		.009907	.006946	.000000	-.009907	5226.782104	171.250000	201.000000	1.000000
18		.006455	.004784	.017750	.011295	5617.827820	172.750000	140.000000	1.000000
19		.004113	.003230	.000000	-.004113	8551.810181	174.250000	136.000000	1.000000
20		.002563	.002137	.000000	-.002563	5898.154297	175.750000	56.000000	1.000000
21		.001561	.001385	.000000	-.001561	19750.134521	177.250000	119.000000	1.000000
22		.000930	.000879	.000000	-.000930	78612.282227	178.750000	288.000000	1.000000
23		.000541	.000546	.000000	-.000541	43538.667969	180.250000	90.000000	1.000000
24		.000308	.000332	.000000	-.000308	76517.976563	181.750000	90.000000	1.000000
25		.000171	.000198	.000000	-.000171	79412.337891	183.250000	50.000000	1.000000
26		.000093	.000115	.000000	-.000093	31331.186035	184.750000	5.000000	1.000000
27		.058180	.021527	.260570	.202390	270.616264	172.750000	55.000000	.000000
28		.042117	.016255	.114840	.072723	524.024261	174.250000	81.000000	.000000
29		.029848	.012085	.000000	-.029848	1546.204193	175.750000	175.000000	.000000
30		.020703	.008854	.018020	-.002683	3881.774048	177.250000	311.000000	.000000
31		.014052	.006393	.000000	-.014052	10791.159790	178.750000	594.000000	.000000
32		.009331	.004549	.000000	-.009331	2088.800323	180.250000	73.000000	.000000
33		.006060	.003187	.000000	-.006060	1926.713028	181.750000	42.000000	.000000
34		.003849	.002195	.000000	-.003849	9852.639160	183.250000	147.000000	.000000
35		.002391	.001484	.000000	-.002391	1748.188416	184.750000	11.000000	.000000
36		.001452	.000984	.000000	-.001452	1497.215500	186.250000	1.000000	.000000
37		.738485	.046085	.556390	-.182095	198.201183	160.750000	149.000000	.000000
38		.685198	.045309	.587160	-.098038	125.358228	162.250000	104.000000	.000000
39		.627744	.043336	.718580	.090836	90.091172	163.750000	80.000000	.000000
40		.567293	.040493	.468890	-.098403	49.292778	165.250000	44.000000	.000000
41		.505221	.037245	.531500	.026279	73.254141	166.750000	69.000000	.000000
42		.443023	.034121	.308820	-.134203	67.131493	168.250000	60.000000	.000000
43		.382200	.031571	.726670	.344470	77.550821	169.750000	69.000000	.000000
44		.324156	.029801	.608830	.284674	174.720438	171.250000	149.000000	.000000
45		.270102	.028686	.602480	.332378	23.067449	172.750000	17.000000	.000000
46		.220975	.027866	.208460	-.012515	231.063702	174.250000	155.000000	.000000
47		.177404	.026941	.102600	-.074804	108.425331	175.750000	59.000000	.000000
48		.139693	.025624	.089530	-.050163	617.945259	177.250000	293.000000	.000000
49		.107840	.023802	.077800	-.029980	366.697723	178.750000	137.000000	.000000
50		.081584	.021505	.000000	-.081584	191.272583	180.250000	53.000000	.000000
51		.060463	.018863	.000000	-.060463	169.574007	181.750000	34.000000	.000000
52		.043884	.016054	.000000	-.043884	89.019310	183.250000	9.000000	.000000

53	.045665	.022452	.000000	-.045665	277.649952	166.750000	44.000000	.000000
54	.032532	.016779	.015430	-.017042	581.805588	168.250000	69.000000	.000000
55	.022685	.012306	.011480	-.011205	2761.513916	169.750000	241.000000	.000000
56	.015479	.008860	.014410	-.001069	2495.379333	171.250000	148.000000	.000000
57	.010333	.006263	.026530	.016197	2863.748260	172.750000	113.000000	.000000
58	.006748	.004346	.021220	.014472	6454.589478	174.250000	169.000000	.000000
59	.004309	.002960	.012290	.007981	4961.456360	175.750000	81.000000	.000000
60	.002691	.001977	.002750	.000059	18459.721924	177.250000	194.000000	.000000
61	.001643	.001295	.000000	-.001643	22572.322021	178.750000	144.000000	.000000
62	.000981	.000831	.000000	-.000981	35496.656738	180.250000	135.000000	.000000
63	.000572	.000522	.000000	-.000572	92717.848633	181.750000	208.000000	.000000
64	.000326	.000321	.000000	-.000326	53092.980469	183.250000	65.000000	.000000
65	.000182	.000193	.000000	-.000182	12911.528809	184.750000	2.000000	.000000

CASE	I2	I3	I4
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2	.000000	.000000	.000000
3	.000000	.000000	.000000
4	.000000	.000000	.000000
5	.000000	.000000	.000000
6	.000000	.000000	.000000
7	.000000	.000000	.000000
8	.000000	.000000	.000000
9	.000000	.000000	.000000
10	.000000	.000000	.000000
11	.000000	.000000	.000000
12	.000000	.000000	.000000
13	.000000	.000000	.000000
14	.000000	.000000	.000000
15	.000000	.000000	.000000
16	.000000	.000000	.000000
17	.000000	.000000	.000000
18	.000000	.000000	.000000
19	.000000	.000000	.000000
20	.000000	.000000	.000000
21	.000000	.000000	.000000
22	.000000	.000000	.000000
23	.000000	.000000	.000000
24	.000000	.000000	.000000
25	.000000	.000000	.000000
26	.000000	.000000	.000000
27	1.000000	.000000	.000000
28	1.000000	.000000	.000000
29	1.000000	.000000	.000000
30	1.000000	.000000	.000000
31	1.000000	.000000	.000000
32	1.000000	.000000	.000000
33	1.000000	.000000	.000000
34	1.000000	.000000	.000000
35	1.000000	.000000	.000000
36	1.000000	.000000	.000000
37	.000000	1.000000	.000000
38	.000000	1.000000	.000000
39	.000000	1.000000	.000000
40	.000000	1.000000	.000000
41	.000000	1.000000	.000000

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44	.000000	1.000000	.000000
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46	.000000	1.000000	.000000
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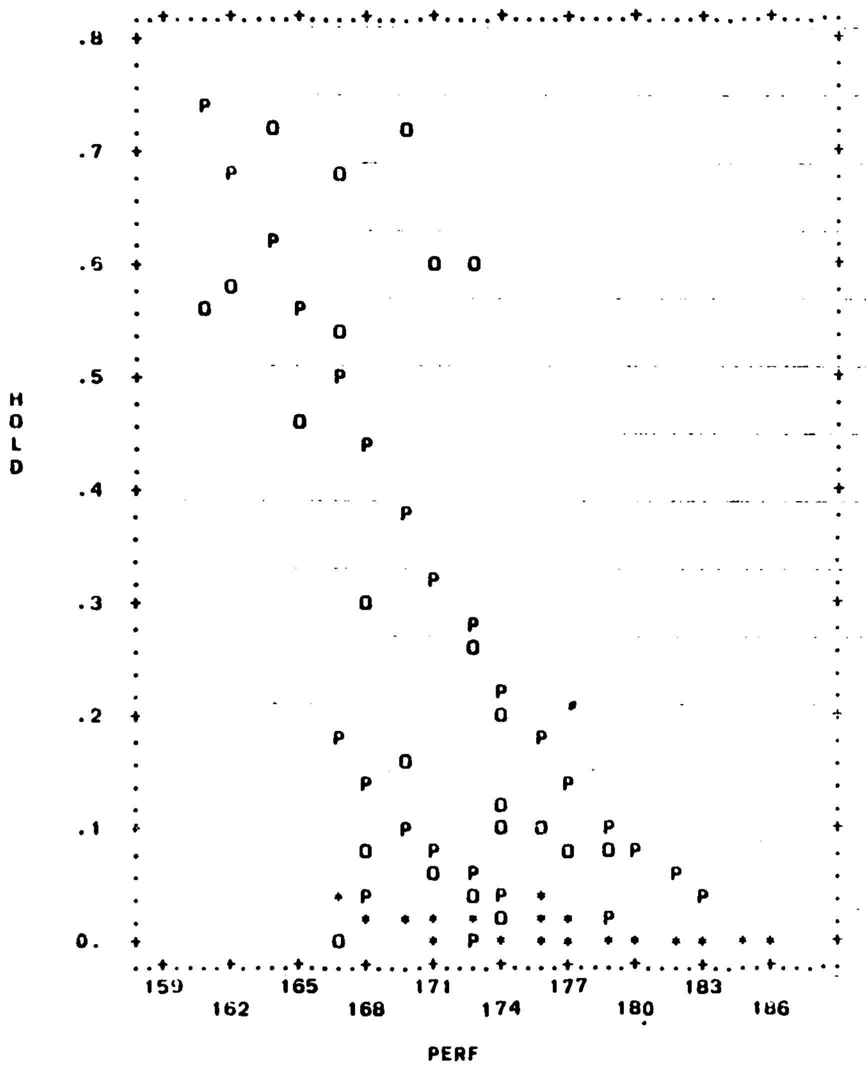
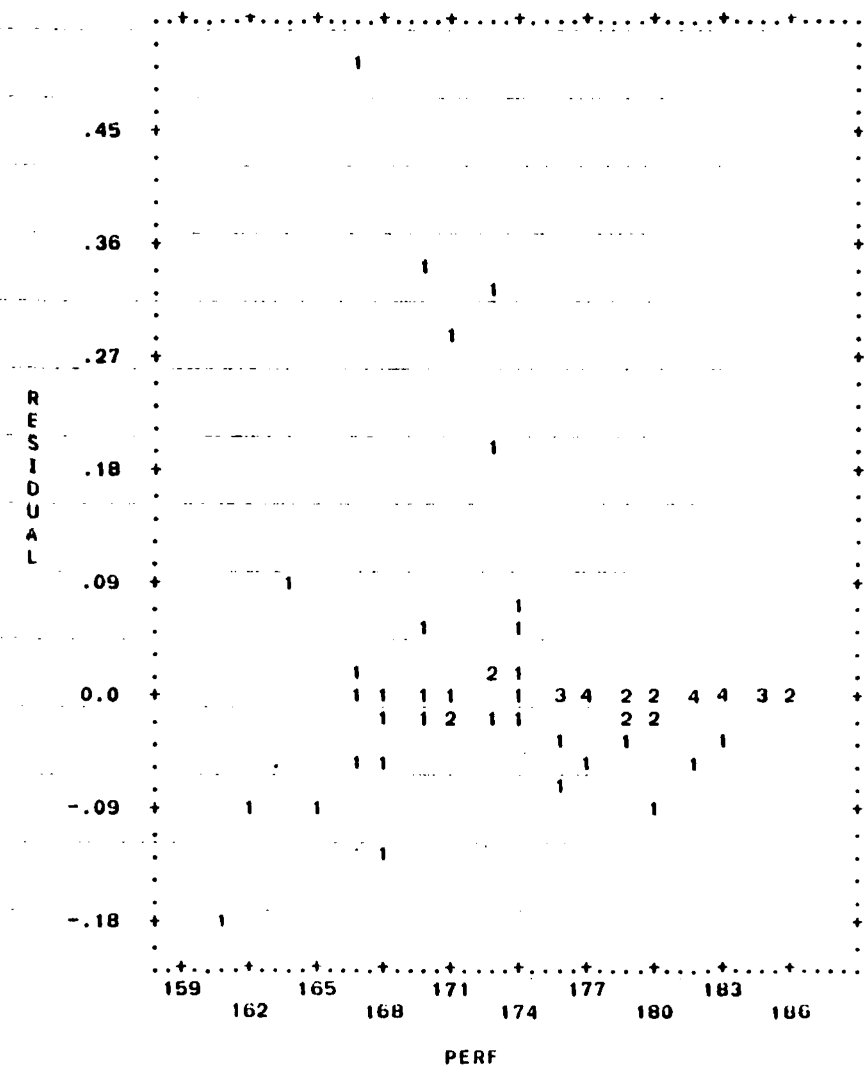
62	.000000	.000000	1.000000
63	.000000	.000000	1.000000
64	.000000	.000000	1.000000
65	.000000	.000000	1.000000

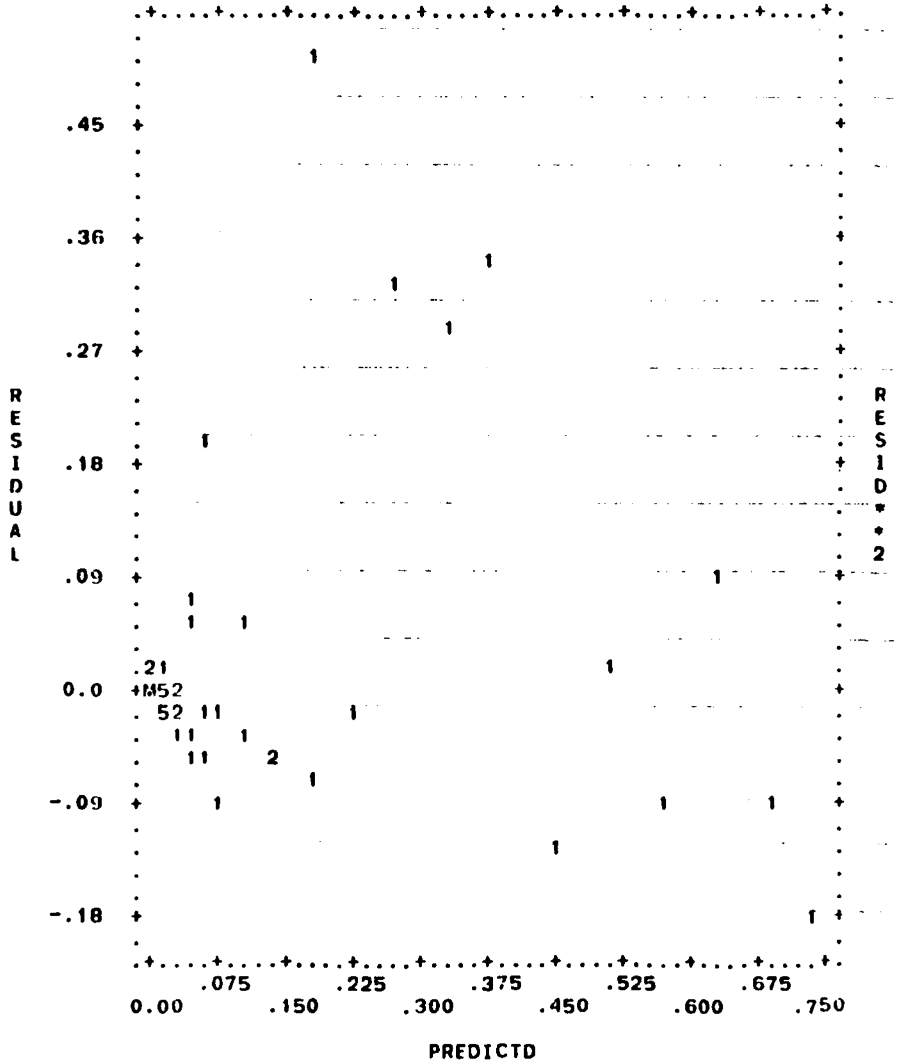
SERIAL CORRELATION .28382

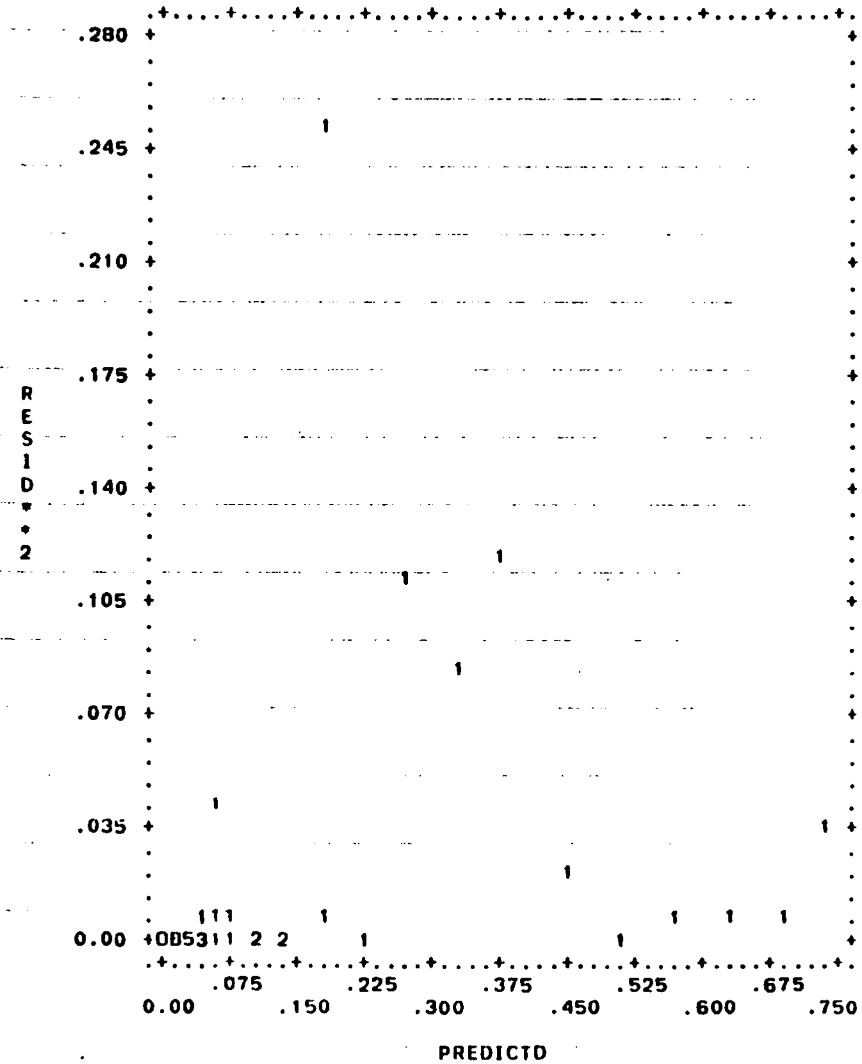
PLOTS OF VARIABLE(1) VERSUS PREDICTED AND OBSERVED VARIABLE(2) AND VERSUS RESIDUALS.



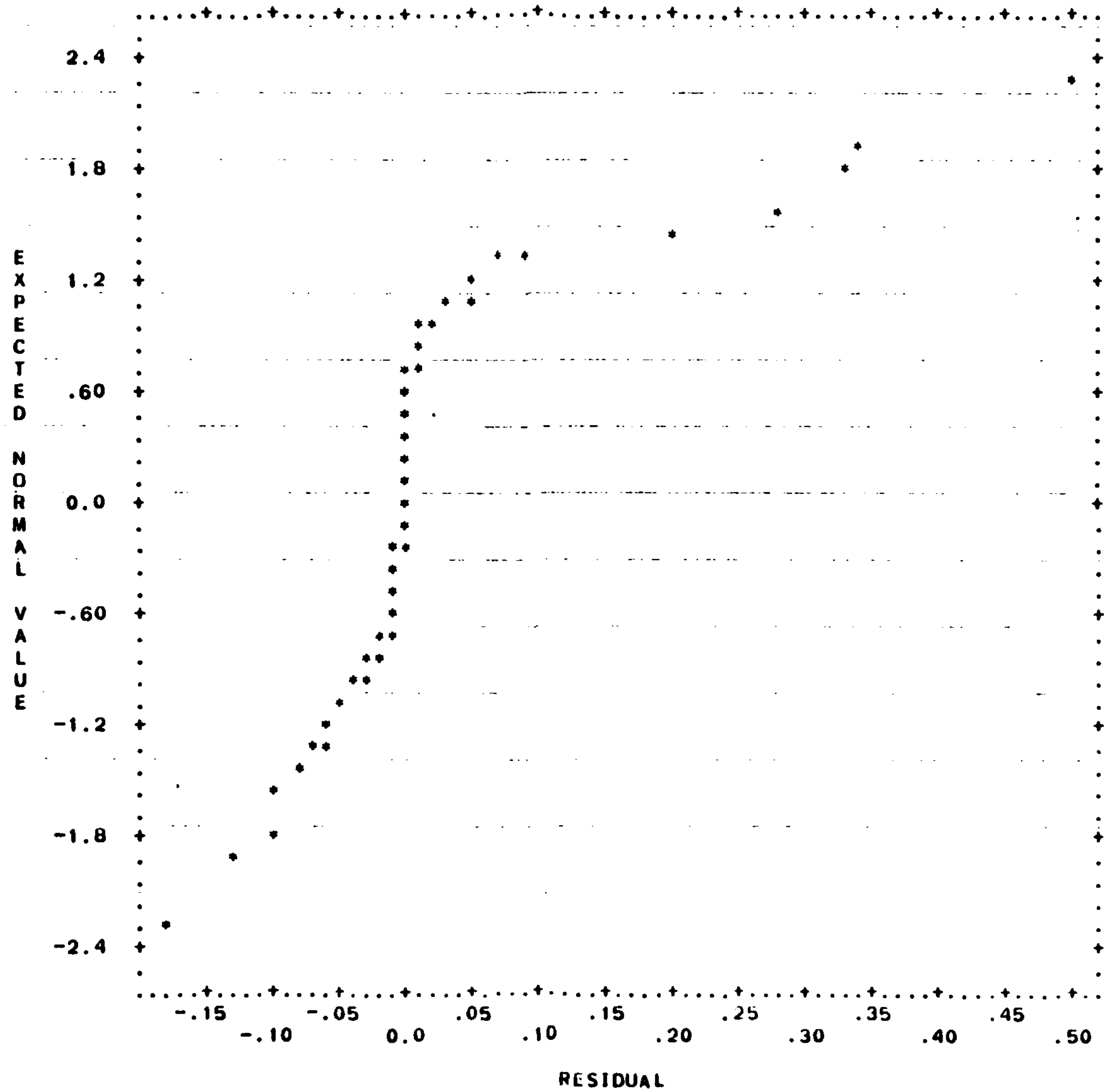


PLOTS OF PREDICTED VARIABLE HOLD VERSUS RESIDUALS AND VERSUS RESIDUALS SQUARED





NORMAL PROBABILITY PLOT OF RESIDUALS



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BMDP3R - NONLINEAR REGRESSION                           PROGRAM REVISED FEBRUARY 1979                         8
HEALTH SCIENCES COMPUTING FACILITY                      MANUAL DATE  --  1977
UNIVERSITY OF CALIFORNIA, LOS ANGELES
COPYRIGHT (C) 1977, THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

IN THIS VERSION OF BMDP3R

   -- THE FORM OF SPECIFYING LINEAR CONSTRAINTS HAS BEEN CHANGED, SEE BMDP-77 MANUAL PAGE 480.
   -- COMPUTATIONS ARE NOW PERFORMED IN DOUBLE PRECISION.
      IF YOU USE SUBROUTINE FUN BE SURE ALL FUNCTION REFERENCES ARE IN DOUBLE PRECISION.
   -- DEFAULT TOLERANCE FOR PIVOTING IS NOW .00000001.


  PROGRAM TERMINATED NORMALLY.


@BRKPT PRINT$
```

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PP       PP   AA        AA   RR       RR            777            777
PP       PP   AA        AA   RR       RR           777            777
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PP            AA        AA   RR        RR   777            777

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       777            222        11               33
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22       222   22       222  SSS     SS    EE             PP       PP   88      88    22       222
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    222            222            SSS      EEEEEEE        PPPPPPPPPP     8888888888       222
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222            222           SS      SS    EE             PP            888    888    222
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222222222222   222222222222   SSSSSSSS     EEEEEEEEEEEE   PP              88888888    222222222222
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FILENAME + PRT2   USERID + HOFMOCKEL-JL   ACCOUNT + DIA72130230A   CREATED AT: 18:16:08   22 SEP 82
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012

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ELT017 RLIB70 09/22-16:55:24-(4,)
004 @RUN,X/NR PAR77,DLK7213030A/HOFMUCKEL-JL,PASS,G,100
002 @SYM PRINT$,,CSCRMT
001 @ASG,A PRT2.
001 @USE PRT,PRT2
000 @PRX,U PRT.
000 @PASS*NLR.PAR77
000 /PROBLEM
000           TITLE IS ' REGRESSION ON REAL PI DATA'.
000 /INPUT
000           VARIABLES ARE 9.
000           FORMAT IS '(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))'.
000 /VARIABLE
000           NAMES ARE PERF,HOLD,CASEWT,TIMEWT,I1,I2,I3,I4,I5.
000 /REGRESS
000           TITLE IS ' PARAMETERS FROM REAL DATA SET # 1( 6 SOURCES )'.
000           DEPENDENT IS HOLD.
000           NUMBER IS 2.
000           PARAMETERS ARE 7.
000           WEIGHT IS CASEWT.
004           ITERATIONS ARE 50.
004           HALVING IS 20.
000 /PARAMETER
000           INITIAL ARE -20.0, 0.125,0.0,0.0,0.0,0.0,0.0.
000 /PLOT
000           RESIDUAL.
000           VARIABLE IS PERF.
000           NORMAL.
000           SIZE IS 50,40.
000 /END
003 @ADD,P NLRDAT.A1
000 @EOF
000 @PASS*NLR.PAR77
000 /PROBLEM
000           TITLE IS ' REGRESSION ON REAL PI DATA'.
000 /INPUT
000           VARIABLES ARE 8.
000           FORMAT IS '(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))'.
000 /VARIABLE
000           NAMES ARE PERF,HOLD,CASEWT,TIMEWT,I1,I2,I3,I4.
000 /REGRESS
000           TITLE IS ' PARAMETERS FROM REAL DATA SET # 2( 5 SOURCES )'.
000           DEPENDENT IS HOLD.
000           NUMBER IS 2.
000           PARAMETERS ARE 6.
000           WEIGHT IS CASEWT.
004           ITERATIONS ARE 50.
004           HALVING IS 20.
000 /PARAMETER
000           INITIAL ARE -20.0, 0.125,0.0,0.0,0.0,0.0,0.0.
000 /PLOT
000           RESIDUAL.
000           VARIABLE IS PERF.
000           NORMAL.
000           SIZE IS 50,40.
000 /END
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```
003 @ADD,P NLRDAT.A2
000 @EOF
000 @PASS*NLR.PAR77
000 /PROBLEM
000          TITLE IS ' REGRESSION ON REAL PI DATA'.
000 /INPUT
000          VARIABLES ARE 8.
000          FORMAT IS '(F6 2,F9.5,F12.5,F6.1,5(1X,F1.0))'.
000 /VARIABLE
000          NAMES ARE PERF,HOLD,CASEWT,TIMEWT,I1,I2,I3,I4.
000 /REGRESS
000          TITLE IS ' PARAMETERS FROM REAL DATA SET # 3( 5 SOURCES )'.
000          DEPENDENT IS HOLD.
000          NUMBER IS 2.
000          PARAMETERS ARE 6.
000          WEIGHT IS CASEWT.
004          ITERATIONS ARE 50.
004          HALVING IS 20.
000 /PARAMETER
000          INITIAL ARE -20.0, 0.125,0.0,0.0,0.0,0.0.
000 /PLOT
000          RESIDUAL.
000          VARIABLE IS PERF.
000          NORMAL.
000          SIZE IS 50,40.
000 /END
003 @ADD,P NLRDAT.A3
000 @EOF
000 @BRKPT PRINT$
002 @SYM PRINT$,,CSCRMT
002 @SYM,U PRT.,,CSCRMT
000 @FIN

END ELT.
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000002        000 174.25   .00923  2130.33652  368. 0 0 0 0 0
000003        000 175.75   .00000  3206.75296  374. 0 0 0 0 0
000004        000 177.25   .00000  3385.82523  256. 0 0 0 0 0
000005        000 178.75   .00000  2053.32242   95. 0 0 0 0 0
000006        000 180.25   .00000  1547.43471   41. 0 0 0 0 0
000007        000 181.75   .00000  6557.75958  109. 0 0 0 0 0
000008        000 183.25   .00000  4531.68317   40. 0 0 0 0 0
000009        000 184.75   .00000  8975.75354   44. 0 0 0 0 0
000010        000 186.25   .00000 13092.22632   33. 0 0 0 0 0
000011        000 187.75   .00000  6856.22125    3. 0 0 0 0 0
000012        000 171.25   .00000    72.79577   20. 1 0 0 0 0
000013        000 172.75   .01702   950.65219  233. 1 0 0 0 0
000014        000 174.25   .00000  3481.58160  604. 1 0 0 0 0
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000016        000 177.25   .00000  1421.57776  105. 1 0 0 0 0
000017        000 178.75   .00000   556.19869   22. 1 0 0 0 0
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000021        000 184.75   .00000 38588.38672  204. 1 0 0 0 0
000022        000 186.25   .00000 25537.83569   69. 1 0 0 0 0
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000035        000 184.75   .00000 73445.75391  392. 0 1 0 0 0
000036        000 186.25   .00000 24496.01538   66. 0 1 0 0 0
000037        000 168.25   .97667    16.30957    2. 0 0 1 0 0
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000045        000 180.25   .00000  1613.32571   25. 0 0 1 0 0
000046        000 181.75   .00000  4129.53210   67. 0 0 1 0 0
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000048        000 184.75   .00000 14507.47009   74. 0 0 1 0 0
000049        000 186.25   .00000 11727.51270   29. 0 0 1 0 0
000050        000 187.75   .00000  6360.58649    2. 0 0 1 0 0
000051        000 163.75   .00000     9.49148    1. 0 0 0 1 0
000052        000 165.25   .06000    14.23563    5. 0 0 0 1 0
000053        000 166.75   .01667    43.81716   26. 0 0 0 1 0
000054        000 168.25   .00000   116.88164   63. 0 0 0 1 0
000055        000 169.75   .07171   395.11330  175. 0 0 0 1 0
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000057	000	172.75	.00401	782.29477	191.	0	0	0	1	0
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000059	000	175.75	.00000	951.34534	108.	0	0	0	1	0
000060	000	177.25	.00000	733.63285	52.	0	0	0	1	0
000061	000	178.75	.00000	676.22335	28.	0	0	0	1	0
000062	000	180.25	.00000	2834.26804	79.	0	0	0	1	0
000063	000	181.75	.00000	2862.41379	45.	0	0	0	1	0
000064	000	183.25	.00000	6960.70038	64.	0	0	0	1	0
000065	000	184.75	.00266	40256.79639	213.	0	0	0	1	0
000066	000	186.25	.00000	29360.64868	80.	0	0	0	1	0
000067	000	187.75	.00000	6856.22125	3.	0	0	0	1	0
000068	000	184.75	.00000	88094.99219	471.	0	0	0	0	1
000069	000	186.25	.00066	425715.65234	1217.	0	0	0	0	1
000070	000	187.75	.00000	5881.76160	1.	0	0	0	0	1
000071	000	189.25	.00000	11817.16187	1.	0	0	0	0	1

END ELT.

```
@ELT.L NLRDAT.A2
ELT017 RLIB70 09/22-16:55:51-(0,)
000001     000 165.25  .10954     27.04722   17. 0 0 0 0 0
000002     000 166.75  .08222     17.75272    6. 0 0 0 0 0
000003     000 168.25  .00000     17.58046    3. 0 0 0 0 0
000004     000 169.75  .14508    102.41307   42. 0 0 0 0 0
000005     000 171.25  .06174    571.92847  192. 0 0 0 0 0
000006     000 172.75  .13419    381.68828   91. 0 0 0 0 0
000007     000 174.25  .05667    220.63721   34. 0 0 0 0 0
000008     000 175.75  .28720    318.52114   33. 0 0 0 0 0
000009     000 177.25  .08698    694.85287   49. 0 0 0 0 0
000010     000 178.75  .00000    556.19869   22. 0 0 0 0 0
000011     000 180.25  .00000    423.91037    6. 0 0 0 0 0
000012     000 181.75  .00000   2633.03195   41. 0 0 0 0 0
000013     000 183.25  .00000   3529.20151   30. 0 0 0 0 0
000014     000 184.75  .00000   6600.21674   31. 0 0 0 0 0
000015     000 186.25  .00000  49202.67969  137. 0 0 0 0 0
000016     000 187.75  .00000120676.11426  174. 0 0 0 0 0
000017     000 189.25  .00000140450.82422   99. 0 0 0 0 0
000018     000 165.25  .24396     50.69377   37. 1 0 0 0 0
000019     000 166.75  .08161     94.53536   62. 1 0 0 0 0
000020     000 168.25  .23255    139.38367   76. 1 0 0 0 0
000021     000 169.75  .14763    445.83105  198. 1 0 0 0 0
000022     000 171.25  .04621    382.47181  127. 1 0 0 0 0
000023     000 172.75  .00000    257.78625   60. 1 0 0 0 0
000024     000 174.25  .00000    402.30010   66. 1 0 0 0 0
000025     000 175.75  .04505    469.42521   51. 1 0 0 0 0
000026     000 177.25  .00000   1356.56985  100. 1 0 0 0 0
000027     000 178.75  .00000    920.16695   40. 1 0 0 0 0
000028     000 180.25  .00000   1345.90224   35. 1 0 0 0 0
000029     000 181.75  .00000   2919.83124   46. 1 0 0 0 0
000030     000 183.25  .00000   4733.23401   42. 1 0 0 0 0
000031     000 184.75  .00000   9159.39746   45. 1 0 0 0 0
000032     000 186.25  .00000  14807.56763   38. 1 0 0 0 0
000033     000 187.75  .00000  86822.81543  124. 1 0 0 0 0
000034     000 189.25  .00000398959.06250  289. 1 0 0 0 0
000035     000 174.25  .00000    105.70066   13. 0 1 0 0 0
000036     000 175.75  .00000    402.15676   43. 0 1 0 0 0
000037     000 177.25  .00000   1161.62575   85. 0 1 0 0 0
000038     000 178.75  .00000   3604.46732  170. 0 1 0 0 0
000039     000 180.25  .00000   6372.31366  183. 0 1 0 0 0
000040     000 181.75  .00355  11653.78320  197. 0 1 0 0 0
000041     000 183.25  .00000  33856.87891  328. 0 1 0 0 0
000042     000 184.75  .00000   2930.46463   10. 0 1 0 0 0
000043     000 186.25  .00000  11727.51270   29. 0 1 0 0 0
000044     000 187.75  .00000   8985.49756    7. 0 1 0 0 0
000045     000 189.25  .00000392153.55469  284. 0 1 0 0 0
000046     000 160.75  .00000     12.44589    6. 0 0 1 0 0
000047     000 162.25  .00000      9.59932    2. 0 0 1 0 0
000048     000 163.75  .00000     13.60895    6. 0 0 1 0 0
000049     000 165.25  .99333     14.23563    5. 0 0 1 0 0
000050     000 166.75  .00000     15.50934    4. 0 0 1 0 0
000051     000 168.25  .66020     28.97494   11. 0 0 1 0 0
000052     000 169.75  .63000     46.77965   16. 0 0 1 0 0
000053     000 171.25  .48048     95.26556   28. 0 0 1 0 0
000054     000 172.75  .18678    401.69524   96. 0 0 1 0 0
000055     000 174.25  .25722    322.56655   52. 0 0 1 0 0
```

000056	000	175.75	.27820	832.79329	94.	0	0	1	0	0
000057	000	177.25	.45699	1187.60989	87.	0	0	1	0	0
000058	000	178.75	.33630	3790.69943	179.	0	0	1	0	0
000059	000	180.25	.25899	6917.02802	199.	0	0	1	0	0
000060	000	181.75	.28466	6789.25592	113.	0	0	1	0	0
000061	000	183.25	.14207	7671.60333	71.	0	0	1	0	0
000062	000	184.75	.19703	19502.81470	101.	0	0	1	0	0
000063	000	186.25	.08077	34578.41504	95.	0	0	1	0	0
000064	000	187.75	.09507	86822.81543	124.	0	0	1	0	0
000065	000	189.25	.11143	149964.70703	106.	0	0	1	0	0
000066	000	168.25	.00000	46.67624	22.	0	0	0	1	0
000067	000	169.75	.00000	89.34906	36.	0	0	0	1	0
000068	000	171.25	.01422	601.08328	202.	0	0	0	1	0
000069	000	172.75	.02713	742.21407	181.	0	0	0	1	0
000070	000	174.25	.01758	653.63223	110.	0	0	0	1	0
000071	000	175.75	.00000	1086.89137	124.	0	0	0	1	0
000072	000	177.25	.00000	1044.73967	76.	0	0	0	1	0
000073	000	178.75	.00000	961.09224	42.	0	0	0	1	0
000074	000	180.25	.00000	753.87708	17.	0	0	0	1	0
000075	000	181.75	.00000	4418.22546	72.	0	0	0	1	0
000076	000	183.25	.00000	14083.49646	134.	0	0	0	1	0
000077	000	184.75	.00000	18762.33154	97.	0	0	0	1	0
000078	000	186.25	.00000	33882.47705	93.	0	0	0	1	0
000079	000	187.75	.00000	124739.52539	180.	0	0	0	1	0
000080	000	189.25	.00000	120073.20215	84.	0	0	0	1	0

END ELT.

```
@ELT,L NLRDAT.A3
FLTOT7 RLIB70 09/22-16:56:01-(0,)
000001        000 166.75   .67605     32.90634   18.  0 0 0 0 0
000002        000 168.25   .07936    234.77729  131.  0 0 0 0 0
000003        000 169.75   .16015     74.20759   29.  0 0 0 0 0
000004        000 171.25   .06286    338.77347  112.  0 0 0 0 0
000005        000 172.75   .04777    477.76903  115.  0 0 0 0 0
000006        000 174.25   .09734    288.48280   46.  0 0 0 0 0
000007        000 175.75   .03564    672.02929   75.  0 0 0 0 0
000008        000 177.25   .01386   2371.39636  178.  0 0 0 0 0
000009        000 178.75   .00000   2694.21713  126.  0 0 0 0 0
000010        000 180.25   .00000   1648.51399   44.  0 0 0 0 0
000011        000 181.75   .00000   3668.03201   59.  0 0 0 0 0
000012        000 183.25   .00000   8789.76660   82.  0 0 0 0 0
000013        000 186.25   .00000  14120.41931   36.  0 0 0 0 0
000014        000 166.75   .03356     76.10590   49.  1 0 0 0 0
000015        000 168.25   .01405    248.66408  139.  1 0 0 0 0
000016        000 169.75   .02224    333.38058  147.  1 0 0 0 0
000017        000 171.25   .00000    598.16775  201.  1 0 0 0 0
000018        000 172.75   .01775    577.91299  140.  1 0 0 0 0
000019        000 174.25   .00000    802.33388  136.  1 0 0 0 0
000020        000 175.75   .00000    511.56015   56.  1 0 0 0 0
000021        000 177.25   .00000   1603.64960  119.  1 0 0 0 0
000022        000 178.75   .00000   6046.69366  288.  1 0 0 0 0
000023        000 180.25   .00000   3208.00150   90.  1 0 0 0 0
000024        000 181.75   .00000   5458.56342   90.  1 0 0 0 0
000025        000 183.25   .00000   5541.48645   50.  1 0 0 0 0
000026        000 184.75   .00000   2160.39270    5.  1 0 0 0 0
000027        000 172.75   .26057    237.84853   55.  0 1 0 0 0
000028        000 174.25   .11484    487.90275   81.  0 1 0 0 0
000029        000 175.75   .00000   1519.16173  175.  0 1 0 0 0
000030        000 177.25   .01802   4102.94598  311.  0 1 0 0 0
000031        000 178.75   .00000  12381.47009  594.  0 1 0 0 0
000032        000 180.25   .00000   2630.53827   73.  0 1 0 0 0
000033        000 181.75   .00000   2090.32983   42.  0 1 0 0 0
000034        000 183.25   .00000  15407.87964  147.  0 1 0 0 0
000035        000 184.75   .00000   3092.65625   11.  0 1 0 0 0
000036        000 186.25   .00000   3026.46002    1.  0 1 0 0 0
000037        000 160.75   .55639    153.11034  149.  0 0 1 0 0
000038        000 162.25   .58716    110.60673  104.  0 0 1 0 0
000039        000 163.75   .71858     92.07990   80.  0 0 1 0 0
000040        000 165.25   .46889     59.14456   44.  0 0 1 0 0
000041        000 166.75   .53150    104.47772   69.  0 0 1 0 0
000042        000 168.25   .30882    111.69447   60.  0 0 1 0 0
000043        000 169.75   .72667    161.59447   69.  0 0 1 0 0
000044        000 171.25   .60883    446.58243  149.  0 0 1 0 0
000045        000 172.75   .60248     88.75602   17.  0 0 1 0 0
000046        000 174.25   .20846    911.04621  155.  0 0 1 0 0
000047        000 175.75   .10260    536.86532   59.  0 0 1 0 0
000048        000 177.25   .08953   3868.57300  293.  0 0 1 0 0
000049        000 178.75   .07786   2921.73505  137.  0 0 1 0 0
000050        000 180.25   .00000   1952.55644   53.  0 0 1 0 0
000051        000 181.75   .00000   2233.14334   34.  0 0 1 0 0
000052        000 183.25   .00000   1523.35822    9.  0 0 1 0 0
000053        000 166.75   .00000     69.03726   44.  0 0 0 1 0
000054        000 168.25   .01549    127.26297   69.  0 0 0 1 0
000055        000 169.75   .01148    540.66393  241.  0 0 0 1 0
```

```
000056      000 171.25   .01441    443.66793   148.  0 0 0 1 0
000057      000 172.75   .02653    469.75962   113.  0 0 0 1 0
000058      000 174.25   .02122    991.15921   169.  0 0 0 1 0
000059      000 175.75   .01229    722.77535    81.  0 0 0 1 0
000060      000 177.25   .00275   2579.66464   194.  0 0 0 1 0
000061      000 178.75   .00000   3066.53751   144.  0 0 0 1 0
000062      000 180.25   .00000   4738.53656   135.  0 0 0 1 0
000063      000 181.75   .00000  12291.03040   208.  0 0 0 1 0
000064      000 183.25   .00000   7062.21802    65.  0 0 0 1 0
000065      000 184.75   .00000   1740.[illegible]1133     2.  0 0 0 1 0

END ELT.

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@BRKPT PRINT$
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@PASS*NLR.PAR77

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BMDPAR--DERIVATIVE-FREE NONLINEAR REGRESSION             PROGRAM REVISED OCTOBER 25, 1978           1
HEALTH SCIENCES COMPUTING FACILITY                       MANUAL DATE  --  1977
UNIVERSITY OF CALIFORNIA, LOS ANGELES
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 PROGRAM CONTROL INFORMATION

         S    A  *SWE B ]UW(E F A*R"
         /PROBLEM
                   TITLE IS ' REGRESSION ON REAL PI DATA'.
         /INPUT
                   VARIABLES ARE 9.
                   FORMAT IS '(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))'.
         /VARIABLE
                   NAMES ARE PERF,HOLD,CASEWT,TIMEWT,I1,I2,I3,I4,I5.
         /REGRESS
                   TITLE IS ' PARAMETERS FROM REAL DATA SET # 1( 6 SOURCES )'.
                   DEPENDENT IS HOLD.
                   NUMBER IS 2.
                   PARAMETERS ARE 7.
                   WEIGHT IS CASEWT.
                   ITERATIONS ARE 50.
                   HALVING IS 20.
         /PARAMETER
                   INITIAL ARE -20.0, 0.125,0.0,0.0,0.0,0.0,0.0.
         /PLOT
                   RESIDUAL.
                   VARIABLE IS PERF.
                   NORMAL.
                   SIZE IS 50,40.
         /END

 PROBLEM TITLE . . . . . . . REGRESSION ON REAL PI DATA

 NUMBER OF VARIABLES TO READ IN. . . . . . . . .         9
 NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. .         0
 TOTAL NUMBER OF VARIABLES . . . . . . . . . . .         9
 NUMBER OF CASES TO READ IN. . . . . . . . . . . 1000000
 CASE LABELING VARIABLES . . . . . . . . . . . .
 LIMITS AND MISSING VALUE CHECKED BEFORE TRANSFORMATIONS
 BLANKS ARE. . . . . . . . . . . . . . . . . . .   ZEROS
 INPUT UNIT NUMBER . . . . . . . . . . . . . . .         5
 REWIND INPUT UNIT PRIOR TO READING. . DATA. . .        NO

 INPUT FORMAT
         (F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))

 VARIABLES TO BE USED
              1  PERF          2  HOLD          3  CASEWT          4  TIMEWT          5  I1
              6  I2            7  I3            8  I4              9  I5

 VARIABLES TO BE PLOTTED
              1  PERF
```

PLOT OF PREDICTED VALUES VERSUS RESIDUALS . . .	YES
NORMAL PROBABILITY PLOT OF RESIDUALS.	YES
DETRENDED NORMAL PROBABILITY PLOT OF RESIDUALS.	NO

REGRESSION TITLE
PARAMETERS FROM REAL DATA SET # 1(6 SOURCES)

REGRESSION NUMBER	2
DEPENDENT VARIABLE.	HOLD
WEIGHTING VARIABLE.	CASEWT
NUMBER OF PARAMETERS.	7
NUMBER OF CONSTRAINTS	0
TOLERANCE FOR PIVOTING.	1.0-008
TOLERANCE FOR CONVERGENCE	1.0-005
MAXIMUM NUMBER OF ITERATIONS.	50
MAXIMUM NUMBER OF INCREMENT HALVINGS.	20

PARAMETERS TO BE ESTIMATED

	1 P(1)	2 P(2)	3 P(3)	4 P(4)	5 P(5)	6 P(6)
MINIMUM	****************	****************	****************	****************	****************	****************
MAXIMUM	****************	****************	****************	****************	****************	****************
INITIAL	-20.000000	.125000	.000000	.000000	.000000	.000000

	7 P(7)
MINIMUM	****************
MAXIMUM	****************
INITIAL	.000000

USING THE ABOVE SPECIFICATIONS THIS PROGRAM COULD USE UP TO 252 CASES.

@ADD,P NLRDAT A1

NUMBER OF CASES READ. 71

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
1	PERF	185.095457	2.520794	163.750000	189.250000
2	HOLD	.000924	.008479	.000000	.976670
4	TIMEWT	654.769554	518.261086	1.000000	1217.000000
5	I1	.098641	.300302	.000000	1.000000
6	I2	.139592	.349030	.000000	1.000000
7	I3	.058102	.235602	.000000	1.000000
8	I4	.098862	.300602	.000000	1.000000
9	I5	.549988	.501036	.000000	1.000000
3	CASEWT	NOT	COMPUTED	9.491480	425715.652344

ITER. NO.	INCR. HALV.	RESIDUAL SUM OF SQUARES	PARAMETERS 1 P(1)	2 P(2)	3 P(3)	4 P(4)	5 P(5)	6 P(6)
0	0	65312.474464	-20.000000	.137500	.000000	.000000	.000000	.000000

0	0	2343.980164	-22.000000	.125000	.000000	.000000	.000000	.000000
0	0	85.818715	-20.000000	.125000	.000000	.000000	.010000	.000000
0	0	84.700371	-20.000000	.125000	.000000	.000000	.000000	.000000
0	0	84.700237	-20.000000	.125000	.000000	.000000	.000000	.000000
0	0	84.472314	-20.000000	.125000	.000000	.010000	.000000	.000000
0	0	84.444749	-20.000000	.125000	.010000	.000000	.000000	.000000
0	0	84.307361	-20.000000	.125000	.000000	.000000	.000000	.010000
1	3	76.658070	-19.996946	.125890	.007855	.005716	-.096050	.016878
2	0	33.442862	-19.988237	.127592	.012313	.010187	-.859446	.032159
3	1	33.372766	-19.989999	.127563	.014176	.010583	-.904678	.028286
4	3	32.870143	-19.993152	.127916	.012677	.010296	-1.024895	.031358
5	4	32.535208	-19.973628	.127956	.013500	.011764	-.957395	.032348
6	7	32.488056	-19.974111	.127953	.014086	.012199	-.970627	.032383
7	7	32.479682	-19.975007	.127953	.014229	.012016	-.984390	.032028
8	10	32.478718	-19.974878	.127953	.014241	.011964	-.982605	.032080
9	6	32.462728	-19.975359	.127981	.012426	.009932	-.976731	.030151
10	5	32.368885	-19.968762	.128009	.016029	.009377	-1.012275	.022837
11	6	32.357674	-19.965506	.127959	.016241	.009869	-.991976	.023524
12	10	32.357525	-19.966234	.127962	.016253	.009877	-.990829	.023528
13	5	32.350886	-20.194869	.129296	.024649	.014540	-.997202	.029890
14	6	32.347194	-20.062414	.128518	.022952	.013405	-.996051	.027604
15	6	32.346544	-19.927816	.127725	.022268	.014096	-.992979	.025595
16	5	32.337565	-20.231517	.129506	.023401	.018314	-.997259	.029869
17	6	32.307917	-19.974230	.128010	.019215	.014350	-.992571	.022855
18	12	32.307907	-19.970034	.127985	.019160	.014303	-.992486	.022750
19	7	32.305873	-20.038004	.128385	.019518	.015205	-.993505	.024025
20	7	32.303852	-20.112102	.128818	.020392	.016215	-.994226	.025273
21	7	32.300172	-20.200348	.129338	.022178	.017195	-.996343	.026477
22	8	32.299613	-20.166053	.129136	.022124	.016876	-.995692	.026177
23	10	32.299576	-20.157455	.129086	.022079	.016748	-.995559	.026072
24	10	32.299527	-20.148854	.129035	.022043	.016648	-.995416	.025974
25	9	32.299300	-20.169139	.129154	.022282	.016802	-.995722	.026240
26	9	32.299116	-20.185751	.129252	.022346	.016955	-.996014	.026379
27	8	32.297814	-20.151161	.129049	.022290	.016637	-.995413	.025973
28	8	32.297329	-20.116342	.128844	.022245	.016316	-.994806	.025559
29	8	32.296687	-20.042351	.128412	.022023	.015370	-.993980	.024399
30	9	32.296518	-20.078384	.128623	.022113	.015809	-.994516	.024950
31	10	32.296332	-20.060839	.128520	.022097	.015719	-.994216	.024721
32	8	32.295503	-19.991218	.128114	.021570	.014670	-.993492	.023265
33	7	32.294170	-20.122662	.128881	.022817	.016197	-.995106	.025062
34	7	32.286661	-20.211590	.129402	.024248	.017548	-.996306	.026482
35	6	32.283689	-20.077096	.128611	.023790	.016359	-.994280	.024762
36	9	32.283352	-20.094407	.128713	.023854	.016516	-.994538	.024991
37	10	32.283094	-20.075555	.128603	.023791	.016275	-.994339	.024683
38	10	32.282863	-20.056970	.128494	.023715	.016056	-.994103	.024364
39	9	32.282663	-20.092746	.128703	.023618	.016616	-.994601	.024947
40	11	32.282620	-20.101715	.128756	.023811	.016680	-.994762	.025046
41	8	32.282070	-20.029728	.128335	.023646	.015789	-.993772	.023887
42	8	32.280123	-19.965262	.127957	.023995	.015241	-.992797	.022705
43	7	32.274555	-20.036678	.128376	.024370	.015974	-.993623	.023715
44	7	32.273450	-20.108633	.128798	.024728	.016738	-.994850	.024784
45	6	32.272040	-19.928777	.127741	.022926	.015154	-.991021	.020949
46	7	32.270144	-20.037645	.128371	.024825	.016665	-.991333	.023760
47	7	32.267581	-20.170490	.129146	.025879	.019639	-.992837	.026298
48	7	32.266918	-20.283311	.129811	.025498	.019486	-.995624	.026576
49	6	32.257584	-20.112578	.128812	.025005	.017471	-.993234	.024314
50	6	32.246514	-19.935383	.127772	.026719	.016444	-.990332	.021074

ITER. NO.	INCR. HALV.	RESIDUAL SUM OF SQUARES	PARAMETERS 7 P(7)
0	0	65312.474464	.000000
0	0	2343.980164	.000000
0	0	85.818715	.000000
0	0	84.700371	.000000
0	0	84.700237	.010000
0	0	84.472314	.000000
0	0	84.444749	.000000
0	0	84.307361	.000000
1	3	76.658070	-.087573
2	0	33.442862	-.464004
3	1	33.372766	-.420833
4	3	32.870143	-.510440
5	4	32.535208	-.490616
6	7	32.488056	-.489273
7	7	32.479682	-.488449
8	10	32.478718	-.488461
9	6	32.462728	-.501719
10	5	32.368885	-.499062
11	6	32.357674	-.488488
12	10	32.357525	-.488214
13	5	32.350886	-.512265
14	6	32.347194	-.499556
15	6	32.346544	-.487449
16	5	32.337565	-.515848
17	6	32.307917	-.498760
18	12	32.307907	-.498360
19	7	32.305873	-.504094
20	7	32.303852	-.509812
21	7	32.300172	-.518393
22	8	32.299613	-.515566
23	10	32.299576	-.514856
24	10	32.299527	-.514151
25	9	32.299300	-.516726
26	9	32.299116	-.518334
27	8	32.297814	-.515004
28	8	32.297329	-.511647
29	8	32.296687	-.505482
30	9	32.296518	-.508592
31	10	32.296332	-.507107
32	8	32.295503	-.501663
33	7	32.294170	-.515451
34	7	32.286661	-.521974
35	6	32.283689	-.509341
36	9	32.283352	-.510951
37	10	32.283094	-.509376
38	10	32.282863	-.507817
39	9	32.282663	-.510965
40	11	32.282620	-.511781
41	8	32.282070	-.506151
42	8	32.280123	-.500020
43	7	32.274555	-.506497
44	7	32.273450	-.512892

45	6	32.272040	-.497501
46	7	32.270144	-.506947
47	7	32.267581	-.519422
48	7	32.266918	-.531819
49	6	32.257584	-.522293
50	6	32.246514	-.506379

THE CONVERGENCE CRITERION HAS NOT BEEN SATISFIED.

PARAMETERS FROM REAL DATA SET # 1(6 SOURCES) 3

THE RESIDUAL SUM OF SQUARES (= 32.2465) WAS SMALLEST WITH THE FOLLOWING PARAMETER VALUES

1 P(1)	2 P(2)	3 P(3)	4 P(4)	5 P(5)	6 P(6)	7 P(7)
-1.993538+001	1.277719-001	2.671866-002	1.644388-002	-9.903316-001	2.107352-002	-5.063794-001

ESTIMATE OF ASYMPTOTIC CORRELATION MATRIX

		P(1) 1	P(2) 2	P(3) 3	P(4) 4	P(5) 5	P(6) 6	P(7) 7
P(1)	1	1.0000						
P(2)	2	-.9990	1.0000					
P(3)	3	.1374	-.1726	1.0000				
P(4)	4	-.1712	.1402	.4723	1.0000			
P(5)	5	.0951	-.1353	.7383	.6308	1.0000		
P(6)	6	-.4238	.3923	.5375	.5980	.5229	1.0000	
P(7)	7	.4891	-.5033	.3223	.1486	.3552	.0353	1.0000

THE ESTIMATED MEAN SQUARE ERROR IS .5039

ESTIMATES OF ASYMPTOTIC STANDARD DEVIATIONS OF PARAMETER ESTIMATES WITH 64 DEGREES OF FREEDOM ARE

1 P(1)	2 P(2)	3 P(3)	4 P(4)	5 P(5)	6 P(6)	7 P(7)
3.937312+000	2.264515-002	2.143320-001	2.353789-001	1.857963-001	2.241265-001	5.445167-001

PARAMETERS FROM REAL DATA SET # 1(6 SOURCES) 4

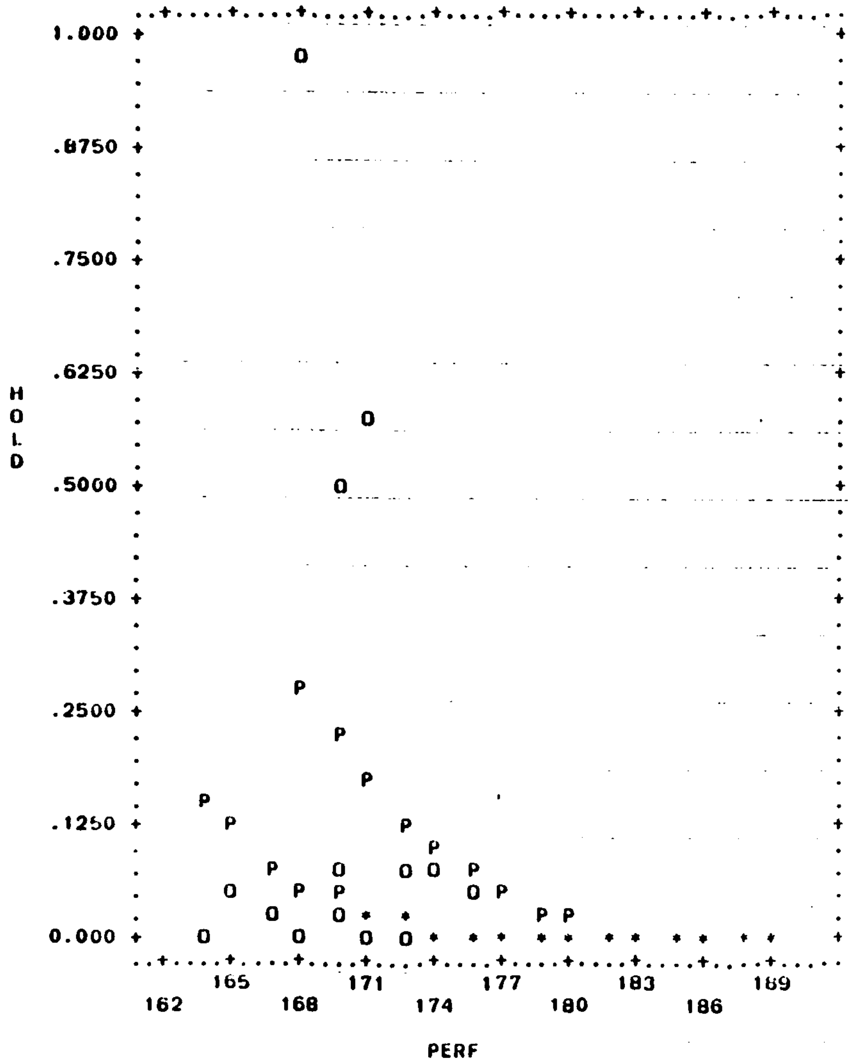
CASE NO. NAME	RESIDUAL	OBSERVED 2 HOLD	PREDICTED 2 HOLD	STD. DEV. PREDICTED	1 PERF	3 CASEWT	4 TIMEWT	5 I1
1	-.016290	.000000	.016290	.006983	172.750000	2466.578064	154.000000	.000000
2	-.000703	.009230	.009933	.004433	174.250000	9457.862549	368.000000	.000000
3	-.005859	.000000	.005859	.002768	175.750000	16226.198364	374.000000	.000000
4	-.003342	.000000	.003342	.001694	177.250000	19519.226807	256.000000	.000000
5	-.001843	.000000	.001843	.001014	178.750000	13477.537231	95.000000	.000000
6	-.000982	.000000	.000982	.000597	180.250000	11572.986572	41.000000	.000000
7	-.000506	.000000	.000506	.000348	181.750000	55932.138184	109.000000	.000000
8	-.000252	.000000	.000252	.000202	183.250000	44135.210449	40.000000	.000000
9	-.000121	.000000	.000121	.000117	184.750000	99971.522461	44.000000	.000000
10	-.000056	.000000	.000056	.000067	186.250000	167047.984375	33.000000	.000000
11	-.000025	.000000	.000025	.000038	187.750000	100396.159180	3.000000	.000000
12	-.024289	.000000	.024289	.008936	171.250000	263.279255	20.000000	1.000000
13	.001785	.017020	.015235	.005566	172.750000	3950.468994	233.000000	1.000000
14	-.009247	.000000	.009247	.003567	174.250000	16592.564453	604.000000	1.000000
15	-.005429	.000000	.005429	.002361	175.750000	7274.398254	153.000000	1.000000
16	-.003082	.000000	.003082	.001585	177.250000	8881.332764	105.000000	1.000000
17	-.001692	.000000	.001692	.001057	178.750000	3976.693970	22.000000	1.000000
18	-.000897	.000000	.000897	.000690	180.250000	41017.955566	143.000000	1.000000
19	-.000460	.000000	.000460	.000437	181.750000	53918.347168	95.000000	1.000000
20	-.000228	.000000	.000228	.000268	183.250000	50946.919434	42.000000	1.000000
21	-.000109	.000000	.000109	.000159	184.750000	477312.996094	204.000000	1.000000
22	-.000050	.000000	.000050	.000091	186.250000	363635.781250	69.000000	1.000000
23	-.000022	.000000	.000022	.000050	187.750000	129624.011016	5.000000	1.000000
24	-.057204	.000000	.057204	.021302	168.250000	61.470247	7.000000	.000000
25	-.009475	.028860	.038335	.014284	169.750000	645.481628	91.000000	.000000
26	.001729	.026610	.024881	.009523	171.250000	1320.301514	124.000000	.000000
27	-.015633	.000000	.015633	.006336	172.750000	2422.311205	145.000000	.000000
28	-.009505	.000000	.009505	.004192	174.250000	2394.954529	86.000000	.000000
29	-.005591	.000000	.005591	.002740	175.750000	5312.769592	114.000000	.000000
30	-.003180	.000000	.003180	.001758	177.250000	8451.845215	103.000000	.000000
31	-.001749	.000000	.001749	.001105	178.750000	19496.871582	132.000000	.000000
32	-.000929	.000000	.000929	.000682	180.250000	46072.232422	167.000000	.000000
33	-.000477	.000000	.000477	.000414	181.750000	77624.403320	144.000000	.000000
34	-.000237	.000000	.000237	.000247	183.250000	161685.539063	149.000000	.000000
35	-.000113	.000000	.000113	.000145	184.750000	872499.976563	392.000000	.000000
36	-.000053	.000000	.000053	.000083	186.250000	334362.207031	66.000000	.000000
37	.692978	.976670	.283692	.056699	168.250000	11.548320	2.000000	.000000
38	.283397	.505960	.222563	.040636	169.750000	38.815129	22.000000	.000000
39	.399528	.569260	.169732	.027246	171.250000	22.079242	6.000000	.000000
40	-.040675	.085040	.125715	.017503	172.750000	482.387894	208.000000	.000000
41	-.013980	.076380	.090360	.011687	174.250000	1201.534821	391.000000	.000000
42	-.019724	.043260	.062984	.009003	175.750000	1055.065277	245.000000	.000000
43	-.042548	.000000	.042548	.007718	177.250000	1589.838104	255.000000	.000000
44	-.024441	.003400	.027841	.006599	178.750000	2171.272095	231.000000	.000000
45	-.017638	.000000	.017638	.005353	180.250000	429.256016	25.000000	.000000
46	-.010814	.000000	.010814	.004069	181.750000	1665.235229	67.000000	.000000
47	-.006414	.000000	.006414	.002959	183.250000	1859.736908	43.000000	.000000
48	-.003680	.000000	.003680	.002049	184.750000	5334.786621	74.000000	.000000
49	-.002041	.000000	.002041	.001371	186.250000	4129.129761	29.000000	.000000
50	-.001094	.000000	001094	.000892	187.750000	2147.527618	2.000000	.000000

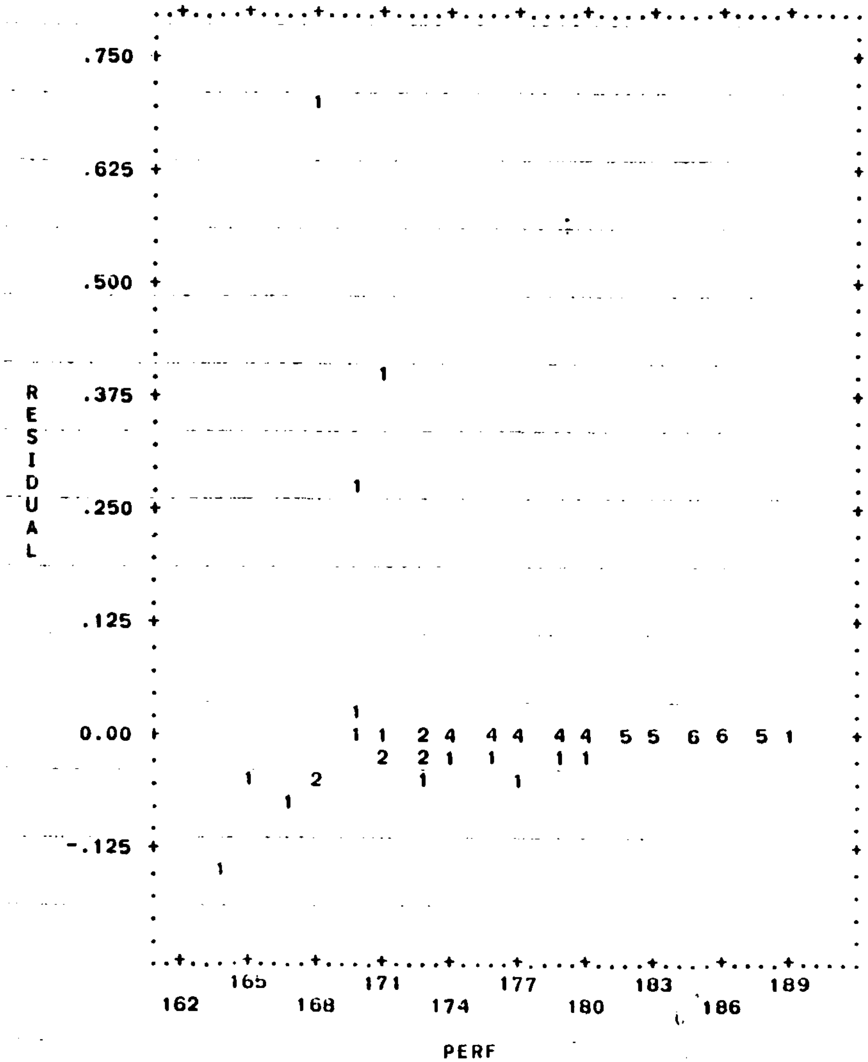
51	-.156645	.000000	.156645	.045467	163.750000	16.426605	1.000000	.000000
52	-.055070	.060000	.115070	.032031	165.250000	28.600635	5.000000	.000000
53	-.065343	.016670	.082013	.021970	166.750000	102.005858	26.000000	.000000
54	-.056675	.000000	.056675	.014935	168.250000	314.569721	63.000000	.000000
55	.033759	.071710	.037951	.010231	169.750000	1226.300980	175.000000	.000000
56	-.024613	.000000	.024613	.007090	171.250000	1230.316132	114.000000	.000000
57	-.011443	.004010	.015453	.004917	172.750000	3205.705292	191.000000	.000000
58	-.009388	.000000	.009388	.003359	174.250000	10995.774902	405.000000	.000000
59	-.005517	.000000	.005517	.002236	175.750000	5110.148926	108.000000	.000000
60	-.003136	.000000	.003136	.001448	177.250000	4505.666443	52.000000	.000000
61	-.001723	.000000	.001723	.000918	178.750000	4748.006226	28.000000	.000000
62	-.000915	.000000	.000915	.000574	180.250000	22761.221680	79.000000	.000000
63	-.000469	.000000	.000469	.000356	181.750000	26315.650879	45.000000	.000000
64	-.000233	.000000	.000233	.000218	183.250000	73351.943359	64.000000	.000000
65	.002549	.002660	.000111	.000132	184.750000	487011.632813	213.000000	.000000
66	-.000052	.000000	.000052	.000078	186.250000	408465.175781	80.000000	.000000
67	-.000023	.000000	.000023	.000044	187.750000	109888.186523	3.000000	.000000
68	-.000778	.000000	.000778	.001163	184.750000	152799.789063	471.000000	.000000
69	.000264	.000660	.000396	.000619	186.250000	771649.734375	1217.000000	.000000
70	-.000195	.000000	.000195	.000320	187.750000	11158.446045	1.000000	.000000
71	-.000092	.000000	.000092	.000160	189.250000	23500.462158	1.000000	.000000

CASE NO. NAME	RESIDUAL	OBSERVED 2 HOLD	PREDICTED 2 HOLD	STD. DEV. PREDICTED	6 12	7 13	8 14	9 15
1	-.016290	.000000	.016290	.006983	.000000	.000000	.000000	.000000
2	-.000703	.009230	.009933	.004433	.000000	.000000	.000000	.000000
3	-.005859	.000000	.005859	.002768	.000000	.000000	.000000	.000000
4	-.003342	.000000	.003342	.001694	.000000	.000000	.000000	.000000
5	-.001843	.000000	.001843	.001014	.000000	.000000	.000000	.000000
6	-.000982	.000000	.000982	.000597	.000000	.000000	.000000	.000000
7	-.000506	.000000	.000506	.000348	.000000	.000000	.000000	.000000
8	-.000252	.000000	.000252	.000202	.000000	.000000	.000000	.000000
9	-.000121	.000000	.000121	.000117	.000000	.000000	.000000	.000000
10	-.000056	.000000	.000056	.000067	.000000	.000000	.000000	.000000
11	-.000025	.000000	.000025	.000038	.000000	.000000	.000000	.000000
12	-.024289	.000000	.024289	.008936	.000000	.000000	.000000	.000000
13	.001785	.017020	.015235	.005566	.000000	.000000	.000000	.000000
14	-.009247	.000000	.009247	.003567	.000000	.000000	.000000	.000000
15	-.005429	.000000	.005429	.002361	.000000	.000000	.000000	.000000
16	-.003082	.000000	.003082	.001585	.000000	.000000	.000000	.000000
17	-.001692	.000000	.001692	.001057	.000000	.000000	.000000	.000000
18	-.000897	.000000	.000897	.000690	.000000	.000000	.000000	.000000
19	-.000460	.000000	.000460	.000437	.000000	.000000	.000000	.000000
20	-.000228	.000000	.000228	.000268	.000000	.000000	.000000	.000000
21	-.000109	.000000	.000109	.000159	.000000	.000000	.000000	.000000
22	-.000050	.000000	.000050	.000091	.000000	.000000	.000000	.000000
23	-.000022	.000000	.000022	.000050	.000000	.000000	.000000	.000000
24	-.057204	.000000	.057204	.021302	1.000000	.000000	.000000	.000000
25	-.009475	.028860	.038335	.014284	1.000000	.000000	.000000	.000000
26	.001729	.026610	.024881	.009523	1.000000	.000000	.000000	.000000
27	-.015633	.000000	.015633	.006336	1.000000	.000000	.000000	.000000
28	-.009505	.000000	.009505	.004192	1.000000	.000000	.000000	.000000
29	-.005591	.000000	.005591	.002740	1.000000	.000000	.000000	.000000
30	-.003180	.000000	.003180	.001758	1.000000	.000000	.000000	.000000
31	-.001749	.000000	.001749	.001105	1.000000	.000000	.000000	.000000
32	-.000929	.000000	.000929	.000682	1.000000	.000000	.000000	.000000

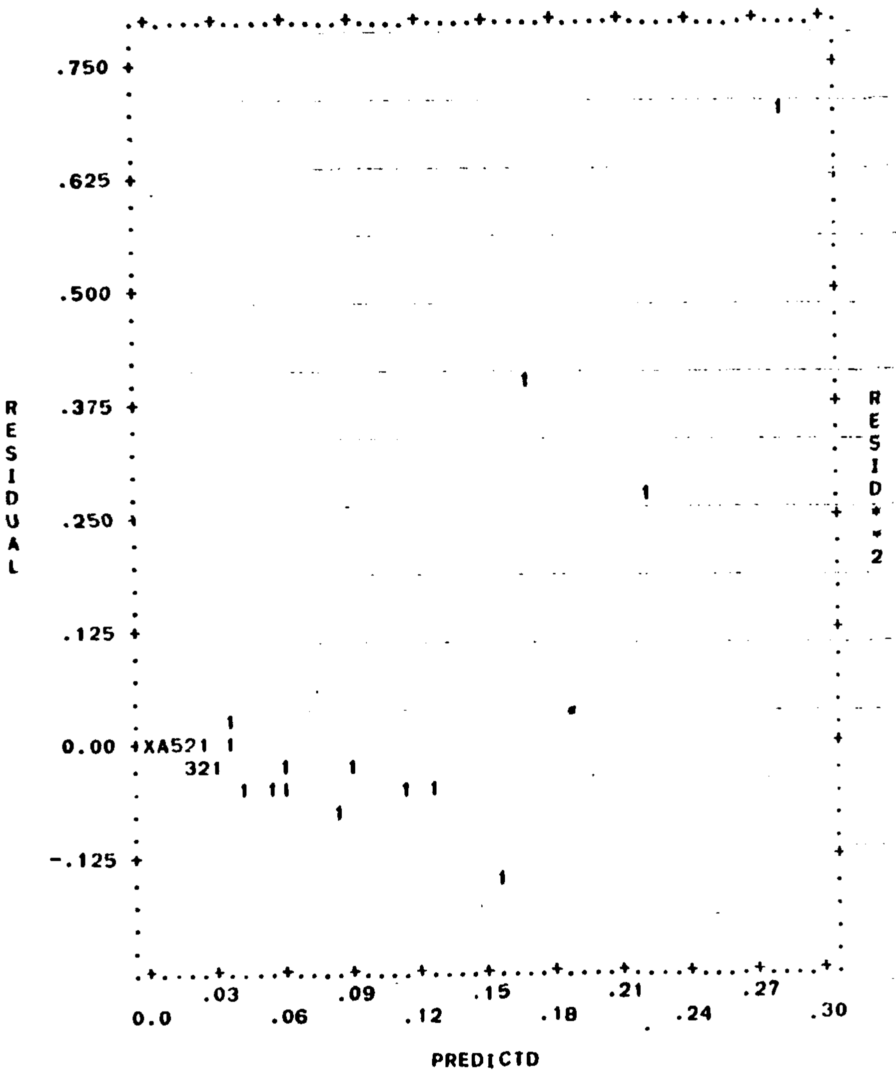
33	-.000477	.000000	.000477	.000414	1.000000	.000000	.000000	.000000
34	-.000237	.000000	.000237	.000247	1.000000	.000000	.000000	.000000
35	-.000113	.000000	.000113	.000145	1.000000	.000000	.000000	.000000
36	-.000053	.000000	.000053	.000083	1.000000	.000000	.000000	.000000
37	.692978	.976670	.283692	.056699	.000000	1.000000	.000000	.000000
38	.283397	.505960	.222563	.040636	.000000	1.000000	.000000	.000000
39	.399528	.569260	.169732	.027246	.000000	1.000000	.000000	.000000
40	-.040675	.085040	.125715	.017503	.000000	1.000000	.000000	.000000
41	-.013980	.076380	.090360	.011687	.000000	1.000000	.000000	.000000
42	-.019724	.043260	.062984	.009003	.000000	1.000000	.000000	.000000
43	-.042548	.000000	.042548	.007718	.000000	1.000000	.000000	.000000
44	-.024441	.003400	.027841	.006599	.000000	1.000000	.000000	.000000
45	-.017639	.000000	.017638	.005353	.000000	1.000000	.000000	.000000
46	-.010814	.000000	.010814	.004089	.000000	1.000000	.000000	.000000
47	-.006414	.000000	.006414	.002959	.000000	1.000000	.000000	.000000
48	-.003680	.000000	.003680	.002049	.000000	1.000000	.000000	.000000
49	-.002041	.000000	.002041	.001371	.000000	1.000000	.000000	.000000
50	-.001094	.000000	.001094	.000892	.000000	1.000000	.000000	.000000
51	-.156645	.000000	.156645	.045467	.000000	.000000	1.000000	.000000
52	-.055070	.060000	.115070	.032031	.000000	.000000	1.000000	.000000
53	-.065343	.016670	.082013	.021970	.000000	.000000	1.000000	.000000
54	-.056675	.000000	.056675	.014935	.000000	.000000	1.000000	.000000
55	.033759	.071710	.037951	.010231	.000000	.000000	1.000000	.000000
56	-.024613	.000000	.024613	.007090	.000000	.000000	1.000000	.000000
57	-.011443	.004010	.015453	.004917	.000000	.000000	1.000000	.000000
58	-.009388	.000000	.009388	.003359	.000000	.000000	1.000000	.000000
59	-.005517	.000000	.005517	.002236	.000000	.000000	1.000000	.000000
60	-.003136	.000000	.003136	.001448	.000000	.000000	1.000000	.000000
61	-.001723	.000000	.001723	.000918	.000000	.000000	1.000000	.000000
62	-.000915	.000000	.000915	.000574	.000000	.000000	1.000000	.000000
63	-.000469	.000000	.000469	.000356	.000000	.000000	1.000000	.000000
64	-.000233	.000000	.000233	.000218	.000000	.000000	1.000000	.000000
65	.002549	.002660	.000111	.000132	.000000	.000000	1.000000	.000000
66	-.000052	.000000	.000052	.000078	.000000	.000000	1.000000	.000000
67	-.000023	.000000	.000023	.000044	.000000	.000000	1.000000	.000000
68	-.000778	.000000	.000778	.001163	.000000	.000000	.000000	1.000000
69	.000264	.000660	.000396	.000619	.000000	.000000	.000000	1.000000
70	-.000195	.000000	.000195	.000320	.000000	.000000	.000000	1.000000
71	-.000092	.000000	.000092	.000160	.000000	.000000	.000000	1.000000

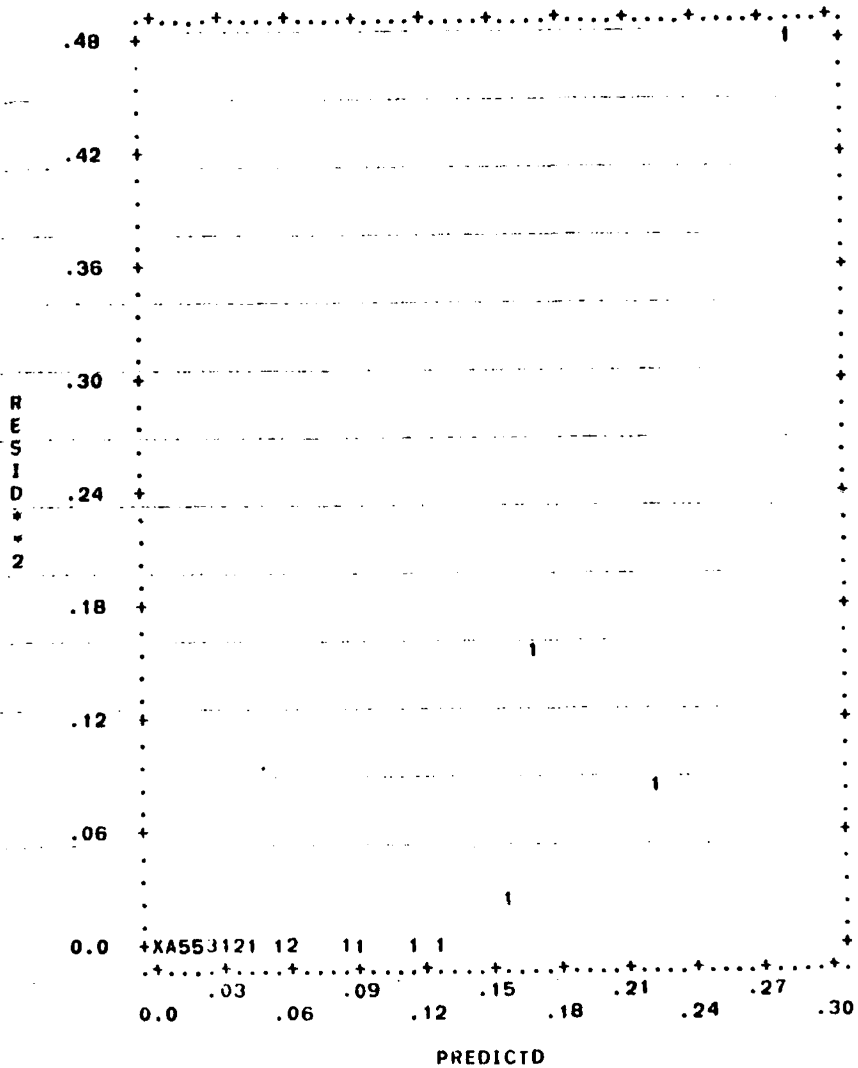
PLOT OF PERF VERSUS PREDICTED AND OBSERVED HOLD AND VERSUS RESIDUALS.



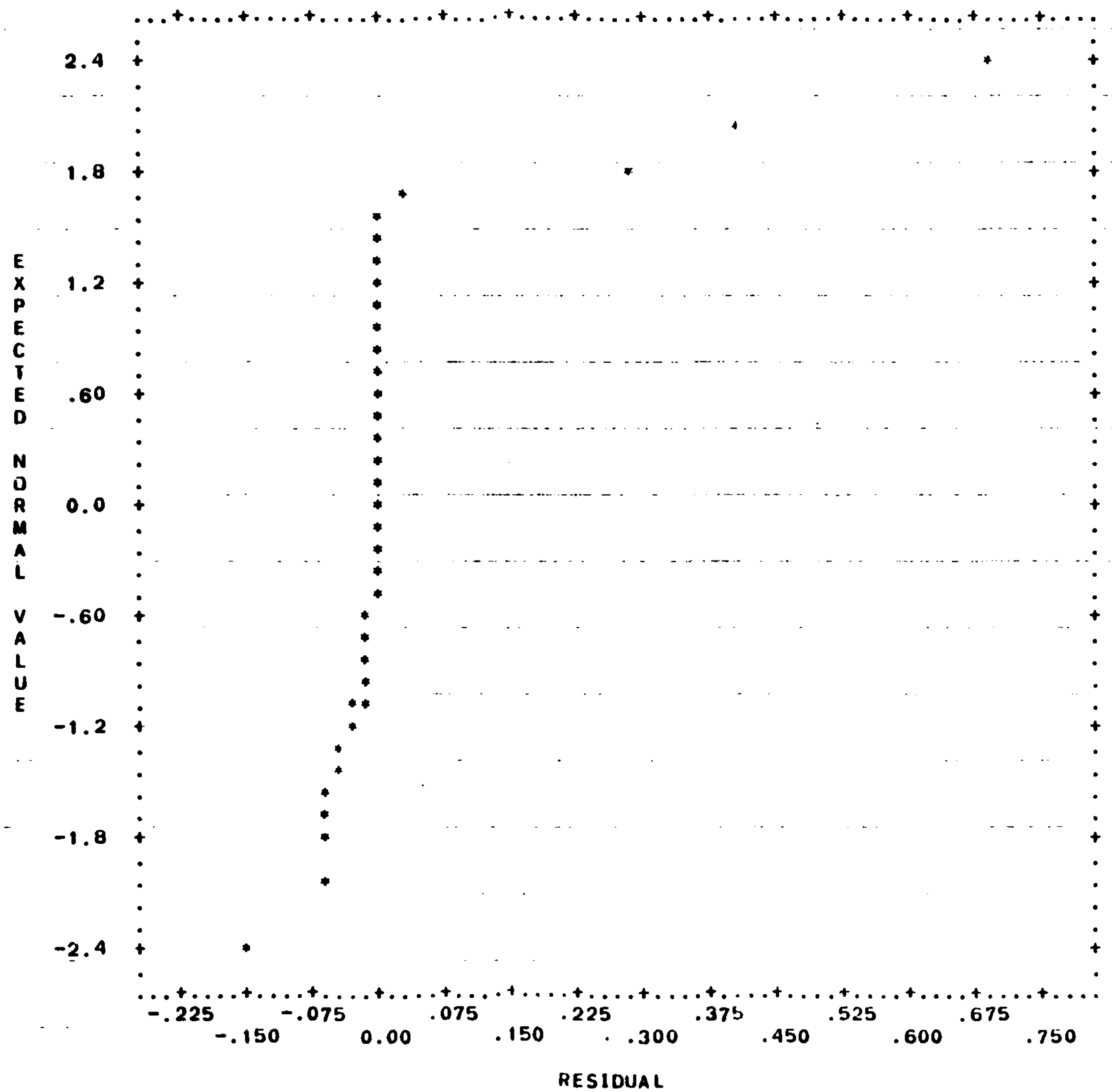


PLOTS OF PREDICTED VARIABLE HOLD VERSUS RESIDUALS AND VERSUS RESIDUALS SQUARED





NORMAL PROBABILITY PLOT OF RESIDUALS



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PROGRAM TERMINATED NORMALLY.
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@PASS•NLR.PAH77

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BMDPAR--DERIVATIVE-FREE NONLINEAR REGRESSION             PROGRAM REVISED OCTOBER 25, 1978        1
HEALTH SCIENCES COMPUTING FACILITY                       MANUAL DATE  --  1977
UNIVERSITY OF CALIFORNIA, LOS ANGELES
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  PROGRAM CONTROL INFORMATION

        S    A  ·SWE B ]UW(E F A*R"
        /PROBLEM
                 TITLE IS ' REGRESSION ON REAL PI DATA'.
        /INPUT
                 VARIABLES ARE 8.
                 FORMAT IS '(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))'.
        /VARIABLE
                 NAMES ARE PERF,HOLD,CASEWT,TIMEWT,I1,I2,I3,I4.
        /REGRESS
                 TITLE IS ' PARAMETERS FROM REAL DATA SET # 2( 5 SOURCES )'.
                 DEPENDENT IS HOLD.
                 NUMBER IS 2.
                 PARAMETERS ARE 6.
                 WEIGHT IS CASEWT.
                 ITERATIONS ARE 50.
                 HALVING IS 20.
        /PARAMETER
                 INITIAL ARE -20.0, 0.125,0.0,0.0,0.0,0.0.
        /PLOT
                 RESIDUAL.
                 VARIABLE IS PERF.
                 NORMAL.
                 SIZE IS 50,40.
        /END

  PROBLEM TITLE . . . . . . . REGRESSION ON REAL PI DATA

  NUMBER OF VARIABLES TO READ IN. . . . . . . . . .        8
  NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. .          0
  TOTAL NUMBER OF VARIABLES . . . . . . . . . . .          8
  NUMBER OF CASES TO READ IN. . . . . . . . . . . . 1000000
  CASE LABELING VARIABLES . . . . . . . . . . . .
  LIMITS AND MISSING VALUE CHECKED BEFORE TRANSFORMATIONS
  BLANKS ARE. . . . . . . . . . . . . . . . . . . .   ZEROS
  INPUT UNIT NUMBER . . . . . . . . . . . . . . .          5
  REWIND INPUT UNIT PRIOR TO READING. . DATA. . .         NO

  INPUT FORMAT
        (F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))

  VARIABLES TO BE USED
              1  PERF          2  HOLD          3  CASEWT        4  TIMEWT        5  I1
              6  I2            7  I3            8  I4

  VARIABLES TO BE PLOTTED
              1  PERF
```

PLOT OF PREDICTED VALUES VERSUS RESIDUALS . . .   YES
NORMAL PROBABILITY PLOT OF RESIDUALS. . . . . .   YES
DETRENDED NORMAL PROBABILITY PLOT OF RESIDUALS.   NO

REGRESSION TITLE
PARAMETERS FROM REAL DATA SET # 2(5 SOURCES)

```
REGRESSION NUMBER . . . . . . . . . . . . . . . . .         2
DEPENDENT VARIABLE. . . . . . . . . . . . . . . . .      HOLD
WEIGHTING VARIABLE. . . . . . . . . . . . . . . . .    CASEWT
NUMBER OF PARAMETERS. . . . . . . . . . . . . . . .         6
NUMBER OF CONSTRAINTS . . . . . . . . . . . . . . .         0
TOLERANCE FOR PIVOTING. . . . . . . . . . . . . . . 1.0-008
TOLERANCE FOR CONVERGENCE . . . . . . . . . . . . . 1.0-005
MAXIMUM NUMBER OF ITERATIONS. . . . . . . . . . . .        50
MAXIMUM NUMBER OF INCREMENT HALVINGS. . . . . . . .        20
```

PARAMETERS TO BE ESTIMATED

	1 P(1)	2 P(2)	3 P(3)	4 P(4)	5 P(5)	6 P(6)
MINIMUM	****************	****************	****************	****************	****************	****************
MAXIMUM	****************	****************	****************	****************	****************	****************
INITIAL	-20.000000	.125000	.000000	.000000	.000000	.000000

USING THE ABOVE SPECIFICATIONS THIS PROGRAM COULD USE UP TO 286 CASES.

@ADD,P HLRDAT.A2

NUMBER OF CASES READ. 80

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
1	PERF	188.033289	2.274476	160.750000	189.250000
2	HOLD	.019983	.050401	.000000	.993330
4	TIMEWT	189.973511	90.081267	2.000000	328.000000
5	I1	.266483	.444909	.000000	1.000000
6	I2	.240860	.430304	.000000	1.000000
7	I3	.162466	.371205	.000000	1.000000
8	I4	.163953	.372569	.000000	1.000000
3	CASEWT	NOT	COMPUTED	9.599320	398959.062500

ITER. NO.	INCR. HALV.	RESIDUAL SUM OF SQUARES	PARAMETERS 1 P(1)	2 P(2)	3 P(3)	4 P(4)	5 P(5)	6 P(6)
0	0	***************	-20.000000	.137500	.000000	.000000	.000000	.000000
0	0	7865.873238	-20.000000	.125000	.000000	.000000	.010000	.000000
0	0	7598.107425	-20.000000	.125000	.010000	.000000	.000000	.000000
0	0	7598.075785	-20.000000	.125000	.000000	.000000	.000000	.000000
0	0	7598.032581	-20.000000	.125000	.000000	.010000	.000000	.000000
0	0	7597.847925	-20.000000	.125000	.000000	.000000	.000000	.010000
0	0	1587.202636	-22.000000	.125000	.000000	.000000	.000000	.000000

1	3	377.716611	-21.824755	.129600	-.020728	.573502	-.683475	.127897
2	3	313.377616	-21.820119	.129628	.173918	.586267	-.447491	.354446
3	3	274.250997	-21.543755	.128943	.217537	.426359	-.513418	.495059
4	3	267.285003	-21.284307	.128292	.120976	.342957	-.604114	.496571
5	4	261.105708	-21.361317	.128464	.115174	.477151	-.611853	.486254
6	6	260.766243	-21.382887	.128527	.109800	.472192	-.614041	.494487
7	0	198.606107	-20.409695	.125715	.240839	.338422	-1.421446	.374773
8	0	183.946307	-20.279506	.125408	.199521	.321624	-1.322246	.382899
9	7	183.945487	-20.282875	.125417	.199460	.321121	-1.320916	.382324
10	5	183.526144	-20.292251	.125437	.218030	.370343	-1.302058	.422358
11	8	183.511007	-20.298709	.125455	.216916	.366371	-1.300580	.419446
12	4	183.164171	-20.376807	.125650	.250123	.427478	-1.255590	.437760
13	3	182.450683	-20.448200	.125740	.349177	1.165108	-1.182187	.871410
14	3	180.417215	-20.435764	.125729	.351618	1.025808	-1.221153	.844593
15	4	180.205745	-20.485724	.125899	.375803	.880442	-1.190755	.844010
16	7	180.203445	-20.479503	.125876	.373684	.906110	-1.194327	.847991
17	3	179.936115	-20.424247	.125713	.344602	.936958	-1.242731	.820342
18	5	179.787346	-20.426886	.125760	.339142	.800146	-1.251920	.836267
19	11	179.787329	-20.427232	.125763	.339065	.794231	-1.252039	.836291
20	12	179.787197	-20.427076	.125761	.339091	.797727	-1.251977	.836434
21	8	179.786704	-20.429496	.125773	.339576	.780369	-1.250954	.836747
22	11	179.786470	-20.429092	.125770	.339588	.784319	-1.251065	.836749
23	11	179.785606	-20.428147	.125769	.338846	.776363	-1.251618	.836359

PARAMETERS FROM REAL DATA SET # 2(5 SOURCES)

THE RESIDUAL SUM OF SQUARES (= 179.786) WAS SMALLEST WITH THE FOLLOWING PARAMETER VALUES

1 P(1)	2 P(2)	3 P(3)	4 P(4)	5 P(5)	6 P(6)
-2.042815+001	1.257693-001	3.388464-001	7.763627-001	-1.251618+000	8.363586-001

ESTIMATE OF ASYMPTOTIC CORRELATION MATRIX

		P(1) 1	P(2) 2	P(3) 3	P(4) 4	P(5) 5	P(6) 6
P(1)	1	1.0000					
P(2)	2	-.8902	1.0000				
P(3)	3	-.8641	.7071	1.0000			
P(4)	4	-.6581	.2523	.6605	1.0000		
P(5)	5	-.9050	.7927	.7652	.5982	1.0000	
P(6)	6	-.7088	.7806	.5200	.3028	.5546	1.0000

THE ESTIMATED MEAN SQUARE ERROR IS 2.430

ESTIMATES OF ASYMPTOTIC STANDARD DEVIATIONS OF PARAMETER ESTIMATES WITH 74 DEGREES OF FREEDOM ARE

1 P(1)	2 P(2)	3 P(3)	4 P(4)	5 P(5)	6 P(6)
5.109263-001	1.148474-003	4.023944-001	3.399756+000	2.983930-001	4.312122-001

PARAMETERS FROM REAL DATA SET # 2(5 SOURCES)

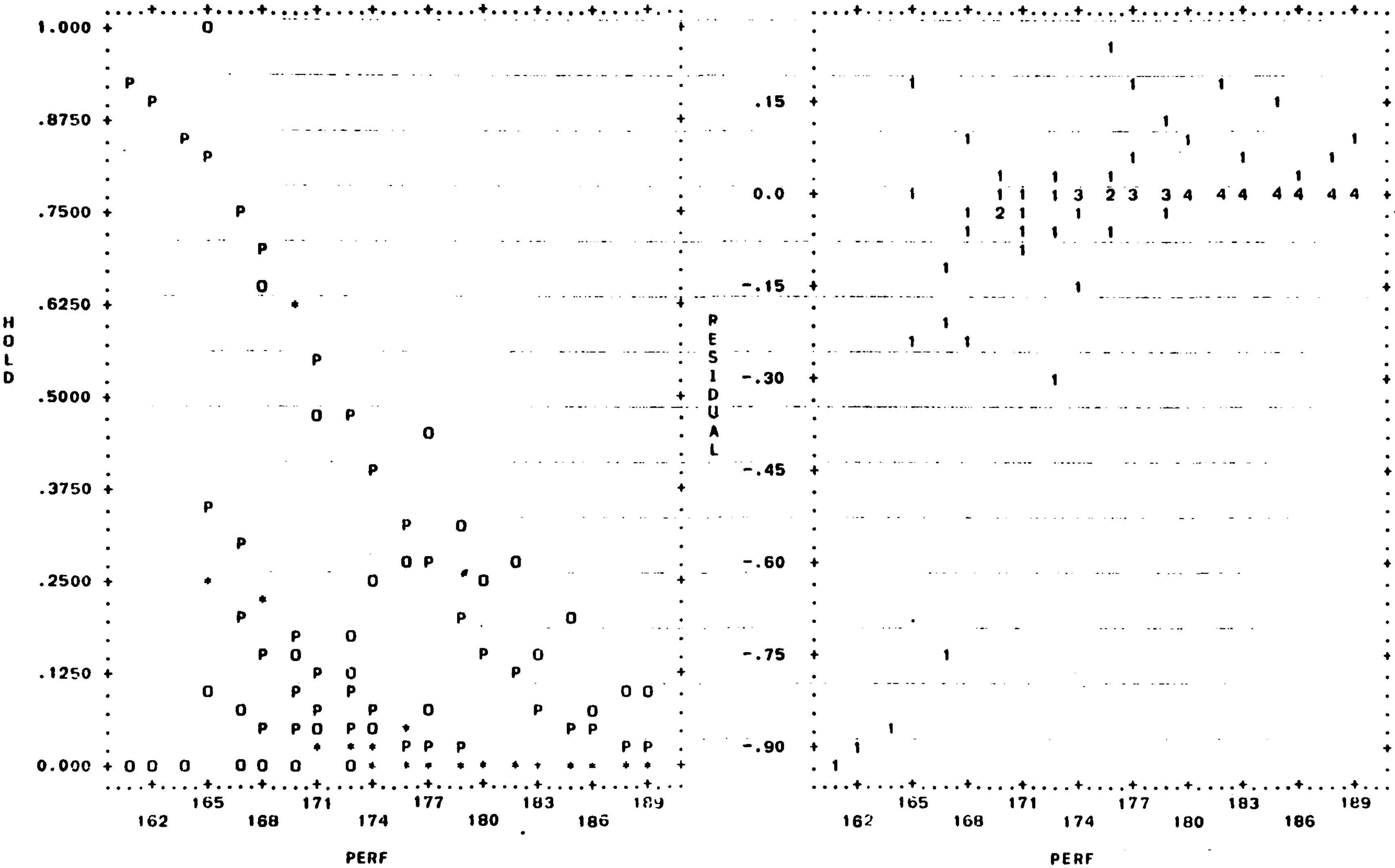
CASE NO. NAME	RESIDUAL	OBSERVED 2 HOLD	PREDICTED 2 HOLD	STD. DEV. PREDICTED	1 PERF	3 CASEWT	4 TIMEWT	5 I1
1	-.251671	.109540	.361211	.110028	165.250000	23.981393	17.000000	.000000
2	-.211042	.082220	.293262	.091574	166.750000	15.012445	6.000000	.000000
3	-.231922	.000000	.231922	.074490	168.250000	14.200582	3.000000	.000000
4	-.033396	.145080	.178476	.059798	169.750000	79.150329	42.000000	.000000
5	-.071794	.061740	.133534	.047814	171.250000	423.685548	192.000000	.000000
6	.037131	.134190	.097059	.038258	172.750000	271.524738	91.000000	.000000
7	-.011818	.056670	.068488	.030552	174.250000	150.995138	34.000000	.000000
8	.240312	.287200	.046888	.024147	175.750000	210.060556	33.000000	.000000
9	.055851	.086980	.031129	.018702	177.250000	442.273151	49.000000	.000000
10	-.020031	.000000	.020031	.014077	178.750000	342.140671	22.000000	.000000
11	-.012488	.000000	.012488	.010240	180.250000	252.301575	6.000000	.000000
12	-.007541	.000000	.007541	.007174	181.750000	1517.676895	41.000000	.000000
13	-.004408	.000000	.004408	.004833	183.250000	1971.529099	30.000000	.000000
14	-.002495	.000000	.002495	.003128	184.750000	3575.605804	31.000000	.000000
15	-.001366	.000000	.001366	.001944	186.250000	25862.039795	137.000000	.000000
16	-.000724	.000000	.000724	.001161	187.750000	61567.805664	174.000000	.000000
17	-.000371	.000000	.000371	.000666	189.250000	69575.790039	99.000000	.000000
18	.000141	.243960	.243819	.061945	165.250000	56.251160	37.000000	1.000000
19	-.107082	.081610	.188692	.053433	166.750000	108.231956	62.000000	1.000000
20	.090551	.232550	.141999	.044482	168.250000	164.611578	76.000000	1.000000
21	.043801	.147630	.103829	.035739	169.750000	542.950401	198.000000	1.000000
22	-.027503	.046210	.073713	.027713	171.250000	480.126144	127.000000	1.000000
23	-.050780	.000000	.050780	.020739	172.750000	333.424789	60.000000	1.000000
24	-.033926	.000000	.033926	.014980	174.250000	535.918846	66.000000	1.000000
25	.023079	.045050	.021971	.010442	175.750000	643.851852	51.000000	1.000000
26	-.013787	.000000	.013787	.007025	177.250000	1915.301590	100.000000	1.000000
27	-.008379	.000000	.008379	.004562	178.750000	1337.191219	40.000000	1.000000
28	-.004931	.000000	.004931	.002859	180.250000	2013.222870	35.000000	1.000000
29	-.002809	.000000	.002809	.001729	181.750000	4496.270874	46.000000	1.000000
30	-.001549	.000000	.001549	.001010	183.250000	7505.533203	42.000000	1.000000
31	-.000826	.000000	.000826	.000569	184.750000	14961.275269	45.000000	1.000000
32	-.000426	.000000	.000426	.000309	186.250000	24925.656494	38.000000	1.000000
33	-.000213	.000000	.000213	.000162	187.750000	150678.980469	124.000000	1.000000
34	-.000103	.000000	.000103	.000082	189.250000	714166.406250	289.000000	1.000000
35	-.011802	.000000	.011802	.027200	171.250000	395.694912	13.000000	.000000
36	-.007100	.000000	.007100	.015898	175.750000	1681.314087	43.000000	.000000
37	-.004135	.000000	.004135	.009249	177.250000	5114.842834	85.000000	.000000
38	-.002331	.000000	.002331	.005407	178.750000	18713.571533	170.000000	.000000
39	-.001272	.000000	.001272	.003178	180.250000	36825.845703	183.000000	.000000
40	.002879	.003550	.000671	.001863	181.750000	74953.039063	197.000000	.000000
41	-.000343	.000000	.000343	.001076	183.250000	242384.900391	328.000000	.000000
42	-.000169	.000000	.000169	.000606	184.750000	23361.791504	10.000000	.000000
43	-.000081	.000000	.000081	.000330	186.250000	104169.010742	29.000000	.000000
44	-.000037	.000000	.000037	.000173	187.750000	88986.839844	7.000000	.000000
45	-.000017	.000000	.000017	.000087	189.250000	4333028.312500	284.000000	.000000
46	-.928178	.000000	.928178	.042864	160.750000	46.674262	6.000000	.000000
47	-.898615	.000000	.898615	.052009	162.250000	25.758423	2.000000	.000000
48	-.861050	.000000	.861050	.060573	163.750000	26.006276	6.000000	.000000
49	.178351	.993330	.814979	.067685	165.250000	19.314271	5.000000	.000000
50	-.760446	.000000	.760446	.072534	166.750000	14.921870	4.000000	.000000

51	-.037949	.660200	.698149	.074536	168.250000	19.783586	11.000000	.000000
52	.000537	.630000	.629463	.073471	169.750000	22.727600	16.000000	.000000
53	-.075892	.480480	.556372	.069565	171.250000	33.082221	28.000000	.000000
54	-.294526	.186780	.481306	.063487	172.750000	100.314138	96.000000	.000000
55	-.149679	.257220	.406899	.056225	174.250000	58.356630	52.000000	.000000
56	-.057516	.278200	.335716	.048876	175.750000	110.059486	94.000000	.000000
57	.186998	.456990	.269992	.042346	177.250000	115.670372	87.000000	.000000
58	.124876	.336300	.211424	.037055	178.750000	274.543350	179.000000	.000000
59	.097939	.258990	.161051	.032847	180.250000	375.760876	199.000000	.000000
60	.165421	.284660	.119239	.029215	181.750000	278.864998	113.000000	.000000
61	.056328	.142070	.085742	.025672	183.250000	239.950323	71.000000	.000000
62	.137189	.197030	.059841	.021930	184.750000	467.314194	101.000000	.000000
63	.040257	.080770	.040513	.018202	186.250000	637.837601	95.000000	.000000
64	.068477	.095070	.026593	.014489	187.750000	1237.507126	124.000000	.000000
65	.094514	.111430	.016916	.011069	189.250000	1656.014236	106.000000	.000000
66	-.058337	.000000	.058337	.039529	168.250000	122.259225	22.000000	.000000
67	-.039412	.000000	.039412	.028958	169.750000	267.434776	36.000000	.000000
68	-.011595	.014220	.025815	.020492	171.250000	2048.600525	202.000000	.000000
69	.010743	.027130	.016387	.014004	172.750000	2870.866760	181.000000	.000000
70	.007504	.017580	.010076	.009241	174.250000	2861.086121	110.000000	.000000
71	-.006000	.000000	.006000	.005887	175.750000	5371.366089	124.000000	.000000
72	-.003458	.000000	.003458	.003621	177.250000	5819.055420	76.000000	.000000
73	-.001929	.000000	.001929	.002149	178.750000	6026.360535	42.000000	.000000
74	-.001042	.000000	.001042	.001231	180.250000	5318.224609	17.000000	.000000
75	-.000544	.000000	.000544	.000681	181.750000	35060.266113	72.000000	.000000
76	-.000275	.000000	.000275	.000363	183.250000	125734.669922	134.000000	.000000
77	-.000134	.000000	.000134	.000187	184.750000	188536.113281	97.000000	.000000
78	-.000063	.000000	.000063	.000093	186.250000	383452.726563	93.000000	.000000
79	-.000029	.000000	.000029	.000045	187.750000	1591008.406250	180.000000	.000000
80	-.000013	.000000	.000013	.000021	189.250000	1727275.218750	84.000000	.000000

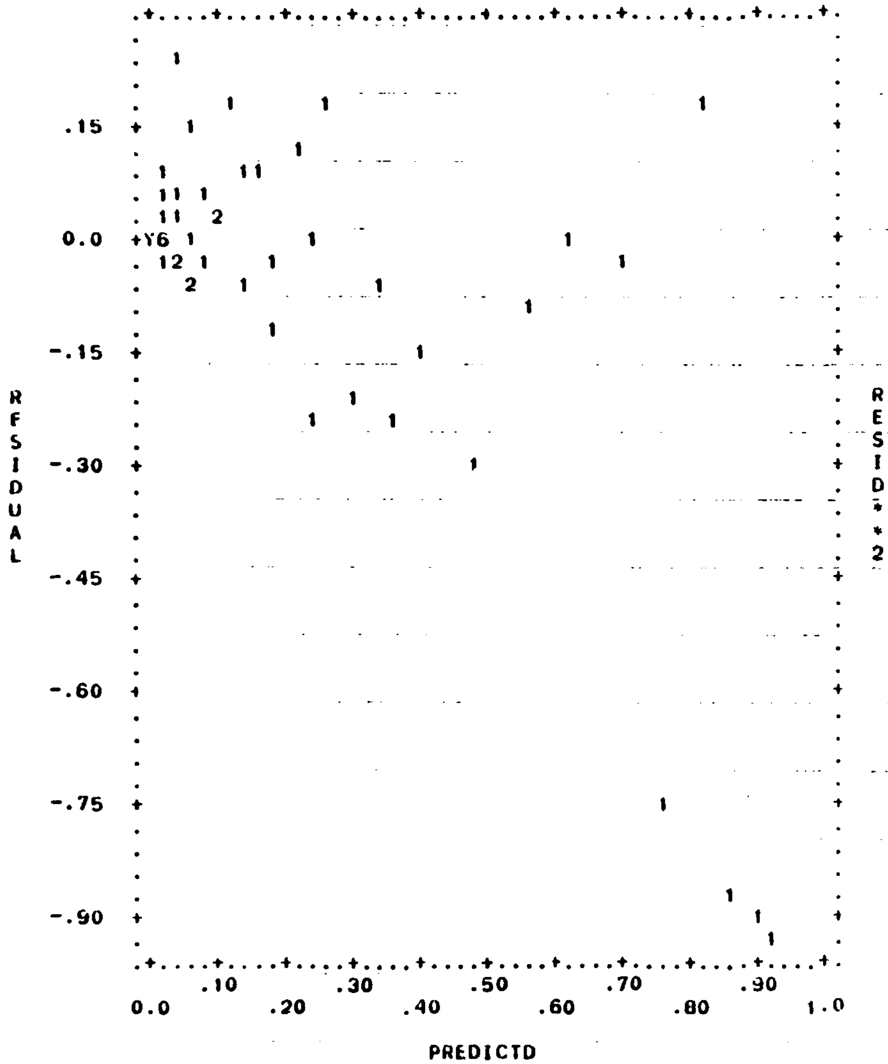
CASE NO. NAME	RESIDUAL	OBSERVED 2 HOLD	PREDICTED 2 HOLD	STD. DEV. PREDICTED	6 I2	7 I3	8 I4
1	-.251671	.109540	.361211	.110028	.000000	.000000	.000000
2	-.211042	.082220	.293262	.091574	.000000	.000000	.000000
3	-.231922	.000000	.231922	.074490	.000000	.000000	.000000
4	-.033396	.145080	.178476	.059798	.000000	.000000	.000000
5	-.071794	.061740	.133534	.047814	.000000	.000000	.000000
6	.037131	.134190	.097059	.038258	.000000	.000000	.000000
7	-.011818	.056670	.068488	.030552	.000000	.000000	.000000
8	.240312	.287200	.046888	.024147	.000000	.000000	.000000
9	.055851	.086980	.031129	.018702	.000000	.000000	.000000
10	-.020031	.000000	.020031	.014077	.000000	.000000	.000000
11	-.012488	.000000	.012488	.010240	.000000	.000000	.000000
12	-.007541	.000000	.007541	.007174	.000000	.000000	.000000
13	-.004408	.000000	.004408	.004833	.000000	.000000	.000000
14	-.002495	.000000	.002495	.003128	.000000	.000000	.000000
15	-.001366	.000000	.001366	.001944	.000000	.000000	.000000
16	-.000724	.000000	.000724	.001161	.000000	.000000	.000000
17	-.000371	.000000	.000371	.000666	.000000	.000000	.000000
18	.000141	.243960	.243819	.061945	.000000	.000000	.000000
19	-.107082	.081610	.188692	.053433	.000000	.000000	.000000
20	.090551	.232550	.141999	.044482	.000000	.000000	.000000
21	.043801	.147630	.103829	.035739	.000000	.000000	.000000
22	-.027503	.046210	.073713	.027713	.000000	.000000	.000000
23	-.050780	.000000	.050780	.020739	.000000	.000000	.000000

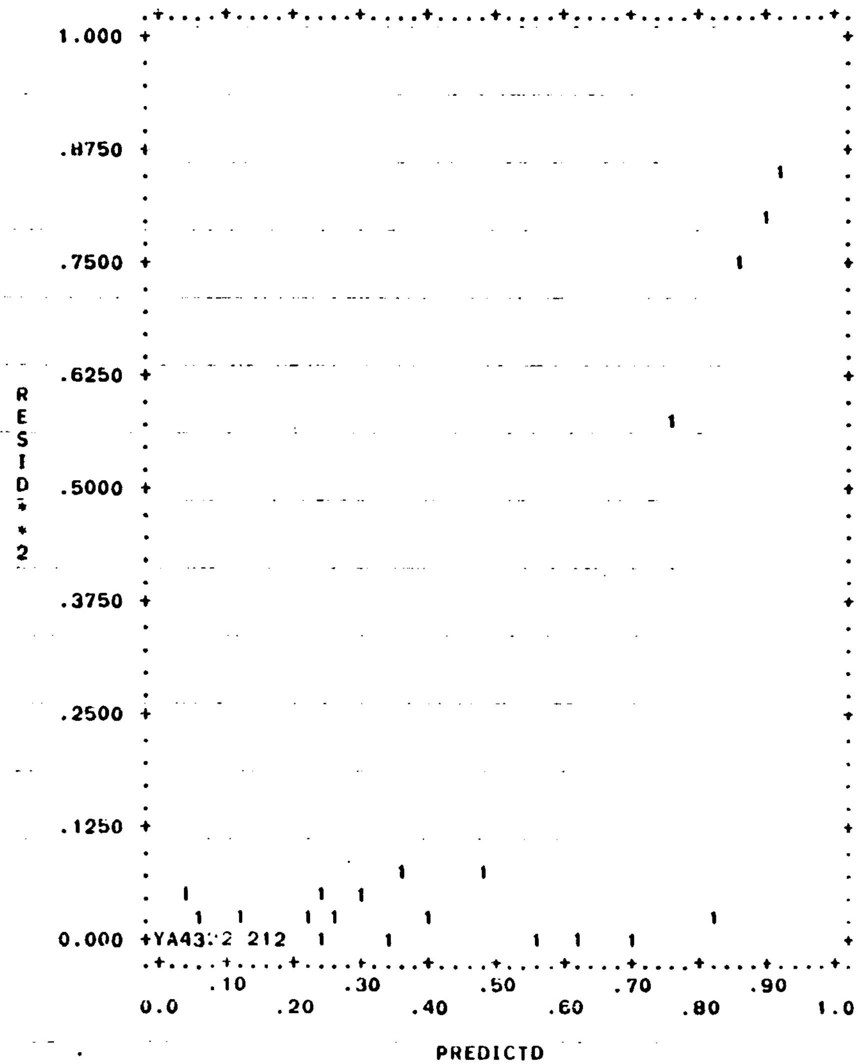
24	-.033926	.000000	.033926	.014080	.000000	.000000	.000000
25	.023079	.045050	.021971	.010442	.000000	.000000	.000000
26	-.013787	.000000	.013787	.007025	.000000	.000000	.000000
27	-.008379	.000000	.008379	.004562	.000000	.000000	.000000
28	-.004931	.000000	.004931	.002859	.000000	.000000	.000000
29	-.002809	.000000	.002809	.001729	.000000	.000000	.000000
30	-.001549	.000000	.001549	.001010	.000000	.000000	.000000
31	-.000826	.000000	.000826	.000569	.000000	.000000	.000000
32	-.000426	.000000	.000426	.000309	.000000	.000000	.000000
33	-.000213	.000000	.000213	.000162	.000000	.000000	.000000
34	-.000103	.000000	.000103	.000082	.000000	.000000	.000000
35	-.011802	.000000	.011802	.027200	1.000000	.000000	.000000
36	-.007100	.000000	.007100	.015898	1.000000	.000000	.000000
37	-.004135	.000000	.004135	.009249	1.000000	.000000	.000000
38	-.002331	.000000	.002331	.005407	1.000000	.000000	.000000
39	-.001272	.000000	.001272	.003178	1.000000	.000000	.000000
40	.002879	.003550	.000671	.001863	1.000000	.000000	.000000
41	-.000343	.000000	.000343	.001076	1.000000	.000000	.000000
42	-.000169	.000000	.000169	.000606	1.000000	.000000	.000000
43	-.000081	.000000	.000081	.000330	1.000000	.000000	.000000
44	-.000037	.000000	.000037	.000173	1.000000	.000000	.000000
45	-.000017	.000000	.000017	.000087	1.000000	.000000	.000000
46	-.928178	.000000	.928178	.042864	.000000	1.000000	.000000
47	-.898615	.000000	.898615	.052069	.000000	1.000000	.000000
48	-.861050	.000000	.861050	.060573	.000000	1.000000	.000000
49	.178351	.993330	.814979	.067685	.000000	1.000000	.000000
50	-.760446	.000000	.760446	.072534	.000000	1.000000	.000000
51	-.037949	.660200	.698149	.074536	.000000	1.000000	.000000
52	.000537	.630000	.629463	.073471	.000000	1.000000	.000000
53	-.075892	.480480	.556372	.069565	.000000	1.000000	.000000
54	-.294526	.186780	.481306	.063487	.000000	1.000000	.000000
55	-.149679	.257220	.406899	.056225	.000000	1.000000	.000000
56	-.057516	.278200	.335716	.048876	.000000	1.000000	.000000
57	.186998	.456990	.269992	.042346	.000000	1.000000	.000000
58	.124876	.336300	.211424	.037055	.000000	1.000000	.000000
59	.097939	.258990	.161051	.032847	.000000	1.000000	.000000
60	.165421	.284660	.119239	.029215	.000000	1.000000	.000000
61	.056328	.142070	.085742	.025672	.000000	1.000000	.000000
62	.137189	.197030	.059841	.021950	.000000	1.000000	.000000
63	.040257	.080770	.040513	.018202	.000000	1.000000	.000000
64	.068477	.095070	.026593	.011489	.000000	1.000000	.000000
65	.094514	.111430	.016916	.011069	.000000	1.000000	.000000
66	-.058337	.000000	.058337	.039529	.000000	.000000	1.000000
67	-.039412	.000000	.039412	.028958	.000000	.000000	1.000000
68	-.011595	.014220	.025815	.020492	.000000	.000000	1.000000
69	.010743	.027130	.016387	.014004	.000000	.000000	1.000000
70	.007504	.017580	.010076	.009241	.000000	.000000	1.000000
71	-.006000	.000000	.006000	.005887	.000000	.000000	1.000000
72	-.003458	.000000	.003458	.003621	.000000	.000000	1.000000
73	-.001929	.000000	.001929	.002149	.000000	.000000	1.000000
74	-.001042	.000000	.001042	.001231	.000000	.000000	1.000000
75	-.000544	.000000	.000544	.000681	.000000	.000000	1.000000
76	-.000275	.000000	.000275	.000363	.000000	.000000	1.000000
77	-.000134	.000000	.000134	.000187	.000000	.000000	1.000000
78	-.000063	.000000	.000063	.000093	.000000	.000000	1.000000
79	-.000029	.000000	.000029	.000045	.000000	.000000	1.000000
80	-.000013	.000000	000013	.000021	.000000	.000000	1.000000

PLOT OF PERF VERSUS PREDICTED AND OBSERVED HOLD AND VERSUS RESIDUALS.

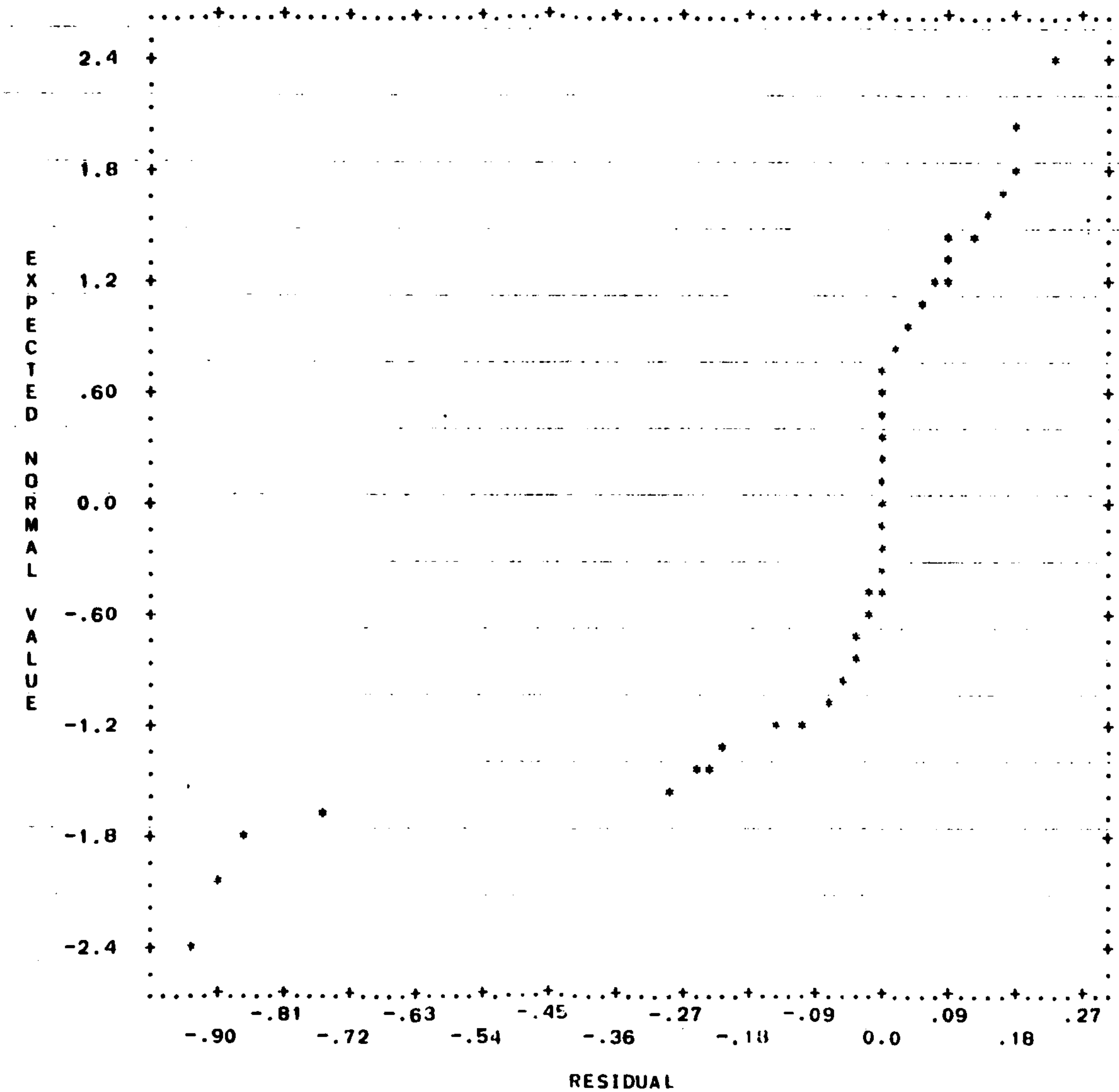


PLOTS OF PREDICTED VARIABLE HOLD VERSUS RESIDUALS AND VERSUS RESIDUALS SQUARED





NORMAL PROBABILITY PLOT OF RESIDUALS



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BMDPAR--DERIVATIVE-FREE NONLINEAR REGRESSION          PROGRAM REVISED OCTOBER 25, 1978          8
HEALTH SCIENCES COMPUTING FACILITY                    MANUAL DATE  --  1977
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 PROGRAM TERMINATED NORMALLY.
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@PASS*NLR.PAR77

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HEALTH SCIENCES COMPUTING FACILITY                            MANUAL DATE  --  1977
UNIVERSITY OF CALIFORNIA, LOS ANGELES
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 PROGRAM CONTROL INFORMATION

        S    A  •SWE B ]UW(E F A+R"
        /PROBLEM
                  TITLE IS ' REGRESSION ON REAL PI DATA'.
        /INPUT
                  VARIABLES ARE 8.
                  FORMAT IS '(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))'.
        /VARIABLE
                  NAMES ARE PERF,HOLD,CASEWT,TIMEWT,I1,I2,I3,I4.
        /REGRESS
                  TITLE IS ' PARAMETERS FROM REAL DATA SET # 3( 5 SOURCES )'.
                  DEPENDENT IS HOLD.
                  NUMBER IS 2.
                  PARAMETERS ARE 6.
                  WEIGHT IS CASEWT.
                  ITERATIONS ARE 50.
                  HALVING IS 20.
        /PARAMETER
                  INITIAL ARE -20.0, 0.125,0.0,0.0,0.0,0.0.
        /PLOT
                  RESIDUAL.
                  VARIABLE IS PERF.
                  NORMAL.
                  SIZE IS 50,40.
        /END

PROBLEM TITLE . . . . . . . REGRESSION ON REAL PI DATA

NUMBER OF VARIABLES TO READ IN. . . . . . . . .          8
NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. .          0
TOTAL NUMBER OF VARIABLES . . . . . . . . . . .          8
NUMBER OF CASES TO READ IN. . . . . . . . . . . .  1000000
CASE LABELING VARIABLES . . . . . . . . . . . .
LIMITS AND MISSING VALUE CHECKED BEFORE TRANSFORMATIONS
BLANKS ARE. . . . . . . . . . . . . . . . . . . .   ZEROS
INPUT UNIT NUMBER . . . . . . . . . . . . . . .          5
REWIND INPUT UNIT PRIOR TO READING. . DATA. . .         NO

INPUT FORMAT
      (F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))

VARIABLES TO BE USED
             1  PERF          2  HOLD          3  CASEWT       4  TIMEWT       5  I1
             6  I2            7  I3            8  I4

VARIABLES TO BE PLOTTED
             1  PERF
```

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PLOT OF PREDICTED VALUES VERSUS RESIDUALS . . .      YES
NORMAL PROBABILITY PLOT OF RESIDUALS. . . . . .      YES
DETRENDED NORMAL PROBABILITY PLOT OF RESIDUALS.       NO
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REGRESSION TITLE
PARAMETERS FROM REAL DATA SET # 3(5 SOURCES)

REGRESSION NUMBER	2
DEPENDENT VARIABLE.	HOLD
WEIGHTING VARIABLE.	CASEWT
NUMBER OF PARAMETERS.	6
NUMBER OF CONSTRAINTS	0
TOLERANCE FOR PIVOTING.	1.0-008
TOLERANCE FOR CONVERGENCE	1.0-005
MAXIMUM NUMBER OF ITERATIONS.	50
MAXIMUM NUMBER OF INCREMENT HALVINGS.	20

PARAMETERS TO BE ESTIMATED

	1 P(1)	2 P(2)	3 P(3)	4 P(4)	5 P(5)	6 P(6)
MINIMUM	****************	****************	****************	****************	****************	****************
MAXIMUM	****************	****************	****************	****************	****************	****************
INITIAL	-20.000000	.125000	.000000	.000000	.000000	.000000

USING THE ABOVE SPECIFICATIONS THIS PROGRAM COULD USE UP TO 286 CASES.

@ADD,P NLRDAT.A3

NUMBER OF CASES READ. 65

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
1	PERF	180.907249	3.718233	160.750000	186.250000
2	HOLD	.012998	.061371	.000000	.726670
4	TIMEWT	155.281631	151.562706	1.000000	594.000000
5	I1	.171645	.380006	.000000	1.000000
6	I2	.287964	.456338	.000000	1.000000
7	I3	.096512	.297590	.000000	1.000000
8	I4	.220145	.417569	.000000	1.000000
3	CASEWT	NOT	COMPUTED	32.906340	15467.879639

ITER. NO.	INCR. HALV.	RESIDUAL SUM OF SQUARES	PARAMETERS 1 P(1)	2 P(2)	3 P(3)	4 P(4)	5 P(5)	6 P(6)
0	0	406593.158461	-20.000000	.137500	.000000	.000000	.000000	.000000
0	0	2586.171810	-22.000000	.125000	.000000	.000000	.000000	.000000
0	0	442.699920	-20.000000	.125000	.000000	.000000	.010000	.000000
0	0	433.609395	-20.000000	.125000	.000000	.010000	.000000	.000000
0	0	433.157671	-20.000000	.125000	.000000	.000000	.000000	.000000
0	0	432.743247	-20.000000	.125000	.000000	.000000	.000000	.010000
0	0	432.704209	-20.000000	.125000	.010000	.000000	.000000	.000000

1	6	432.081492	-19.999403	.124792	.009953	.005192	.032917	.000326
2	0	135.037468	-20.051678	.125541	.536225	.069059	-1.343055	.493049
3	0	103.301079	-20.055323	.125276	.705803	-.066158	-.639582	.619564
4	0	83.988023	-20.034362	.125024	.646138	-.078767	-.814981	.567455
5	2	82.997407	-20.036308	.125116	.644430	-.120614	-.837619	.561929
6	4	82.976597	-20.029280	.125023	.632441	-.119475	-.828340	.553685
7	6	82.976570	-20.027740	.125002	.629934	-.119287	-.826066	.551288
8	2	82.625741	-20.011220	.124678	.615082	-.117035	-.787205	.553199
9	3	82.351155	-20.033727	.124874	.657848	-.106393	-.796724	.580204
10	0	80.049487	-20.123285	.125392	.698593	-.149120	-.846252	.651287
11	4	80.048578	-20.117730	.125355	.692336	-.151319	-.845648	.648195
12	2	79.939502	-20.147974	.125511	.682423	-.170141	-.842923	.647941
13	3	79.886470	-19.914369	.124143	.659272	-.140866	-.844693	.629572
14	0	79.519368	-17.114872	.108138	.977517	.015464	-.931506	.786071
15	0	79.163282	-16.952889	.107216	1.085845	-.024121	-.963938	.808701
16	1	79.144737	-16.819914	.106477	.994839	-.012559	-.961494	.813806
17	0	78.479053	-16.638403	.105246	1.040982	.024428	-.906621	.787560
18	2	76.234974	-16.842031	.106363	.929493	-.036939	-.886499	.826763
19	2	75.784276	-16.810327	.106106	.924074	-.040580	-.871068	.843005
20	2	75.505167	-16.811410	.106013	.912222	-.038696	-.849867	.867652
21	5	75.057653	-16.810927	.106033	.992410	-.080474	-.853059	.867127
22	2	74.920557	-16.794476	.105846	.994523	-.093852	-.830185	.897728
23	3	74.864813	-16.815041	.106015	.993825	-.088229	-.843769	.877516
24	3	73.924086	-16.665851	.105103	1.020858	-.187812	-.849109	.886738
25	3	73.843584	-16.637949	.104976	1.020914	-.166498	-.856636	.870460
26	6	73.842224	-16.637592	.104969	1.020815	-.168301	-.855733	.872054
27	4	73.835968	-16.635562	.104950	1.016618	-.178008	-.852710	.873068
28	4	73.825233	-16.611446	.104795	1.010374	-.184442	-.850315	.879169
29	2	73.671534	-16.670479	.104978	1.012598	-.198873	-.820768	.899741
30	3	73.564717	-16.672753	.105066	1.011011	-.180262	-.835641	.883707
31	3	73.408450	-16.681553	.105180	.994542	-.228066	-.854217	.856299
32	6	73.407396	-16.670565	.105109	.995420	-.229158	-.853095	.856843
33	3	73.354529	-16.691541	.105290	.990393	-.209620	-.863526	.846229
34	8	73.354427	-16.690714	.105284	.991028	-.210202	-.863245	.846423
35	6	73.353682	-16.683858	.105238	.990683	-.212215	-.862453	.847775
36	4	73.335071	-16.678937	.105179	.992150	-.219653	-.857450	.851770
37	5	73.326203	-16.685908	.105234	.990750	-.215205	-.859916	.849160
38	7	73.326153	-16.685299	.105237	.990417	-.216741	-.861218	.847510
39	3	73.325485	-16.679878	.105258	.987998	-.198248	-.870771	.835932
40	2	73.301680	-16.594018	.104658	.995376	-.227752	-.853661	.851391
41	3	73.276260	-16.632374	.104316	.989576	-.209981	-.864293	.840553
42	4	73.266702	-16.606780	.104768	.991390	-.217167	-.860392	.846844
43	4	73.246798	-16.605330	.104724	.995153	-.223823	-.854679	.850045
44	3	73.202716	-16.628726	.104926	.981093	-.209347	-.866564	.837651
45	2	73.103991	-16.624429	.104923	.983415	-.230368	-.875344	.821205
46	3	73.102887	-16.598270	.104813	.984841	-.210216	-.882803	.813907
47	2	73.078654	-16.495568	.104133	.984569	-.243113	-.868713	.819504
48	3	73.049380	-16.541888	.104457	.983971	-.222246	-.877895	.815041
49	4	73.031277	-16.611971	.104862	.990036	-.187982	-.873432	.810487
50	8	73.030472	-16.614071	.104873	.990254	-.184538	-.873360	.810833

THE CONVERGENCE CRITERION HAS NOT BEEN SATISFIED.

PARAMETERS FROM REAL DATA SET # 3(5 SOURCES)

THE RESIDUAL SUM OF SQUARES (= 73.0305) WAS SMALLEST WITH THE FOLLOWING PARAMETER VALUES

1 P(1)	2 P(2)	3 P(3)	4 P(4)	5 P(5)	6 P(6)
-1.661407+001	1.048728-001	9.902541-001	-1.845380-001	-8.733600-001	8.108331-001

ESTIMATE OF ASYMPTOTIC CORRELATION MATRIX

		P(1) 1	P(2) 2	P(3) 3	P(4) 4	P(5) 5	P(6) 6
P(1)	1	1.0000					
P(2)	2	-.9981	1.0000				
P(3)	3	-.1187	.0829	1.0000			
P(4)	4	-.1808	.1736	.2168	1.0000		
P(5)	5	-.1768	.1173	.4190	.0612	1.0000	
P(6)	6	-.1724	.1467	.3055	.1814	.4565	1.0000

THE ESTIMATED MEAN SQUARE ERROR IS 1.238

ESTIMATES OF ASYMPTOTIC STANDARD DEVIATIONS OF PARAMETER ESTIMATES WITH 59 DEGREES OF FREEDOM ARE

1 P(1)	2 P(2)	3 P(3)	4 P(4)	5 P(5)	6 P(6)
2.005340+000	1.153529-002	2.902650-001	5.737299-001	1.701247-001	2.521113-001

PARAMETERS FROM REAL DATA SET # 3(5 SOURCES)

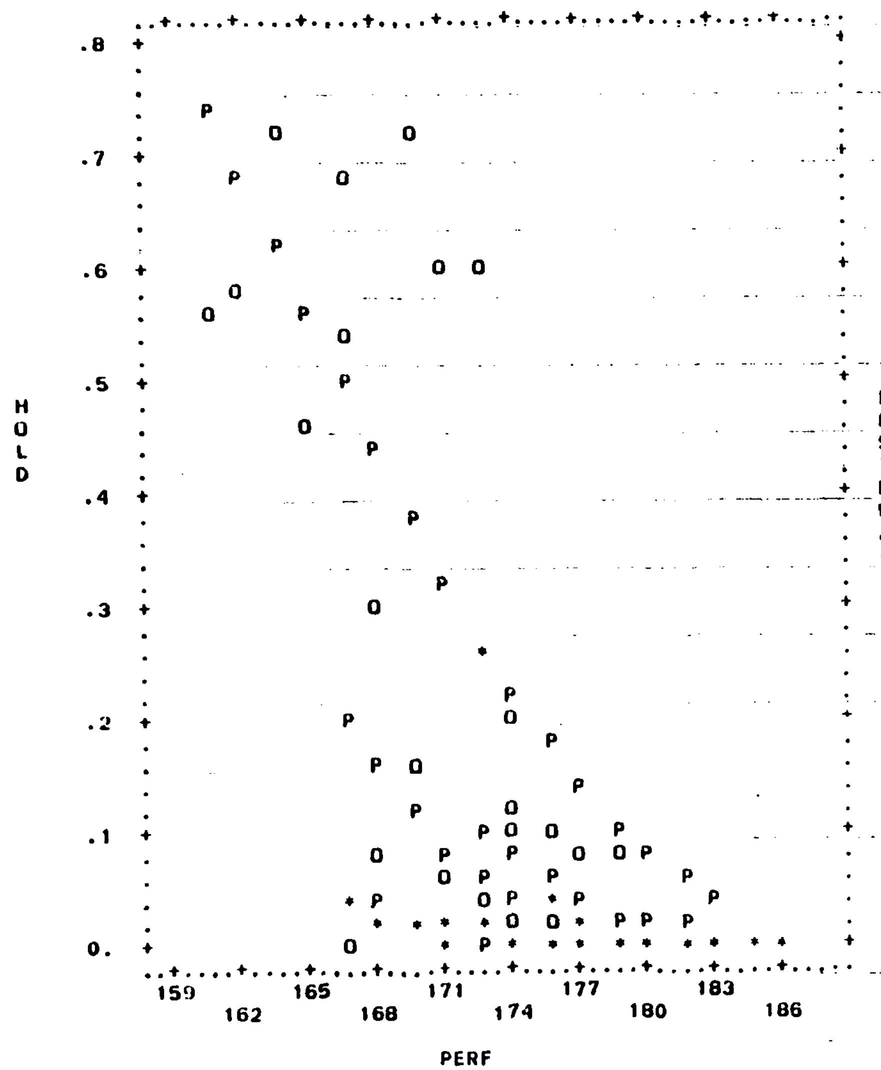
CASE NO.	NAME	RESIDUAL	OBSERVED 2 HOLD	PREDICTED 2 HOLD	STD. DEV. PREDICTED	1 PERF	3 CASEWT	4 TIMEWT	5 I1
1		.484847	.676050	.191203	.040279	166.750000	37.294627	18.000000	.000000
2		-.071962	.079360	.151322	.032819	168.250000	263.047478	131.000000	.000000
3		.042751	.160150	.117399	.026363	169.750000	81.155460	29.000000	.000000
4		-.026388	.062860	.089248	.020964	171.250000	357.233948	112.000000	.000000
5		-.018687	.047770	.066457	.016568	172.750000	480.105522	115.000000	.000000
6		.048885	.097340	.048455	.013050	174.250000	273.170616	46.000000	.000000
7		.001056	.035640	.034584	.010252	175.750000	593.225517	75.000000	.000000
8		-.010295	.013860	.024155	.008022	177.250000	1931.289459	178.000000	.000000
9		-.016506	.000000	.016506	.006231	178.750000	2004.084167	126.000000	.000000
10		-.011032	.000000	.011032	.004785	180.250000	1109.013474	44.000000	.000000
11		-.007211	.000000	.007211	.003618	181.750000	2210.104340	59.000000	.000000
12		-.004609	.000000	.004609	.002685	183.250000	4697.717163	82.000000	.000000
13		-.001759	.000000	.001759	.001385	186.250000	5767.313660	36.000000	.000000
14		.002380	.033560	.031180	.017439	166.750000	441.568779	49.000000	1.000000
15		-.007588	.014050	.021638	.012694	168.250000	1690.119156	139.000000	1.000000
16		.007550	.022240	.014690	.009064	169.750000	2609.981293	147.000000	1.000000
17		-.009755	.000000	.009755	.006355	171.250000	5307.752563	201.000000	1.000000
18		.011416	.017750	.006334	.004378	172.750000	5724.410767	140.000000	1.000000
19		-.004021	.000000	.004021	.002966	174.250000	8746.239258	136.000000	1.000000
20		-.002496	.000000	.002496	.001976	175.750000	6056.132263	56.000000	1.000000
21		-.001514	.000000	.001514	.001296	177.250000	20364.827881	119.000000	1.000000
22		-.000898	.000000	.000898	.000836	178.750000	81423.337891	288.000000	1.000000
23		-.000520	.000000	.000520	.000530	180.250000	45310.479980	90.000000	1.000000
24		-.000294	.000000	.000294	.000331	181.750000	80033.190430	90.000000	1.000000
25		-.000163	.000000	.000163	.000203	183.250000	83501.959961	50.000000	1.000000
26		-.000088	.000000	.000088	.000122	184.750000	33131.026855	5.000000	1.000000
27		.166847	.260570	.093723	.044391	172.750000	174.576843	55.000000	.000000
28		.044798	.114840	.070042	.028805	174.250000	327.038086	81.000000	.000000
29		-.051257	.000000	.051257	.017708	175.750000	920.704826	175.000000	.000000
30		-.018699	.018020	.036719	.011325	177.250000	2226.781281	311.000000	.000000
31		-.025743	.000000	.025743	.009156	178.750000	5961.130554	594.000000	.000000
32		-.017658	.000000	.017658	.008938	180.250000	1113.095200	73.000000	.000000
33		-.011848	.000000	.011848	.008730	181.750000	991.261200	42.000000	.000000
34		-.007774	.000000	.007774	.008024	183.250000	4897.313721	147.000000	.000000
35		-.004988	.000000	.004988	.006322	184.750000	839.983009	11.000000	.000000
36		-.003129	.000000	.003129	.005647	186.250000	695.726524	1.000000	.000000
37		-.178977	.556390	.735367	.045199	160.750000	196.696196	149.000000	.000000
38		-.094311	.587160	.681471	.043083	162.250000	124.569114	104.000000	.000000
39		.095148	.718580	.623432	.041080	163.750000	89.675521	80.000000	.000000
40		-.093566	.468890	.562456	.037073	165.250000	49.167062	44.000000	.000000
41		.031544	.531500	.499956	.032331	166.750000	73.246154	69.000000	.000000
42		-.128637	.308820	.437457	.027486	168.250000	65.307557	60.000000	.000000
43		.350187	.726670	.376483	.023268	169.750000	78.006531	69.000000	.000000
44		.290381	.608830	.318449	.020330	171.250000	176.362375	149.000000	.000000
45		.337919	.602480	.264561	.018909	172.750000	28.439407	17.000000	.000000
46		-.007281	.208460	.215741	.018606	174.250000	235.099882	155.000000	.000000
47		-.069993	.102600	.172593	.018683	175.750000	110.799619	59.000000	.000000
48		-.045858	.089530	.135388	.018537	177.250000	634.417480	293.000000	.000000
49		-.026230	.077860	.104090	.017869	178.750000	378.316833	137.000000	.000000
50		-.078403	.000000	.078403	.016630	180.250000	198.344755	53.000000	.000000

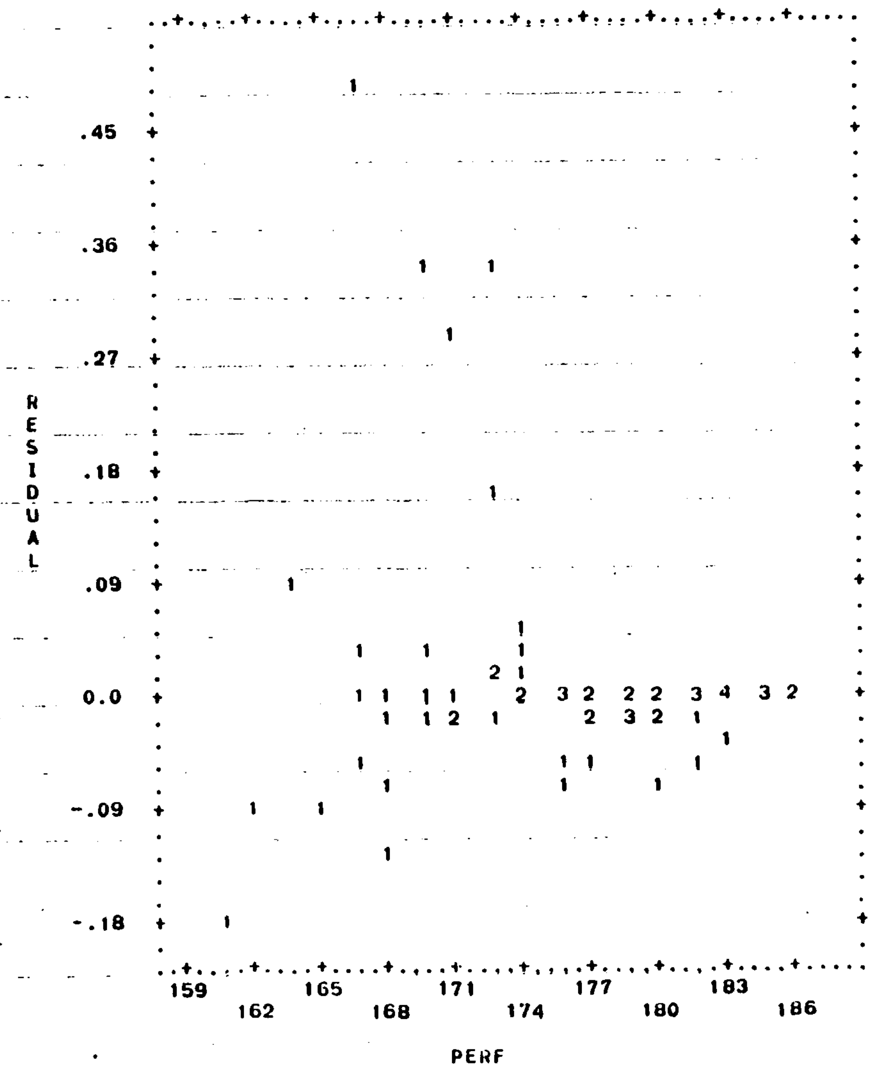
51	-.057836	.000000	.057836	.014923	181.750000	176.783247	34.000000	.000000
52	-.041769	.000000	.041769	.012919	183.250000	93.318983	9.000000	.000000
53	-.046061	.000000	.046061	.021802	166.750000	275.376457	44.000000	.000000
54	-.017276	.015490	.032766	.016290	168.250000	577.792397	69.000000	.000000
55	-.011328	.011480	.022808	.011935	169.750000	2748.856506	241.000000	.000000
56	-.001123	.014410	.015533	.006577	171.250000	2486.855835	148.000000	.000000
57	.016184	.026530	.010346	.006046	172.750000	2860.196411	113.000000	.000000
58	.014480	.021220	.006740	.004182	174.250000	6464.451782	169.000000	.000000
59	.007998	.012290	.004292	.002838	175.750000	4984.094727	81.000000	.000000
60	.000077	.002750	.002673	.001890	177.250000	18579.388184	194.000000	.000000
61	-.001626	.000000	.001626	.001235	178.750000	22804.186523	144.000000	.000000
62	-.000967	.000000	.000967	.000792	180.250000	35990.456055	135.000000	.000000
63	-.000562	.000000	.000562	.000498	181.750000	94361.081055	208.000000	.000000
64	-.000319	.000000	.000319	.000307	183.250000	54254.814941	65.000000	.000000
65	-.000177	.000000	.000177	.000186	184.750000	13251.605347	2.000000	.000000

CASE NO. NAME	RESIDUAL	OBSERVED 2 HOLD	PREDICTED 2 HOLD	STD. DEV. PREDICTED	6 12	7 13	8 14
1	.484847	.676050	.191203	.040279	.000000	.000000	.000000
2	-.071962	.079360	.151322	.032819	.000000	.000000	.000000
3	.042751	.160150	.117399	.026363	.000000	.000000	.000000
4	-.026388	.062860	.089248	.020964	.000000	.000000	.000000
5	-.018687	.047770	.066457	.016568	.000000	.000000	.000000
6	.048885	.097340	.048455	.013050	.000000	.000000	.000000
7	.001056	.035640	.034584	.010252	.000000	.000000	.000000
8	-.010295	.013860	.024155	.008022	.000000	.000000	.000000
9	-.016506	.000000	.016506	.006231	.000000	.000000	.000000
10	-.011032	.000000	.011032	.004785	.000000	.000000	.000000
11	-.007211	.000000	.007211	.003618	.000000	.000000	.000000
12	-.004609	.000000	.004609	.002685	.000000	.000000	.000000
13	-.001759	.000000	.001759	.001395	.000000	.000000	.000000
14	.002380	.033560	.031180	.017439	.000000	.000000	.000000
15	-.007588	.014050	.021638	.012694	.000000	.000000	.000000
16	.007550	.022240	.014690	.009064	.000000	.000000	.000000
17	-.009755	.000000	.009755	.006355	.000000	.000000	.000000
18	.011416	.017750	.006334	.004378	.000000	.000000	.000000
19	-.004021	.000000	.004021	.002966	.000000	.000000	.000000
20	-.002496	.000000	.002496	.001976	.000000	.000000	.000000
21	-.001514	.000000	.001514	.001296	.000000	.000000	.000000
22	-.000898	.000000	.000898	.000836	.000000	.000000	.000000
23	-.000520	.000000	.000520	.000530	.000000	.000000	.000000
24	-.000294	.000000	.000294	.000331	.000000	.000000	.000000
25	-.000163	.000000	.000163	.000203	.000000	.000000	.000000
26	-.000088	.000000	.000088	.000122	.000000	.000000	.000000
27	.166847	.260570	.093723	.044391	1.000000	.000000	.000000
28	.044798	.114840	.070042	.028805	1.000000	.000000	.000000
29	-.051257	.000000	.051257	.017708	1.000000	.000000	.000000
30	-.018699	.018020	.036719	.011325	1.000000	.000000	.000000
31	-.025743	.000000	.025743	.009156	1.000000	.000000	.000000
32	-.017658	.000000	.017658	.008938	1.000000	.000000	.000000
33	-.011848	.000000	.011848	.008730	1.000000	.000000	.000000
34	-.007774	.000000	.007774	.008024	1.000000	.000000	.000000
35	-.004988	.000000	.004988	.006922	1.000000	.000000	.000000
36	-.003129	.000000	.003129	.005647	1.000000	.000000	.000000
37	-.178977	.556390	.735367	.045199	.000000	1.000000	.000000
38	-.094311	.587160	681471	.043683	.000000	1.000000	.000000

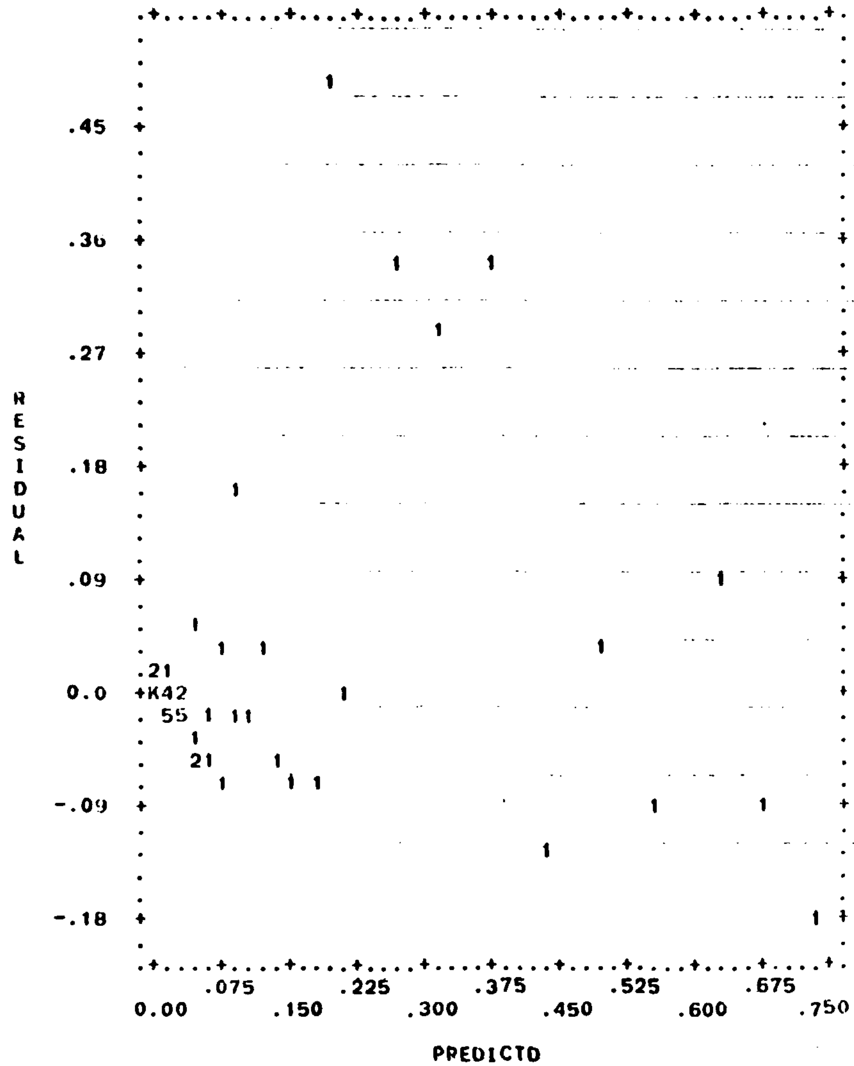
39	.095148	.718580	.623432	.041080	.000000	1.000000	.000000
40	-.093566	.468890	.562456	.037073	.000000	1.000000	.000000
41	.031544	.531500	.499956	.032331	.000000	1.000000	.000000
42	-.128637	.308920	.437457	.027486	.000000	1.000000	.000000
43	.350187	.726670	.376483	.023268	.000000	1.000000	.000000
44	.290381	.608830	.318449	.020330	.000000	1.000000	.000000
45	.337919	.602480	.264561	.018909	.000000	1.000000	.000000
46	-.007281	.208460	.215741	.018606	.000000	1.000000	.000000
47	-.069993	.102609	.172593	.018683	.000000	1.000000	.000000
48	-.045858	.089530	.135388	.018537	.000000	1.000000	.000000
49	-.026230	.077860	.104090	.017869	.000000	1.000000	.000000
50	-.078403	.000000	.078403	.016630	.000000	1.000000	.000000
51	-.057836	.000000	.057836	.014923	.000000	1.000000	.000000
52	-.041769	.000000	.041769	.012919	.000000	1.000000	.000000
53	-.046061	.000000	.046061	.021802	.000000	.000000	1.000000
54	-.017276	.015490	.032766	.016290	.000000	.000000	1.000000
55	-.011328	.011480	.022808	.011935	.000000	.000000	1.000000
56	-.001123	.014410	.015533	.008577	.000000	.000000	1.000000
57	.016184	.026530	.010346	.006046	.000000	.000000	1.000000
58	.014480	.021220	.006740	.004182	.000000	.000000	1.000000
59	.007998	.012290	.004292	.002838	.000000	.000000	1.000000
60	.000077	.002750	.002673	.001890	.000000	.000000	1.000000
61	-.001626	.000000	.001626	.001235	.000000	.000000	1.000000
62	-.000967	.000000	.000967	.000792	.000000	.000000	1.000000
63	-.000562	.000000	.000562	.000498	.000000	.000000	1.000000
64	-.000319	.000000	.000319	.000307	.000000	.000000	1.000000
65	-.000177	.000000	.000177	.000186	.000000	.000000	1.000000

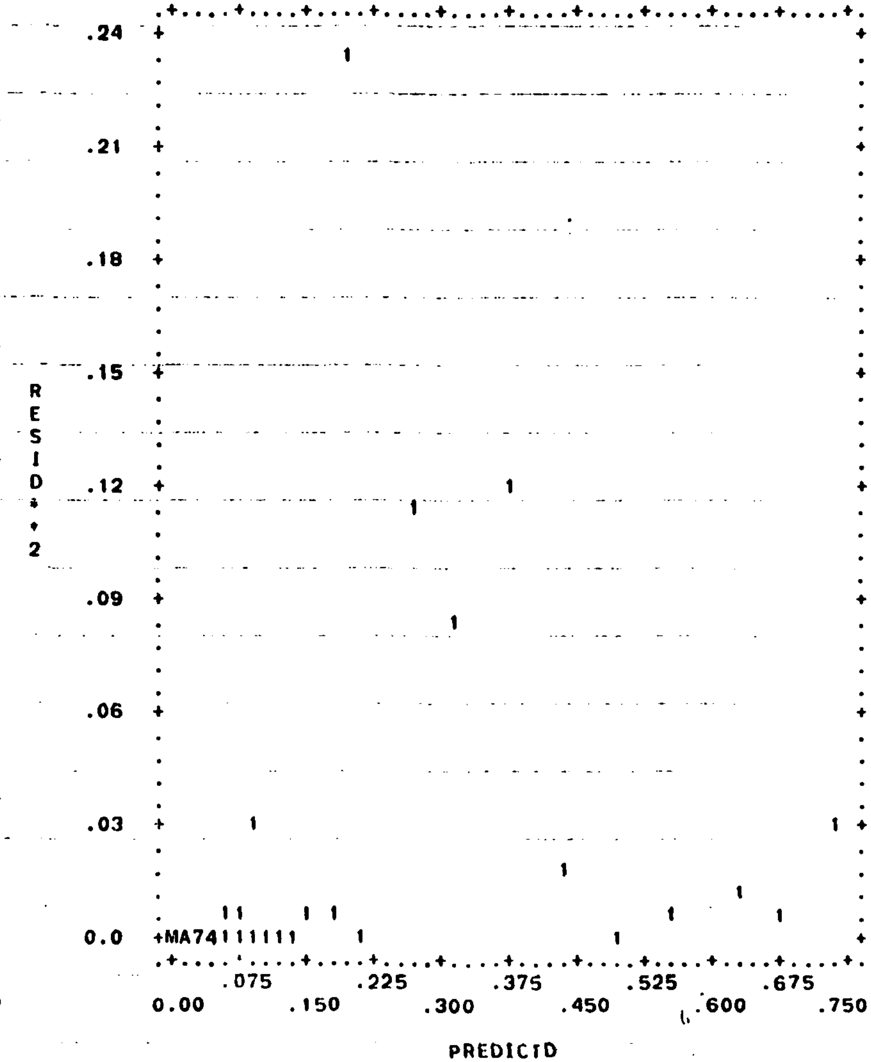
PLOT OF PERF VERSUS PREDICTED AND OBSERVED HOLD AND VERSUS RESIDUALS.



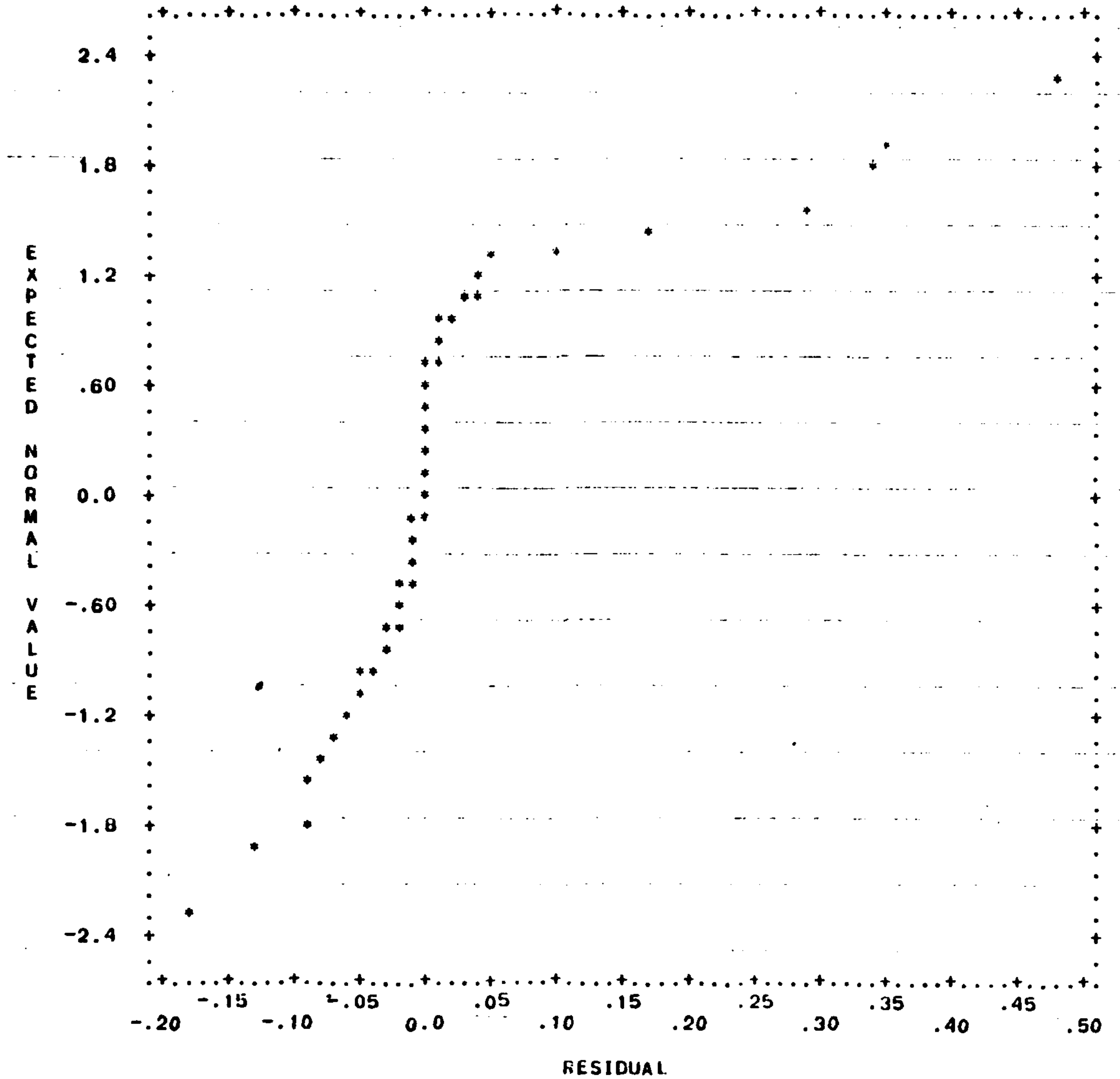


PLOTS OF PREDICTED VARIABLE HOLD VERSUS RESIDUALS AND VERSUS RESIDUALS SQUARED





NORMAL PROBABILITY PLOT OF RESIDUALS



```
BMDPAR--DERIVATIVE-FREE NONLINEAR REGRESSION          PROGRAM REVISED OCTOBER 25, 1978          8
HEALTH SCIENCES COMPUTING FACILITY                    MANUAL DATE  --  1977
UNIVERSITY OF CALIFORNIA, LOS ANGELES
COPYRIGHT (C) 1977, REGENTS OF UNIVERSITY OF CALIFORNIA

  PROGRAM TERMINATED NORMALLY.

@BRKPT PRINT$
```

APPENDIX B

BMDP 1981 VERSION
NONLINEAR REGRESSION OUTPUTS

```
@PRT NLR.RUN/3R81BHILDA
PASS*NLR(1).RUN/3R81BHILDA(1)
        @OLD*FTN.FTN,SI P3RFUN
              SUBROUTINE P3RFUN(F,DF,P,X,N,KASE,NVAR,NPAR,IP,XLOSS,ID)
              IMPLICIT DOUBLE PRECISION (A-H,O-Z)
              COMMON/MEMORY/LENGTH,LEXICN,IB(2)
              DIMENSION DF(NPAR),P(NPAR),X(NVAR)
              DF(1) = DEXP(P(2)*X(3))
              DF(2) = P(1)*X(3)*DF(1)
              DF(3) = DEXP(P(4)*X(3))
              DF(4) = P(3)*X(3)*DF(3)
              F = P(1)*DF(1) + P(3)*DF(3)
              RETURN
              END
        @MAP,IE
        . BMDP81 UNIVAC SEGMENTED MAP OF BMDP3R
        . BASED ON IBM OVERLAY STRUCTURE WITH DYNAMIC MEMORY
        . ALLOCATION ADDED
        .
        LIB BMDP-SOURCE*BMDP3R.
        LIB BMDP-SOURCE*BMDPLIB81.
        NOT  TPF$.
        .
        SEG $MAIN$
           IN  MAIN/PROGRAM
           IN  S$TART
           ENT S$TART
           IN  F2FRT
        SEG 1A*
        IN       IBSIZE,SETUPS,GETCOR,PRTHED,P3RNWS,TIMEV,ENDSUB
        IN       P3RSET
        SEG 1B*,1A
        IN       GETHNG,GETINP,GETME,GETSTR,GETNAM,RDTRAN
        SEG 2A*
        IN           PLINFO
        SEG 3A*
        IN               PLINF5
        SEG 3B*,3A
        IN               PLINF1,SFOPEN,SFTOFC,SFTINQ
        SEG 3C*,3B
        IN               SFIRPT
        SEG 3D*,3C
        IN               PLINF2
        SEG 3E*,3D
        IN               PLINF3
        SEG 3F*,3E
        IN               PLINF4
        SEG 3G*,3F
        IN               FORCMP,NEXTFM
        SEG 3H*,3G
        IN               FORSIM
        SEG 3I*,3H
        IN               FORANA
        SEG 3J*,3I
        IN               VARPRT,BLDFMT
        SEG 2B*,2A
        IN           UNCOLA
```

```
SEG 3K*
IN                INITER
SEG 3L*,3K
IN                FUNC3R
SEG 1C*,1B
IN       CREDEV,REDEV
SEG 2C*
IN            XREADS,TRANS,TRANSF,MISVAL
SEG 3M*
IN                FORMRC,INTCHS
SEG 3N*,3M
IN                FREERC
SEG 2D*,2C
IN            PRTNOC
SEG 1D*,1C
IN       TPF$.P3RFUN,TRANT
SEG 2E*
IN            LSTSQ,RITEIT,P3RPSI,DORDER,P3RSTP
SEG 2F*,2E
IN            RITEND,PRTRID,SFTDOT,SFTOUT,SFTEND,SFDOUT
IN            SFREPO
IN            SERCOR,SFFOUT
SEG 1E*,1D
IN       CLEARB,RECORD
SEG 1F*,1E
IN       PLOTR,PLTSIN,PLTMFL,PLTSFL,PLTPRT,SCALE,PLTNPR
SEG 1G-,()
IN       RDTERR
SEG 2G*
IN            RDTER1
SEG 2H*,2G
IN            RDTER2
SEG 2I*,2H
IN            RDTER3
SEG 1H*,1G
IN       GETERR
SEG 1I*,1H
IN       DUMPA
SEG 1J*,1I
IN       SHADOW
SEG 1K*,1J
IN       RETYPE
SEG 1L*,1K
IN       GETARG
SEG 1M*,1L
IN       RANDOM,RANDG
.
. ADD THE FOLLOWING AS *LAST* SEGMENT IF PROGRAM IS TO
. BE SEGMENTED
SEG MEM,()
   IN MEMORY
. *NOTHING* SHOULD FOLLOW THE DIRECTIVE IN MEMORY  !!!!!!
END  . MAP OF BMDP3R
@NAMES
/PROBLEM
          TITLE IS 'RADIOACTIVE SULFATE DATA'.
/INPUT
```

```
               VARIABLES ARE 3.
               FORMAT IS '(F8.4,F8.6,F8.0)'.
/VARIABLE
               NAMES ARE COUNT,CASEWT,TIME.
/REGRESS
               DEPENDENT IS COUNT.
               INDEPENDENT IS TIME.
               NUMBER IS 1.
               PARAMETERS ARE 4.
               WEIGHT IS CASEWT.
/PARAMETER
               INITIAL ARE 10, -.1, 5, -.01.
/END
 15.1117 .004379       2
 11.3601 .007749       4
  9.7652 .010487       6
  9.0935 .012093       8
  8.4820 .013900      10
  7.6891 .016914      15
  7.3342 .018591      20
  7.0593 .020067      25
  6.7041 .022249      30
  6.4313 .024177      40
  6.1554 .026393      50
  5.9940 .027833      60
  5.7698 .030039      70
  5.6440 .031392      80
  5.3915 .034402      90
  5.0938 .038540     110
  4.8717 .042135     130
  4.5996 .047267     150
  4.4668 .049453     160
  4.3602 .052600     170
  4.2668 .054928     180
$EOF
```

```
@OLD*FTN.FTN,SI P3RFUN
FTN 8R1X *09/16/82-07:57(,0)
      SUBROUTINE P3RFUN(F,DF,P,X,N,KASE,NVAR,NPAR,IP,XLOSS,ID)
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
      COMMON/MEMORY/LENGTH,LEXICN,IB(2)
      DIMENSION DF(NPAR),P(NPAR),X(NVAR)
      DF(1) = DEXP(P(2)*X(3))
      DF(2) = P(1)*X(3)*DF(1)
      DF(3) = DEXP(P(4)*X(3))
      DF(4) = P(3)*X(3)*DF(3)
      F = P(1)*DF(1) + P(3)*DF(3)
      RETURN
      END

END FTN 69 IBANK 25 DBANK 4 COMMON
```

```
@MAP,IE
MAP 30R1 S74T11 09/16/82 07:57:21
MAIN          ELEMENT START ADDRESS NOT USED - ALTERNATIVE FOUND
START=007061, PROG SIZE(I/D)=10776/8744
SYS$*RLIB$. LEVEL 74R1A
END MAP.  ERRORS: 0  TIME: 39.659  STORAGE: 25649/9/044777/0111777
```

```
PAGE    1

BMDP3R - NONLINEAR REGRESSION
DEPARTMENT OF BIOMATHEMATICS
UNIVERSITY OF CALIFORNIA, LOS ANGELES, CA 90024
(213) 825-5940          TWX  UCLA LSA
PROGRAM REVISED JUNE 1981
MANUAL REVISED -- 1981
COPYRIGHT (C) 1981 REGENTS OF UNIVERSITY OF CALIFORNIA
09/16/82                AT 07:57:57

TO SEE REMARKS AND A SUMMARY OF NEW FEATURES FOR
THIS PROGRAM, STATE NEWS. IN THE PRINT PARAGRAPH.

PROGRAM CONTROL INFORMATION

/PROBLEM
          TITLE IS 'RADIOACTIVE SULFATE DATA'.
/INPUT
          VARIABLES ARE 3.
          FORMAT IS '(F8.4,F8.6,F8.0)'.
/VARIABLE
          NAMES ARE COUNT,CASEWT,TIME.
/REGRESS
          DEPENDENT IS COUNT.
          INDEPENDENT IS TIME.
          NUMBER IS 1.
          PARAMETERS ARE 4.
          WEIGHT IS CASEWT.
/PARAMETER
          INITIAL ARE 10, -.1, 5, -.01.
/END

PROBLEM TITLE IS
RADIOACTIVE SULFATE DATA

NUMBER OF VARIABLES TO READ IN. . . . . . . . . .        3
NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. .        0
TOTAL NUMBER OF VARIABLES . . . . . . . . . . . .        3
NUMBER OF CASES TO READ IN. . . . . . . . . . . . TO END
CASE LABELING VARIABLES . . . . . . . . . . . . .
MISSING VALUES CHECKED BEFORE OR AFTER TRANS. . NEITHER
BLANKS ARE. . . . . . . . . . . . . . . . . . . . MISSING
INPUT UNIT NUMBER . . . . . . . . . . . . . . . .        5
REWIND INPUT UNIT PRIOR TO READING. . DATA. . .       NO
NUMBER OF WORDS OF DYNAMIC STORAGE. . . . . . .    14998
NUMBER OF CASES DESCRIBED BY INPUT FORMAT . . .        1

VARIABLES TO BE USED
     1 COUNT        2 CASEWT       3 TIME

INPUT FORMAT IS
(F8.4,F8.6,F8.0)

MAXIMUM LENGTH DATA RECORD IS    24 CHARACTERS.

I N P U T   V A R I A B L E S . . . . .
```

VARIABLE INDEX	VARIABLE NAME	RECORD NO.	COLUMNS BEGIN	COLUMNS END	FIELD WIDTH	TYPE
1	COUNT	1	1	8	8.4	F
2	CASEWT	1	9	16	8.6	F

VARIABLE INDEX	VARIABLE NAME	RECORD NO.	COLUMNS BEGIN	COLUMNS END	FIELD WIDTH	TYPE
3	TIME	1	17	24	8	F

REGRESSION TITLE
RADIOACTIVE SULFATE DATA

REGRESSION NUMBER	1
INDEPENDENT VARIABLE(FOR BUILT-IN FUNCTION) . .	TIME
DEPENDENT VARIABLE.	COUNT
WEIGHTING VARIABLE.	CASEWT
NUMBER OF PARAMETERS.	4
NUMBER OF CONSTRAINTS	0
TOLERANCE FOR PIVOTING.	.00000001000
TOLERANCE FOR CONVERGENCE	.00001000000
MAXIMUM NUMBER OF ITERATIONS.	50
MAXIMUM NUMBER OF INCREMENT HALVINGS.	5
NUMBER OF DATA PASSES PER CASE.	1
COMPUTE LOSS FUNCTION	NO

USING THE ABOVE SPECIFICATIONS THIS PROGRAM COULD PROCESS 1463 CASES.

BASED ON INPUT FORMAT SUPPLIED 1 RECORDS READ PER CASE.

NUMBER OF CASES READ. 21

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
1	COUNT	5.750701	1.711865	4.266800	15.111700
2	CASEWT	.035707	.014208	.004379	.054928
3	TIME	97.933350	60.915967	2.000000	180.000000

PARAMETER MAXIMA.	.2126765+038	.2126765+038	.2126765+038	.2126765+038
PARAMETER MINIMA.	-.2126765+038	-.2126765+038	-.2126765+038	-.2126765+038

ITERATION NUMBER	INCREMENT HALVINGS	RESIDUAL SUM OF SQUARES	P1	P2	P3	P4
0	0	.559254+001	10.000000	-.100000	5.000000	-.010000
1	1	.379744+000	9.907289	-.101484	4.947083	.000353
2	0	.582450-001	8.301627	-.130408	6.940312	-.003081
3	0	.189502-001	9.234015	-.178251	7.336724	-.003128
4	0	.134532-001	10.542872	-.211035	7.343437	-.003137
5	0	.128966-001	11.124462	-.223769	7.364383	-.003160
6	0	.128496-001	11.290756	-.227774	7.374456	-.003170
7	0	.128457-001	11.336529	-.228964	7.377790	-.003174
8	0	.128453-001	11.349532	-.229309	7.378793	-.003175
9	0	.128453-001	11.353258	-.229409	7.379086	-.003175
10	0	.128453-001	11.354326	-.229438	7.379170	-.003176
11	0	.128453-001	11.354633	-.229446	7.379195	-.003176
12	0	.128453-001	11.354721	-.229448	7.379201	-.003176
13	0	.128453-001	11.35474[illegible]	-.229449	7.379203	-.003176

ITERATION 13 HAS THE SMALLEST RESIDUAL SUM OF SQUARES(SUBJECT TO CONSTRAINTS, IF ANY).

REMAINING CALCULATIONS ARE BASED ON THE RESULTS OF THIS ITERATION.

PAGE 3 RADIOACTIVE SULFATE DATA

ASYMPTOTIC CORRELATION MATRIX OF THE PARAMETERS

		P1 1	P2 2	P3 3	P4 4
P1	1	1.0000			
P2	2	-.8140	1.0000		
P3	3	.1459	-.5026	1.0000	
P4	4	-.1139	.4184	-.8689	1.0000

RESIDUAL MEAN SQUARE .755606-003

DEGREES OF FREEDOM 17

PARAMETER	ESTIMATE	ASYMPTOTIC STANDARD DEVIATION	TOLERANCE
P1	11.354747	.865841	.2445359114
P2	-.229449	.018740	.1865292847
P3	7.379203	.106597	.1970590600
P4	-.003176	.000136	.2445051098

PAGE 4 RADIOACTIVE SULFATE DATA

CASE NO.	LABEL	PREDICTED COUNT	STD DEV OF PRED VALUE	OBSERVED COUNT	RESIDUAL	CASEWT	TIME
1		14.508458	.362616	15.111700	.603242	.004379	2.000000
2		11.821134	.172042	11.360100	-.461034	.007749	4.000000
3		10.106008	.144709	9.765200	-.340808	.010487	6.000000
4		9.005399	.136218	9.093500	.088101	.012093	8.000000
5		8.293258	.118659	8.482000	.188742	.013900	10.000000
6		7.399400	.078204	7.689100	.289700	.016914	15.000000
7		7.040510	.070454	7.334200	.293690	.018591	20.000000
8		6.852662	.072005	7.059300	.206638	.020067	25.000000
9		6.720285	.071352	6.704100	-.016185	.022249	30.000000
10		6.500131	.065070	6.431300	-.068831	.024177	40.000000
11		6.295938	.057665	6.155400	-.140538	.026393	50.000000
12		6.099043	.051118	5.994000	-.105044	.027833	60.000000
13		5.908395	.045842	5.769800	-.138595	.030039	70.000000
14		5.723715	.042003	5.644000	-.079715	.031392	80.000000
15		5.544809	.039683	5.391500	-.153309	.034402	90.000000
16		5.203598	.039321	5.093800	-.109798	.038540	110.000000
17		4.883384	.043086	4.871700	-.011684	.042135	130.000000
18		4.582875	.048814	4.599600	.016725	.047267	150.000000
19		4.439627	.051932	4.496800	.057172	.049453	160.000000
20		4.300858	.055065	4.360200	.059342	.052600	170.000000
21		4.166426	.058141	4.266800	.100374	.054928	180.000000

SERIAL CORRELATION .368

CPU TIME USED 3.020 SECONDS

```
PAGE    5

BMDP3R - NONLINEAR REGRESSION
09/16/82             AT 07:58:00

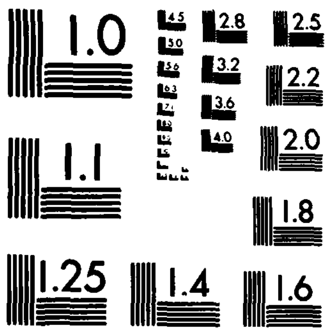
NO MORE CONTROL LANGUAGE.

PROGRAM TERMINATED


@BRKPT PRINTS
```

AD-A134 078 NONLINEAR REGRESSION ANALYSIS METHODOLOGY FOR THE ESTIMATION OF DETECTION..(U) COMPUTER SCIENCES CORP SAN DIEGO CALIF J L HOFMOCKEL SEP 82 NOSC-CR-153 3/5

UNCLASSIFIED N00123-79-D-0272 F/G 9/2 NL



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

```
@PRT NLR.RUN/3RB1INSULIN
PASS*NLR(1).RUN/3RB1INSULIN(2)
@OLD*FTN.FTN,SI P3RFUN
      SUBROUTINE P3RFUN(F,DF,P,X,N,KASE,NVAR,NPAR,IP,XLOSS,ID)
      IMPLICIT DOUBLE PRECISION (A-H,O-Z)
      COMMON/MEMORY/LENGTH,LEXICN,IB(2)
      DIMENSION DF(NPAR),P(NPAR),X(NVAR)
      DF(3) = 1.0
      A = P(1)*X(1) + P(2)
      IF(A.LE.0.0) A = 0.000001
      F = 1.0/A + P(3)
      DF(2) = -1.0/A**2.
      DF(1) = X(1)*DF(2)
      RETURN
      END
@MAP,IE
. BMDPB1 UNIVAC SEGMENTED MAP OF BMDP3R
. BASED ON IBM OVERLAY STRUCTURE WITH DYNAMIC MEMORY
. ALLOCATION ADDED
.
LIB BMDP-SOURCE*BMDP3R.
LIB BMDP-SOURCE*BMDPLIBB1.
NOT  IPF$.
.
SEG $MAIN$
   IN  MAIN/PROGRAM
   IN  S$TART
   ENT S$TART
   IN  F2FRT
SEG 1A*
IN      IBSIZE,SETUPS,GETCOR,PRTHED,P3RNWS,TIMEV,ENDSUB
IN      P3RSET
SEG 1B*,1A
IN      GETHNG,GETINP,GETME,GETSTR,GETNAM,RDTRAN
SEG 2A*
IN          PLINFO
SEG 3A*
IN              PLINF5
SEG 3B*,3A
IN              PLINF1,SFOPEN,SFTOFC,SFTINQ
SEG 3C*,3B
IN              SFIRPT
SEG 3D*,3C
IN              PLINF2
SEG 3E*,3D
IN              PLINF3
SEG 3F*,3E
IN              PLINF4
SEG 3G*,3F
IN              FORCMP,NEXTFM
SEG 3H*,3G
IN              FORSIM
SEG 3I*,3H
IN              FORANA
SEG 3J*,3I
IN              VARPRT,BLDFMT
```

```
SEG 2B*,2A
IN          UNCOLA
SEG 3K*
IN              INITER
SEG 3L*,3K
IN              FUNC3R
SEG 1C*,1B
IN      CREDEV,REDEV
SEG 2C*
IN          XREADS,TRANS,TRANSF,MISVAL
SEG 3M*
IN              FORMRC,INTCHS
SEG 3N*,3M
IN              FREERC
SEG 2D*,2C
IN          PRTNOC
SEG 1D*,1C
IN      TPF$.P3RFUN,TRANT
SEG 2E*
IN          LSTSQ,RITEIT,P3RPSI,DORDER,P3RSTP
SEG 2F*,2E
IN          RITEND,PRTRID,SFTDOT,SFTOUT,SFTEND,SFDOUT
IN          SFREPO
IN          SERCOR,SFFOUT
SEG 1E*,1D
IN      CLEARB,RECORD
SEG 1F*,1E
IN      PLOTR,PLTSIN,PLTMFL,PLTSFL,PLTPRT,SCALE,PLTNPR
SEG 1G*,()
IN      RDTERR
SEG 2G*
IN          RDTER1
SEG 2H*,2G
IN          RDTER2
SEG 2I*,2H
IN          RDTER3
SEG 1H*,1G
IN      GETERR
SEG 1I*,1H
IN      DUMPA
SEG 1J*,1I
IN      SHADOW
SEG 1K*,1J
IN      RETYPE
SEG 1L*,1K
IN      GETARG
SEG 1M*,1L
IN      RANDOM,RANDG
.
. ADD THE FOLLOWING AS *LAST* SEGMENT IF PROGRAM IS TO
. BE SEGMENTED
SEG MEM,()
   IN MEMORY
. *NOTHING* SHOULD FOLLOW THE DIRECTIVE IN MEMORY  !!!!!!
END  . MAP OF BMDP3R
```

```
@NAMES
/PROBLEM
         TITLE IS 'INSULIN DATA'.
/INPUT
         VARIABLES ARE 2.
         FORMAT IS '(F6.0,F6.3)'.
/VARIABLE
         NAMES ARE STANDARD,COUNT.
/REGRESS
         INDEPENDENT IS STANDARD.
         DEPENDENT IS COUNT.
         NUMBER IS 2.
         PARAMETERS ARE 3.
/PARAMETER
         INITIAL ARE 0.01, 0.1, 5.
/END
     0 9.274
     0 9.522
     5 8.082
     5 8.354
    10 7.296
    10 7.518
    25 5.864
    25 5.974
    50 4.396
    50 4.110
   100 2.830
   100 2.674
   200 1.798
   200 1.566
@EOF
```

```
@OLD*FTN.FTN,SI P3RFUN
FTN 8R1X *09/16/82-07:59(,0)
          SUBROUTINE P3RFUN(F,DF,P,X,N,KASE,NVAR,NPAR,IP,XLOSS,ID)
          IMPLICIT DOUBLE PRECISION (A-H,O-Z)
          COMMON/MEMORY/LENGTH,LEXICN,IB(2)
          DIMENSION DF(NPAR),P(NPAR),X(NVAR)
          DF(3) = 1.0
          A = P(1)*X(1) + P(2)
          IF(A.LE.0.0) A = 0.000001
          F = 1.0/A + P(3)
          DF(2) = -1.0/A**2.
          DF(1) = X(1)*DF(2)
          RETURN
          END

END FTN 66 IBANK 28 DBANK 4 COMMON
```

```
@MAP,IE
MAP 30R1 S74T11 09/16/82 07:59:03
MAIN          ELEMENT START ADDRESS NOT USED - ALTERNATIVE FOUND
START=007061, PROG SIZE(I/D)=10776/8744
SYS$*RLIB$. LEVEL 74R1A
END MAP.  ERRORS: 0  TIME: 39.647  STORAGE: 25649/9/044777/0111777
```

@NAMES

```
PAGE    1

BMDP3R - NONLINEAR REGRESSION
DEPARTMENT OF BIOMATHEMATICS
UNIVERSITY OF CALIFORNIA, LOS ANGELES, CA 90024
(213) 825-5940          TWX  UCLA LSA
PROGRAM REVISED JUNE 1981
MANUAL REVISED -- 1981
COPYRIGHT (C) 1981 REGENTS OF UNIVERSITY OF CALIFORNIA
09/16/82            AT 07:59:35

TO SEE REMARKS AND A SUMMARY OF NEW FEATURES FOR
THIS PROGRAM, STATE NEWS. IN THE PRINT PARAGRAPH.

PROGRAM CONTROL INFORMATION

/PROBLEM
          TITLE IS 'INSULIN DATA'.
/INPUT
          VARIABLES ARE 2.
          FORMAT IS '(F6.0,F6.3)'.
/VARIABLE
          NAMES ARE STANDARD,COUNT.
/REGRESS
          INDEPENDENT IS STANDARD.
          DEPENDENT IS COUNT.
          NUMBER IS 2.
          PARAMETERS ARE 3.
/PARAMETER
          INITIAL ARE 0.01, 0.1, 5.
/END

PROBLEM TITLE IS
INSULIN DATA

NUMBER OF VARIABLES TO READ IN. . . . . . . . .         2
NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. .         0
TOTAL NUMBER OF VARIABLES . . . . . . . . . . .         2
NUMBER OF CASES TO READ IN. . . . . . . . . . .    TO END
CASE LABELING VARIABLES . . . . . . . . . . . .
MISSING VALUES CHECKED BEFORE OR AFTER TRANS. .   NEITHER
BLANKS ARE. . . . . . . . . . . . . . . . . . .   MISSING
INPUT UNIT NUMBER . . . . . . . . . . . . . . .         5
REWIND INPUT UNIT PRIOR TO READING. . DATA. . .        NO
NUMBER OF WORDS OF DYNAMIC STORAGE. . . . . . .     14998
NUMBER OF CASES DESCRIBED BY INPUT FORMAT . . .         1

VARIABLES TO BE USED
     1 STANDARD    2 COUNT

INPUT FORMAT IS
(F6.0,F6.3)

MAXIMUM LENGTH DATA RECORD IS   12 CHARACTERS.

I N P U T   V A R I A B L E S . . . . .
  VARIABLE     RECORD   COLUMNS    FIELD  TYPE            VARIABLE     RECORD   COLUMNS    FIELD  TYPE
```

INDEX	NAME	NO.	BEGIN	END	WIDTH	
1	STANDARD	1	1	6	6	F

INDEX	NAME	NO.	BEGIN	END	WIDTH	
· 2	COUNT	1	7	12	8.3	F

REGRESSION TITLE
INSULIN DATA

REGRESSION NUMBER	2
INDEPENDENT VARIABLE(FOR BUILT-IN FUNCTION) . .	STANDARD
DEPENDENT VARIABLE.	COUNT
WEIGHTING VARIABLE.	
NUMBER OF PARAMETERS.	3
NUMBER OF CONSTRAINTS	0
TOLERANCE FOR PIVOTING.	.0000000100
TOLERANCE FOR CONVERGENCE	.00001000000
MAXIMUM NUMBER OF ITERATIONS.	50
MAXIMUM NUMBER OF INCREMENT HALVINGS.	5
NUMBER OF DATA PASSES PER CASE.	1
COMPUTE LOSS FUNCTION	NO

USING THE ABOVE SPECIFICATIONS THIS PROGRAM COULD PROCESS 1633 CASES.

BASED ON INPUT FORMAT SUPPLIED 1 RECORDS READ PER CASE.

NUMBER OF CASES READ. 14

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
1	STANDARD	55.714285	69.637996	.000000	200.000000
2	COUNT	5.661286	2.773082	1.566000	9.522000

PARAMETER MAXIMA.	.2126765+038	.2126765+038	.2126765+038
PARAMETER MINIMA.	-.2126765+038	-.2126765+038	-.2126765+038

ITERATION NUMBER	INCREMENT HALVINGS	RESIDUAL SUM OF SQUARES	P1	P2	P3
0	0	.168068+003	.010000	.100000	5.000000
1	0	.707096+001	.002958	.120812	1.312471
2	0	.319398+000	.002667	.107692	.137569
3	0	.249154+000	.002694	.108966	.138173
4	0	.249145+000	.002694	.108981	.138055
5	0	.249145+000	.002694	.108981	.138049
6	0	.249145+000	.002694	.108981	.138049
7	0	.249145+000	.002694	.108981	.138049
8	0	.249145+000	.002694	.108981	.138049
9	4	.249145+000	.002694	.108981	.138049

ITERATION 9 HAS THE SMALLEST RESIDUAL SUM OF SQUARES(SUBJECT TO CONSTRAINTS, IF ANY).
REMAINING CALCULATIONS ARE BASED ON THE RESULTS OF THIS ITERATION.

ASYMPTOTIC CORRELATION MATRIX OF THE PARAMETERS

		P1 1	P2 2	P3 3
P1	1	1.0000		
P2	2	.7446	1.0000	
P3	3	.9357	.8830	1.0000

RESIDUAL MEAN SQUARE .226495-001

DE' 'S OF FREEDOM 11

A AMETER	ESTIMATE	ASYMPTOTIC STANDARD DEVIATION	TOLERANCE
P	.002694	.000220	.0942264249
F_	.108981	.002070	.1667718963
P3	.138049	.186350	.0465878277

 INSULIN DATA

CASE NO. LABEL	PREDICTED COUNT	STD DEV OF PRED VALUE	OBSERVED COUNT	RESIDUAL	STANDARD
1	9.313981	.088011	9.274000	-.039981	.000000
2	9.313981	.088011	9.522000	.208019	.000000
3	8.304731	.056879	8.082000	-.222731	5.000000
4	8.304731	.056879	8.354000	.049269	5.000000
5	7.495495	.054245	7.296000	-.199495	10.000000
6	7.495495	.054245	7.518000	.022505	10.000000
7	5.809533	.066495	5.864000	.054467	25.000000
8	5.809533	.066495	5.974000	.164467	25.000000
9	4.242117	.061842	4.396000	.153882	50.000000
10	4.242117	.061842	4.110000	-.132118	50.000000
11	2.781170	.059201	2.830000	.048830	100.000000
12	2.781170	.059201	2.674000	-.107170	100.000000
13	1.681973	.091104	1.798000	.116027	200.000000
14	1.681973	.091104	1.566000	-.115973	200.000000

SERIAL CORRELATION -.424

CPU TIME USED 3.392 SECONDS

```
BMDP3R - NONLINEAR REGRESSION
09/16/82            AT 07:59:39

NO MORE CONTROL LANGUAGE.

PROGRAM TERMINATED

@BRKPT PRINT$
```

```
@PRT NLR.RUN/3R81SMITHEX
FURPUR 28R2 S74R1A 09/21/82 10:03:37
PASS*NLR(1).RUN/3R81SMITHEX(2)
      @OLD*FIN.FIN,SI P3RFUN
            SUBROUTINE P3RFUN(F,DF,P,X,N,KASE,NVAR,NPAR,IP,XLOSS,ID)
            IMPLICIT DOUBLE PRECISION (A-H,O-Z)
            COMMON/MEMORY/LENGTH,LEXICN,IB(2)
            DIMENSION DF(NPAR),P(NPAR),X(NVAR)
            DF(1)=1.0D0-DEXP(-P(2)*(X(3)-8.0D0))
            DF(2)=-(0.49D0-P(1))*(X(3)-8.0D0)*DEXP(-P(2)*(X(3)-8.0D0))
            F=P(1)+(0.49D0-P(1))*DEXP(-P(2)*(X(3)-8.0D0))
            RETURN
            END
      @MAP,IE
      . BMDP81 UNIVAC SEGMENTED MAP OF BMDP3R
      . BASED ON IBM OVERLAY STRUCTURE WITH DYNAMIC MEMORY
      . ALLOCATION ADDED
      .
      LIB BMDP-SOURCE*BMDP3R.
      LIB BMDP-SOURCE*BMDPLIB81.
      NOT  TPF$.
      .
      SEG $MAIN$
         IN  MAIN/PROGRAM
         IN  S$START
         ENT S$START
         IN  F2FRT
      SEG 1A*
      IN       IBSIZE,SETUPS,GETCOR,PRTHED,P3RNWS,TIMEV,ENDSUB
      IN       P3RSET
      SEG 1B*,1A
      IN      GETHNG,GETINP,GETME,GETSTR,GETNAM,RDTRAN
      SEG 2A*
      IN            PLINFO
      SEG 3A*
      IN                PLINF5
      SEG 3B*,3A
      IN                PLINF1,SFOPEN,SFTOFC,SFTINQ
      SEG 3C*,3B
      IN                SFIRPT
      SEG 3D*,3C
      IN                PLINF2
      SEG 3E*,3D
      IN                PLINF3
      SEG 3F*,3E
      IN                PLINF4
      SEG 3G*,3F
      IN                FORCMP,NEXTFM
      SEG 3H*,3G
      IN                FORSIM
      SEG 3I*,3H
      IN                FORANA
      SEG 3J*,3I
      IN                VARPRT,BLDFMT
      SEG 2B*,2A
      IN            UNCOLA
      SEG 3K*
      IN                INITER
      SEG 3L*,3K
      IN                FUNC3R
      SEG 1C*,1B
      IN      CREDEV,REDEV
```

```
SEG 2C*
IN         XREADS,TRANS,TRANSF,MISVAL
SEG 3M*
IN            FORMRC,INTCHS
SEG 3N*,3M
IN            FREERC
SEG 2D*,2C
IN         PRTNOC
SEG 1D*,1C
IN      TPF$.P3RFUN,TRANT
SEG 2E*
IN         LSTSQ,RITEIT,P3RPSI,DORDER,P3RSTP
SEG 2F*,2E
IN         RITEND,PRTRID,SFTDOT,SFTOUT,SFTEND,SFDOUT
IN         SFREPO
IN         SERCOR,SFFOUT
SEG 1E*,1D
IN      CLEARB,RECORD
SEG 1F*,1E
IN      PLOTR,PLTSIN,PLTMFL,PLTSFL,PLTPRT,SCALE,PLTNPR
SEG 1G*,()
IN      RDTERR
SEG 2G*
IN         RDTER1
SEG 2H*,2G
IN         RDTER2
SEG 2I*,2H
IN         RDTER3
SEG 1H*,1G
IN      GETERR
SEG 1I*,1H
IN      DUMPA
SEG 1J*,1I
IN      SHADOW
SEG 1K*,1J
IN      RETYPE
SEG 1L*,1K
IN      GETARG
SEG 1M*,1L
IN      RANDOM,RANDG
.
. ADD THE FOLLOWING AS *LAST* SEGMENT IF PROGRAM IS TO
. BE SEGMENTED
SEG MEM,()
  IN MEMORY
. *NOTHING* SHOULD FOLLOW THE DIRECTIVE IN MEMORY  !!!!!!
END  . MAP OF BMDP3R
```

```
/PROBLEM
          TITLE IS 'AN EXAMPLE NONLINEAR REGRESSION - H. SMITH'.
/INPUT
          VARIABLES ARE 3.
          FORMAT IS '(F5.3,F5.1,F5.1)'.
/VARIABLE
          NAMES ARE CHLOR,CASEWT,TIME.
/REGRESS
    TITLE IS'% CHLORINE/UNIT OF PRODUCT RES ON TIME ELAPSED'.
          INDEPENDENT IS TIME.
          DEPENDENT IS CHLOR.
          PARAMETERS ARE 2.
          WEIGHT IS CASEWT.
          HALVING IS 20
/PARAMETER
          INITIAL ARE 0.30,0.02.
/END
0.490  1.0  8.0
0.490  1.0  8.0
0.480  1.0 10.0
0.470  1.0 10.0
0.480  1.0 10.0
0.470  1.0 10.0
0.460  1.0 12.0
0.460  1.0 12.0
0.450  1.0 12.0
0.430  1.0 12.0
0.450  1.0 14.0
0.430  1.0 14.0
0.430  1.0 14.0
0.440  1.0 16.0
0.430  1.0 16.0
0.430  1.0 16.0
0.460  1.0 18.0
0.450  1.0 18.0
0.420  1.0 20.0
0.420  1.0 20.0
0.430  1.0 20.0
0.410  1.0 22.0
0.410  1.0 22.0
0.400  1.0 22.0
0.420  1.0 24.0
0.400  1.0 24.0
0.400  1.0 24.0
0.410  1.0 26.0
0.400  1.0 26.0
0.410  1.0 26.0
0.410  1.0 28.0
0.400  1.0 28.0
0.400  1.0 30.0
0.400  1.0 30.0
0.380  1.0 30.0
0.410  1.0 32.0
0.400  1.0 32.0
0.400  1.0 34.0
0.410  1.0 36.0
0.380  1.0 36.0
0.400  1.0 38.0
0.400  1.0 38.0
0.390  1.0 40.0
0.390  1.0 42.0
EOF
```

```
@OLD•FTN.FTN,SI P3RFUN
FTN 8R1X •09/16/82-08:00(,0)
          SUBROUTINE P3RFUN(F,DF,P,X,N,KASE,NVAR,NPAR,IP,XLOSS,ID)
          IMPLICIT DOUBLE PRECISION (A-H,O-Z)
          COMMON/MEMORY/LENGTH,LEXICN,IB(2)
          DIMENSION DF(NPAR),P(NPAR),X(NVAR)
          DF(1)=1.0D0-DEXP(-P(2)*(X(3)-8.0D0))
          DF(2)=-(0.49D0-P(1))*(X(3)-8.0D0)*DEXP(-P(2)*(X(3)-8.0D0))
          F=P(1)+(0.49D0-P(1))*DEXP(-P(2)*(X(3)-8.0D0))
          RETURN
          END

END FTN 91 IBANK 33 DBANK 4 COMMON
```

```
@MAP,IE
MAP 30R1 S74T11 09/16/82 08:00:38
MAIN         ELEMENT START ADDRESS NOT USED - ALTERNATIVE FOUND
START=007061, PROG SIZE(I/D)=10776/8744
SYS$*RLIB$. LEVEL 74R1A
END MAP.  ERRORS: 0  TIME: 39.776  STORAGE: 25649/9/044777/0111777
```

```
PAGE    1

BMDP3R - NONLINEAR REGRESSION
DEPARTMENT OF BIOMATHEMATICS
UNIVERSITY OF CALIFORNIA, LOS ANGELES, CA 90024
(213) 825-5940            TWX  UCLA LSA
PROGRAM REVISED JUNE 1981
MANUAL REVISED -- 1981
COPYRIGHT (C) 1981 REGENTS OF UNIVERSITY OF CALIFORNIA
09/16/82                AT 08:01:27

TO SEE REMARKS AND A SUMMARY OF NEW FEATURES FOR
THIS PROGRAM, STATE NEWS. IN THE PRINT PARAGRAPH.

PROGRAM CONTROL INFORMATION

/PROBLEM
          TITLE IS 'AN EXAMPLE NONLINEAR REGRESSION - H. SMITH'.
/INPUT
          VARIABLES ARE 3.
          FORMAT IS '(F5.3,F5.1,F5.1)'.
/VARIABLE
          NAMES ARE CHLOR,CASEWT,TIME.
/REGRESS
    TITLE IS'% CHLORINE/UNIT OF PRODUCT RES ON TIME ELAPSED'.
          INDEPENDENT IS TIME.
          DEPENDENT IS CHLOR.
          PARAMETERS ARE 2.
          WEIGHT IS CASEWT.
          HALVING IS 20
/PARAMETER
          INITIAL ARE 0.30,0.02.
/END

PROBLEM TITLE IS
AN EXAMPLE NONLINEAR REGRESSION - H. SMITH

NUMBER OF VARIABLES TO READ IN. . . . . . . . .         3
NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. .         0
TOTAL NUMBER OF VARIABLES . . . . . . . . . . .         3
NUMBER OF CASES TO READ IN. . . . . . . . . . . . TO END
CASE LABELING VARIABLES . . . . . . . . . . . .
MISSING VALUES CHECKED BEFORE OR AFTER TRANS. . NEITHER
BLANKS ARE. . . . . . . . . . . . . . . . . . . MISSING
INPUT UNIT NUMBER . . . . . . . . . . . . . . .         5
REWIND INPUT UNIT PRIOR TO READING. . DATA. . .        NO
NUMBER OF WORDS OF DYNAMIC STORAGE. . . . . . .     14998
NUMBER OF CASES DESCRIBED BY INPUT FORMAT . . .         1

VARIABLES TO BE USED
     1 CHLOR         2 CASEWT        3 TIME

INPUT FORMAT IS
(F5.3,F5.1,F5.1)

MAXIMUM LENGTH DATA RECORD IS   15 CHARACTERS.
```

I N P U T   V A R I A B L E S . . . . .

VARIABLE INDEX	VARIABLE NAME	RECORD NO.	COLUMNS BEGIN	COLUMNS END	FIELD WIDTH	TYPE
1	CHLOR	1	1	5	5.3	F
2	CASEWT	1	6	10	5.1	F

VARIABLE INDEX	VARIABLE NAME	RECORD NO.	COLUMNS BEGIN	COLUMNS END	FIELD WIDTH	TYPE
3	TIME	1	11	15	5.1.	F

```
  REGRESSION TITLE
% CHLORINE/UNIT OF PRODUCT RES ON TIME ELAPSED

  REGRESSION NUMBER . . . . . . . . . . . . . . . . . .     0
  INDEPENDENT VARIABLE(FOR BUILT-IN FUNCTION) . . .   TIME
  DEPENDENT VARIABLE. . . . . . . . . . . . . . . . .   CHLOR
  WEIGHTING VARIABLE. . . . . . . . . . . . . . . . .   CASEWT
  NUMBER OF PARAMETERS. . . . . . . . . . . . . . . .     2
  NUMBER OF CONSTRAINTS . . . . . . . . . . . . . . .     0
  TOLERANCE FOR PIVOTING. . . . . . . . . . . . . . . .00000001000
  TOLERANCE FOR CONVERGENCE . . . . . . . . . . . . . .00001000000
  MAXIMUM NUMBER OF ITERATIONS. . . . . . . . . . . .    50
  MAXIMUM NUMBER OF INCREMENT HALVINGS. . . . . . . .    20
  NUMBER OF DATA PASSES PER CASE. . . . . . . . . . .     1
  COMPUTE LOSS FUNCTION . . . . . . . . . . . . . . .    NO

  USING THE ABOVE SPECIFICATIONS THIS PROGRAM COULD PROCESS 1470 CASES.

BASED ON INPUT FORMAT SUPPLIED    1 RECORDS READ PER CASE.

NUMBER OF CASES READ. . . . . . . . . . . . . . . .      44
```

B-35

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
1	CHLOR	.425000	.030309	.380000	.490000
2	CASEWT	1.000000	.000000	1.000000	1.000000
3	TIME	22.272725	9.650555	8.000000	42.000000

```
  PARAMETER MAXIMA. . . . . . . . . . . . . .  .2126765+038   .2126765+038

  PARAMETER MINIMA. . . . . . . . . . . . . . -.2126765+038  -.2126765+038
```

ITERATION NUMBER	INCREMENT HALVINGS	RESIDUAL SUM OF SQUARES	P1	P2
0	0	.263152-001	.300000	.020000
1	5	.259215-001	.316927	.022521
2	5	.253047-001	.329635	.024988
3	4	.247638-001	.349264	.029796
4	3	.244790-001	.373851	.038986
5	2	.222562-001	.395049	.055743
6	0	.106857-001	.407726	.107597
7	0	.500810-002	.390266	.100513
8	0	.500168-002	.390135	.101609
9	0	.500168-002	.390140	.101632
10	0	.500168-002	.390140	.101633
11	0	.500168-002	.390140	.101633
12	1	.500168-002	.390140	.101633
13	2	.500168-002	.390140	.101633

ITERATION 13 HAS THE SMALLEST RESIDUAL SUM OF SQUARES(SUBJECT TO CONSTRAINTS, IF ANY).

REMAINING CALCULATIONS ARE BASED ON THE RESULTS OF THIS ITERATION.

 % CHLORINE/UNIT OF PRODUCT RES ON TIME ELAPSED

ASYMPTOTIC CORRELATION MATRIX OF THE PARAMETERS

		P1 1	P2 2
P1	1	1.0000	
P2	2	.8879	1.0000

RESIDUAL MEAN SQUARE .119088-003

DEGREES OF FREEDOM 42

PARAMETER	ESTIMATE	ASYMPTOTIC STANDARD DEVIATION	TOLERANCE
P1	.390140	.005045	.2117044715
P2	.101633	.013360	.2117044715

PAGE 4 % CHLORINE/UNIT OF PRODUCT RES ON TIME ELAPSED

CASE NO.	LABEL	PREDICTED CHLOR	STD DEV OF PRED VALUE	OBSERVED CHLOR	RESIDUAL	CASEWT	TIME
1		.490000	.000000	.490000	.000000	1.000000	8.000000
2		.490000	.000000	.490000	.000000	1.000000	8.000000
3		.471632	.001419	.480000	.008368	1.000000	10.000000
4		.471632	.001419	.470000	-.001632	1.000000	10.000000
5		.471632	.001419	.480000	.008368	1.000000	10.000000
6		.471632	.001419	.470000	-.001632	1.000000	10.000000
7		.456642	.002199	.460000	.003358	1.000000	12.000000
8		.456642	.002199	.460000	.003358	1.000000	12.000000
9		.456642	.002199	.450000	-.006642	1.000000	12.000000
10		.456642	.002199	.430000	-.026642	1.000000	12.000000
11		.444410	.002537	.450000	.005590	1.000000	14.000000
12		.444410	.002537	.430000	-.014410	1.000000	14.000000
13		.444410	.002537	.430000	-.014410	1.000000	14.000000
14		.434428	.002587	.440000	.005572	1.000000	16.000000
15		.434428	.002587	.430000	-.004428	1.000000	16.000000
16		.434428	.002587	.430000	-.004428	1.000000	16.000000
17		.426282	.002465	.460000	.033718	1.000000	18.000000
18		.426282	.002465	.450000	.023718	1.000000	18.000000
19		.419634	.002269	.420000	.000366	1.000000	20.000000
20		.419634	.002269	.420000	.000366	1.000000	20.000000
21		.419634	.002269	.430000	.010366	1.000000	20.000000
22		.414209	.002078	.410000	-.004209	1.000000	22.000000
23		.414209	.002078	.410000	-.004209	1.000000	22.000000
24		.414209	.002078	.400000	-.014209	1.000000	22.000000
25		.409782	.001959	.420000	.010218	1.000000	24.000000
26		.409782	.001959	.400000	-.009782	1.000000	24.000000
27		.409782	.001959	.400000	-.009782	1.000000	24.000000
28		.406169	.001951	.410000	.003831	1.000000	26.000000
29		.406169	.001951	.400000	-.006169	1.000000	26.000000
30		.406169	.001951	.410000	.003831	1.000000	26.000000
31		.403220	.002056	.410000	.006780	1.000000	28.000000
32		.403220	.002056	.400000	-.003220	1.000000	28.000000
33		.400814	.002246	.400000	-.000814	1.000000	30.000000
34		.400814	.002246	.400000	-.000814	1.000000	30.000000
35		.400814	.002246	.380000	-.020814	1.000000	30.000000
36		.398851	.002483	.410000	.011149	1.000000	32.000000
37		.398851	.002483	.400000	.001149	1.000000	32.000000
38		.397249	.002740	.400000	.002751	1.000000	34.000000
39		.395941	.002996	.410000	.014059	1.000000	36.000000
40		.395941	.002996	.380000	-.015941	1.000000	36.000000
41		.394874	.003241	.400000	.005126	1.000000	38.000000
42		.394874	.003241	.400000	.005126	1.000000	38.000000
43		.394003	.003468	.390000	-.004003	1.000000	40.000000
44		.393293	.003674	.390000	-.003293	1.000000	42.000000

SERIAL CORRELATION .007

CPU TIME USED 4.678 SECONDS

```
BMDP3R - NONLINEAR REGRESSION
09/16/82             AT 08:01:35

NO MORE CONTROL LANGUAGE.

PROGRAM TERMINATED


@BRKPT PRINTS
```

P3RB1

HOFMOCK

7213

22SEP82

FILENAME • PRI3   USERID • HOFMOCKEL-JL ACCOUNT • DIA72130230A   CREATED AT: 16:20:12 22 SEP 82

123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012

```
@ELT,L NLR.RUN/P3R81
ELT0T7 RLIB70 01/21-09:39:31-(12.)
  012 @RUN,S/NR P3R81,DTH7213030A/HOFMOCKEL-JE,PASS,10,300
  011 @ASG,A PRT3.
  011 @USE PRT,PRT3
  008 @PRX,U PRT.
  008 @ELT,L PASS*NLR.RUN/P3R81
  011 @ELT,L NLRDAT.A1
  011 @ELT,L NLRDAT.A2
  011 @ELT,L NLRDAT.A3
  008 @ASG,T 21.,F///500
  009 @PASS*NLR.P3R81
  008 /PROBLEM
  011           TITLE IS ' REGRESSION ON REAL PI DATA'.
  008 /INPUT
  011           VARIABLES ARE 9.
  011           FORMAT IS '(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))'.
  008 /VARIABLE
  011           NAMES ARE PERF,HOLD,CASEWT,TIMEWT,I1,I2,I3,I4,I5.
  008 /REGRESS
  011           TITLE IS ' PARAMETERS FROM REAL DATA SET # 1 ( 6 SOURCES)'.
  008           INDEPENDENT IS PERF.
  008           DEPENDENT IS HOLD.
  008           NUMBER IS 2.
  011           PARAMETERS ARE 7.
  008           WEIGHT IS CASEWT.
  011           ITERATIONS ARE 10.
  011           HALVING IS 50.
  008 /PARAMETER
  011           INITIAL ARE -20.0,0.120.0,0.0,0.0,0.0,0.0,0.,0..
  008 /PLOT
  008           RESIDUAL.
  008           VARIABLE IS PERF.
  008           NORMAL.
  008           DETRENDED.
  008           SIZE IS 50,40.
  008 /END
  011 @ADD,P NLRDAT.A1
  008 @XQT
  008 @TEST TNE/0/T3
  008 @JUMP 3
  008 @DATA,L 21.
  008 @END
  008 @ERS 21.
  009 @PASS*NLR.P3R81
  008 /PROBLEM
  011           TITLE IS ' REGRESSION ON REAL PIDATA'.
  008 /INPUT
  011           VARIABLES ARE 8.
  011           FORMAT IS '(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))'.
  008 /VARIABLE
  011           NAMES ARE PERF,HOLD,CASEWT,TIMEWT,I1,I2,I3,I4.
  008 /REGRESS
  011           TITLE IS ' PARAMETERS FROM REAL DATA SET # 2 ( 5 SOURCES)'.
  008           INDEPENDENT IS PERF.
  008           DEPENDENT IS HOLD.
  008           NUMBER IS 2.
```

```
011          PARAMETERS ARE 6.
008          WEIGHT IS CASEWT.
011          ITERATIONS ARE 10.
011          HALVING IS 50.
008 /PARAMETER
011          INITIAL ARE -20.0,0.120.0,0.0,0.0,0.0.
008 /PLOT
008          RESIDUAL.
008          VARIABLE IS PERF.
008          NORMAL.
008          DNORMAL.
008          SIZE IS 50,40.
008 /END
011 @ADD,P NLRDAT.A2
008 @EOF
008 @TEST TNE/0/T3
008 @JUMP 3
008 @DATA,L 21.
008 @END
008 @ERS 21.
009 @PASS+NLR.P3R81
008 /PROBLEM
011          TITLE IS ' REGRESSION ON REAL PI DATA'.
008 /INPUT
011          VARIABLES ARE 8.
011          FORMAT IS '(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))'.
008 /VARIABLE
011          NAMES ARE PERF,HOLD,CASEWT,TIMEWT,I1,I2,I3,I4.
008 /REGRESS
011          TITLE IS ' PARAMETERS FROM REAL DATA SET # 3 ( 5 SOURCES)'.
008          INDEPENDENT IS PERF.
008          DEPENDENT IS HOLD.
008          NUMBER IS 2.
011          PARAMETERS ARE 6.
008          WEIGHT IS CASEWT.
011          ITERATIONS ARE 10.
011          HALVING IS 50.
008 /PARAMETER
011          INITIAL ARE -20.0,0.125,0.0,0.0,0.0,0.0.
008 /PLOT
008          RESIDUAL.
008          VARIABLE IS PERF.
008          NORMAL.
008          DNORMAL.
008          SIZE IS 50,40.
008 /END
011 @ADD,P NLRDAT.A3
008 @EOF
008 @TEST TNE/0/T3
008 @JUMP 3
008 @DATA,L 21.
008 @END
008 @BRKPT PRINT$
011 @SYM,U PRT.,,PR
008 @FIN

END ELT.
```

@ELT,L NLRDAT.A1
ELTOT7 RLIB70 09/22-16:18:57-(0,)

000001	000	172.75	.00000	634.00907	154.	0	0	0	0	0
000002	000	174.25	.00923	2130.33652	368.	0	0	0	0	0
000003	000	175.75	.00000	3206.75296	374.	0	0	0	0	0
000004	000	177.25	.00000	3386.82523	256.	0	0	0	0	0
000005	000	178.75	.00000	2053.32242	95.	0	0	0	0	0
000006	000	180.25	.00000	1547.43171	41.	0	0	0	0	0
000007	000	181.75	.00000	6557.75958	109.	0	0	0	0	0
000008	000	183.25	.00000	4531.68317	40.	0	0	0	0	0
000009	000	184.75	.00000	8975.75354	44.	0	0	0	0	0
000010	000	186.25	.00000	13092.22632	33.	0	0	0	0	0
000011	000	187.75	.00000	6856.22125	3.	0	0	0	0	0
000012	000	171.25	.00000	72.79577	20.	1	0	0	0	0
000013	000	172.75	.01702	950.65219	233.	1	0	0	0	0
000014	000	174.25	.00000	3481.58160	604.	1	0	0	0	0
000015	000	175.75	.00000	1332.66386	153.	1	0	0	0	0
000016	000	177.25	.00000	1421.57776	105.	1	0	0	0	0
000017	000	178.75	.00000	556.19869	22.	1	0	0	0	0
000018	000	180.25	.00000	5010.77924	143.	1	0	0	0	0
000019	000	181.75	.00000	5747.74658	95.	1	0	0	0	0
000020	000	183.25	.00000	4733.23401	42.	1	0	0	0	0
000021	000	184.75	.00000	38588.38672	204.	1	0	0	0	0
000022	000	186.25	.00000	25537.83569	69.	1	0	0	0	0
000023	000	187.75	.00000	7893.65527	5.	1	0	0	0	0
000024	000	168.25	.00000	23.04027	7.	0	1	0	0	0
000025	000	169.75	.02886	209.99318	91.	0	1	0	0	0
000026	000	171.25	.02661	373.73109	124.	0	1	0	0	0
000027	000	172.75	.00000	597.94630	145.	0	1	0	0	0
000028	000	174.25	.00000	516.46037	86.	0	1	0	0	0
000029	000	175.75	.00000	1002.16917	114.	0	1	0	0	0
000030	000	177.25	.00000	1395.57329	103.	0	1	0	0	0
000031	000	178.75	.00000	2818.31302	132.	0	1	0	0	0
000032	000	180.25	.00000	5827.64832	167.	0	1	0	0	0
000033	000	181.75	.00000	8583.98083	144.	0	1	0	0	0
000034	000	183.25	.00000	15611.64893	149.	0	1	0	0	0
000035	000	184.75	.00000	73445.75391	392.	0	1	0	0	0
000036	000	186.25	.00000	24496.01538	66.	0	1	0	0	0
000037	000	168.25	.97667	16.30957	2.	0	0	1	0	0
000038	000	169.75	.50596	59.26800	22.	0	0	1	0	0
000039	000	171.25	.56926	36.30138	6.	0	0	1	0	0
000040	000	172.75	.08504	850.43632	208.	0	0	1	0	0
000041	000	174.25	.07638	2262.02036	391.	0	0	1	0	0
000042	000	175.75	.04326	2112.70639	245.	0	0	1	0	0
000043	000	177.25	.00000	3373.80540	255.	0	0	1	0	0
000044	000	178.75	.00340	4866.86658	231.	0	0	1	0	0
000045	000	180.25	.00000	1013.32571	25.	0	0	1	0	0
000046	000	181.75	.00000	4129.53210	67.	0	0	1	0	0
000047	000	183.25	.00000	4834.09961	43.	0	0	1	0	0
000048	000	184.75	.00000	14507.47009	74.	0	0	1	0	0
000049	000	186.25	.00000	11727.51270	29.	0	0	1	0	0
000050	000	187.75	.00000	6360.58649	2.	0	0	1	0	0
000051	000	163.75	.00000	9.49148	1.	0	0	0	1	0
000052	000	165.25	.06000	14.23563	5.	0	0	0	1	0
000053	000	166.75	.01667	43.81716	26.	0	0	0	1	0
000054	000	168.25	.00000	116.88184	63.	0	0	0	1	0
000055	000	169.75	.07171	395.11330	175.	0	0	0	1	0

000056	000	171.25	.00000	344.59908	114.	0	0	0	1	0
000057	000	172.75	.00401	782.29477	191.	0	0	0	1	0
000058	000	174.25	.00000	2342.17657	405.	0	0	0	1	0
000059	000	175.75	.00000	951.34534	108.	0	0	0	1	0
000060	000	177.25	.00000	733.63285	52.	0	0	0	1	0
000061	000	178.75	.00000	676.22335	28.	0	0	0	1	0
000062	000	180.25	.00000	2834.26804	79.	0	0	0	1	0
000063	000	181.75	.00000	2862.41379	45.	0	0	0	1	0
000064	000	183.25	.00000	6960.70038	64.	0	0	0	1	0
000065	000	184.75	.00266	40256.79639	213.	0	0	0	1	0
000066	000	186.25	.00000	29360.64868	80.	0	0	0	1	0
000067	000	187.75	.00000	6856.22125	3.	0	0	0	1	0
000068	000	184.75	.00000	88094.99219	471.	0	0	0	0	1
000069	000	186.25	.00366	425715.65234	1217.	0	0	0	0	1
000070	000	187.75	.00000	5881.76160	1.	0	0	0	0	1
000071	000	189.25	.00000	11817.16187	1.	0	0	0	0	1

END ELT.

```
•ELT,L NLRDAT.A2     I
ELTOT7 RLIB70 09/22-16:19:10-(0,)
000001         000 165.25   .10954     27.04722   17.  0 0 0 0 0
000002         000 166.75   .08222     17.75272    6.  0 0 0 0 0
000003         000 168.25   .00000     17.58046    3.  0 0 0 0 0
000004         000 169.75   .14508    102.41307   42.  0 0 0 0 0
000005         000 171.25   .06174    571.92847  192.  0 0 0 0 0
000006         000 172.75   .13419    381.68828   91.  0 0 0 0 0
000007         000 174.25   .05667    220.63721   34.  0 0 0 0 0
000008         000 175.75   .28720    318.52114   33.  0 0 0 0 0
000009         000 177.25   .08698    694.85287   49.  0 0 0 0 0
000010         000 178.75   .00000    556.19869   22.  0 0 0 0 0
000011         000 180.25   .00000    423.91037    6.  0 0 0 0 0
000012         000 181.75   .00000   2633.03195   41.  0 0 0 0 0
000013         000 183.25   .00000   3529.20151   30.  0 0 0 0 0
000014         000 184.75   .00000   6600.21674   31.  0 0 0 0 0
000015         000 186.25   .00000  49202.67969  137.  0 0 0 0 0
000016         000 187.75   .00000120676.11426  174.  0 0 0 0 0
000017         000 189.25   .00000140450.82422   99.  0 0 0 0 0
000018         000 165.25   .24396     50.69377   37.  1 0 0 0 0
000019         000 166.75   .08161     94.53536   62.  1 0 0 0 0
000020         000 168.25   .23255    139.38367   76.  1 0 0 0 0
000021         000 169.75   .14763    445.83105  198.  1 0 0 0 0
000022         000 171.25   .04621    382.47181  127.  1 0 0 0 0
000023         000 172.75   .00000    257.78625   60.  1 0 0 0 0
000024         000 174.25   .00000    402.30010   66.  1 0 0 0 0
000025         000 175.75   .04505    469.42521   51.  1 0 0 0 0
000026         000 177.25   .00000   1356.56985  100.  1 0 0 0 0
000027         000 178.75   .00000    920.16695   40.  1 0 0 0 0
000028         000 180.25   .00000   1345.90224   35.  1 0 0 0 0
000029         000 181.75   .00000   2919.83124   46.  1 0 0 0 0
000030         000 183.25   .00000   4733.23401   42.  1 0 0 0 0
000031         000 184.75   .00000   9159.39746   45.  1 0 0 0 0
000032         000 186.25   .00000  14807.56763   38.  1 0 0 0 0
000033         000 187.75   .00000  86822.81543  124.  1 0 0 0 0
000034         000 189.25   .00000398959.06250  289.  1 0 0 0 0
000035         000 174.25   .00000    105.70066   13.  0 1 0 0 0
000036         000 175.75   .00000    402.15676   43.  0 1 0 0 0
000037         000 177.25   .00000   1161.62575   85.  0 1 0 0 0
000038         000 178.75   .00000   3604.46732  170.  0 1 0 0 0
000039         000 180.25   .00000   6372.31366  183.  0 1 0 0 0
000040         000 181.75   .00355  11653.78320  197.  0 1 0 0 0
000041         000 183.25   .00000  33856.87891  328.  0 1 0 0 0
000042         000 184.75   .00000   2930.46463   10.  0 1 0 0 0
000043         000 186.25   .00000  11727.51270   29.  0 1 0 0 0
000044         000 187.75   .00000   8985.49756    7.  0 1 0 0 0
000045         000 189.25   .00000392153.55469  284.  0 1 0 0 0
000046         000 160.75   .00000     12.44589    6.  0 0 1 0 0
000047         000 162.25   .00000      9.59932    2.  0 0 1 0 0
000048         000 163.75   .00000     13.60895    6.  0 0 1 0 0
000049         000 165.25   .99333     14.23563    5.  0 0 1 0 0
000050         000 166.75   .00000     15.50934    4.  0 0 1 0 0
000051         000 168.25   .66020     28.97494   11.  0 0 1 0 0
000052         000 169.75   .63000     46.77965   16.  0 0 1 0 0
000053         000 171.25   .48048     95.26556   28.  0 0 1 0 0
000054         000 172.75   .18678    401.69824   96.  0 0 1 0 0
000055         000 174.25   .25722    322.56655   52.  0 0 1 0 0
```

000056	000	175.75	.27820	832.79329	94.	0	0	1	0	0
000057	000	177.25	.45699	1187.60989	87.	0	0	1	0	0
000058	000	178.75	.33630	3790.69943	179.	0	0	1	0	0
000059	000	180.25	.25899	6917.02802	199.	0	0	1	0	0
000060	000	181.75	.28466	6789.25592	113.	0	0	1	0	0
000061	000	183.25	.14207	7671.60333	71.	0	0	1	0	0
000062	000	184.75	.19703	19502.81470	101.	0	0	1	0	0
000063	000	186.25	.08077	34578.41504	95.	0	0	1	0	0
000064	000	187.75	.09507	86822.81543	124.	0	0	1	0	0
000065	000	189.25	.11143	149964.70703	106.	0	0	1	0	0
000066	000	168.25	.00000	46.67624	22.	0	0	0	1	0
000067	000	169.75	.00000	89.34906	36.	0	0	0	1	0
000068	000	171.25	.01422	601.08328	202.	0	0	0	1	0
000069	000	172.75	.02713	742.21407	181.	0	0	0	1	0
000070	000	174.25	.01758	653.63223	110.	0	0	0	1	0
000071	000	175.75	.00000	1085.89137	124.	0	0	0	1	0
000072	000	177.25	.00000	1044.73967	76.	0	0	0	1	0
000073	000	178.75	.00000	961.09224	42.	0	0	0	1	0
000074	000	180.25	.00000	753.87708	17.	0	0	0	1	0
000075	000	181.75	.00000	4418.22546	72.	0	0	0	1	0
000076	000	183.25	.00000	14083.49646	134.	0	0	0	1	0
000077	000	184.75	.00000	18762.33154	97.	0	0	0	1	0
000078	000	186.25	.00000	33882.47705	93.	0	0	0	1	0
000079	000	187.75	.00000	124739.52539	180.	0	0	0	1	0
000080	000	189.25	.00000	120073.20215	84.	0	0	0	1	0

END ELT.

@ELT,L NIRDAT.A3 1
ELTOT7 RLIB70 09/22-16:19:24-(0,)

000001	000	166.75	.67605	32.90634	18.	0	0	0	0	0
000002	000	168.25	.07936	234.77729	131.	0	0	0	0	0
000003	000	169.75	.16015	74.20759	29.	0	0	0	0	0
000004	000	171.25	.06286	338.77347	112.	0	0	0	0	0
000005	000	172.75	.04777	477.76903	115	0	0	0	0	0
000006	000	174.25	.09734	288.48280	46.	0	0	0	0	0
000007	000	175.75	.03564	672.02929	75.	0	0	0	0	0
000008	000	177.25	.01386	2371.39636	178.	0	0	0	0	0
000009	000	178.75	.00000	2694.21713	126.	0	0	0	0	0
000010	000	180.25	.00000	1648.51399	44.	0	0	0	0	0
000011	000	181.75	.00000	3668.03201	59.	0	0	0	0	0
000012	000	183.25	.00000	8789.76060	82.	0	0	0	0	0
000013	000	186.25	.00000	14120.41931	36.	0	0	0	0	0
000014	000	166.75	.03356	76.10590	49.	1	0	0	0	0
000015	000	168.25	.01405	248.66408	139.	1	0	0	0	0
000016	000	169.75	.02224	333.38058	147.	1	0	0	0	0
000017	000	171.25	.00000	598.16775	201.	1	0	0	0	0
000018	000	172.75	.01775	577.91299	140.	1	0	0	0	0
000019	000	174.25	.00000	802.33888	136.	1	0	0	0	0
000020	000	175.75	.00000	511.56015	56.	1	0	0	0	0
000021	000	177.25	.00000	1603.64960	119.	1	0	0	0	0
000022	000	178.75	.00000	6046.69366	288.	1	0	0	0	0
000023	000	180.25	.00000	3208.00150	90.	1	0	0	0	0
000024	000	181.75	.00000	5458.56342	90.	1	0	0	0	0
000025	000	183.25	.00000	5541.48645	50.	1	0	0	0	0
000026	000	184.75	.00000	2160.39270	5.	1	0	0	0	0
000027	000	172.75	.26057	237.84853	55.	0	1	0	0	0
000028	000	174.25	.11484	487.90275	81.	0	1	0	0	0
000029	000	175.75	.00000	1519.16173	175.	0	1	0	0	0
000030	000	177.25	.01802	4102.94598	311.	0	1	0	0	0
000031	000	178.75	.00000	12381.47009	594.	0	1	0	0	0
000032	000	180.25	.00000	2630.53827	73.	0	1	0	0	0
000033	000	181.75	.00000	2690.32903	42.	0	1	0	0	0
000034	000	183.25	.00000	15407.87964	147.	0	1	0	0	0
000035	000	184.75	.00000	3092.65625	11.	0	1	0	0	0
000036	000	186.25	.00000	3026.46002	1.	0	1	0	0	0
000037	000	160.75	.55639	153.11034	149.	0	0	1	0	0
000038	000	162.25	.58716	110.60673	104.	0	0	1	0	0
000039	000	163.75	.71858	92.07990	80.	0	0	1	0	0
000040	000	165.25	.46889	59.14456	44.	0	0	1	0	0
000041	000	166.75	.53150	104.47772	69.	0	0	1	0	0
000042	000	168.25	.30882	111.69417	60.	0	0	1	0	0
000043	000	169.75	.72667	161.59447	69.	0	0	1	0	0
000044	000	171.25	.60883	446.58243	149.	0	0	1	0	0
000045	000	172.75	.60248	88.75602	17.	0	0	1	0	0
000046	000	174.25	.20846	911.04621	155.	0	0	1	0	0
000047	000	175.75	.10260	536.86532	59.	0	0	1	0	0
000048	000	177.25	.08953	3868.57300	293.	0	0	1	0	0
000049	000	178.75	.07786	2921.73505	137.	0	0	1	0	0
000050	000	180.25	.00000	1952.55644	53.	0	0	1	0	0
000051	000	181.75	.00000	2233.14334	34.	0	0	1	0	0
000052	000	183.25	.00000	1523.35822	9.	0	0	1	0	0
000053	000	166.75	.00000	69.03726	44.	0	0	0	1	0
000054	000	168.25	.01549	127.26297	69.	0	0	0	1	0
000055	000	169.75	.01148	540.66393	241.	0	0	0	1	0

```
000056      000 171.25   .01441    443.66793  148. 0 0 0 1 0
000057      000 172.75   .02653    469.75962  113. 0 0 0 1 0
000058      000 174.25   .02122    991.15921  169. 0 0 0 1 0
000059      000 175.75   .01229    722.77535   81. 0 0 0 1 0
000060      000 177.25   .00275   2579.66464  194. 0 0 0 1 0
000061      000 178.75   .00000   3066.53751  144. 0 0 0 1 0
000062      000 180.25   .00000   4738.53656  135. 0 0 0 1 0
000063      000 181.75   .00000  12291.03040  208. 0 0 0 1 0
000064      000 183.25   .00000   7062.21802   65. 0 0 0 1 0
000065      000 184.75   .00000   1740.81133    2. 0 0 0 1 0

END ELT.

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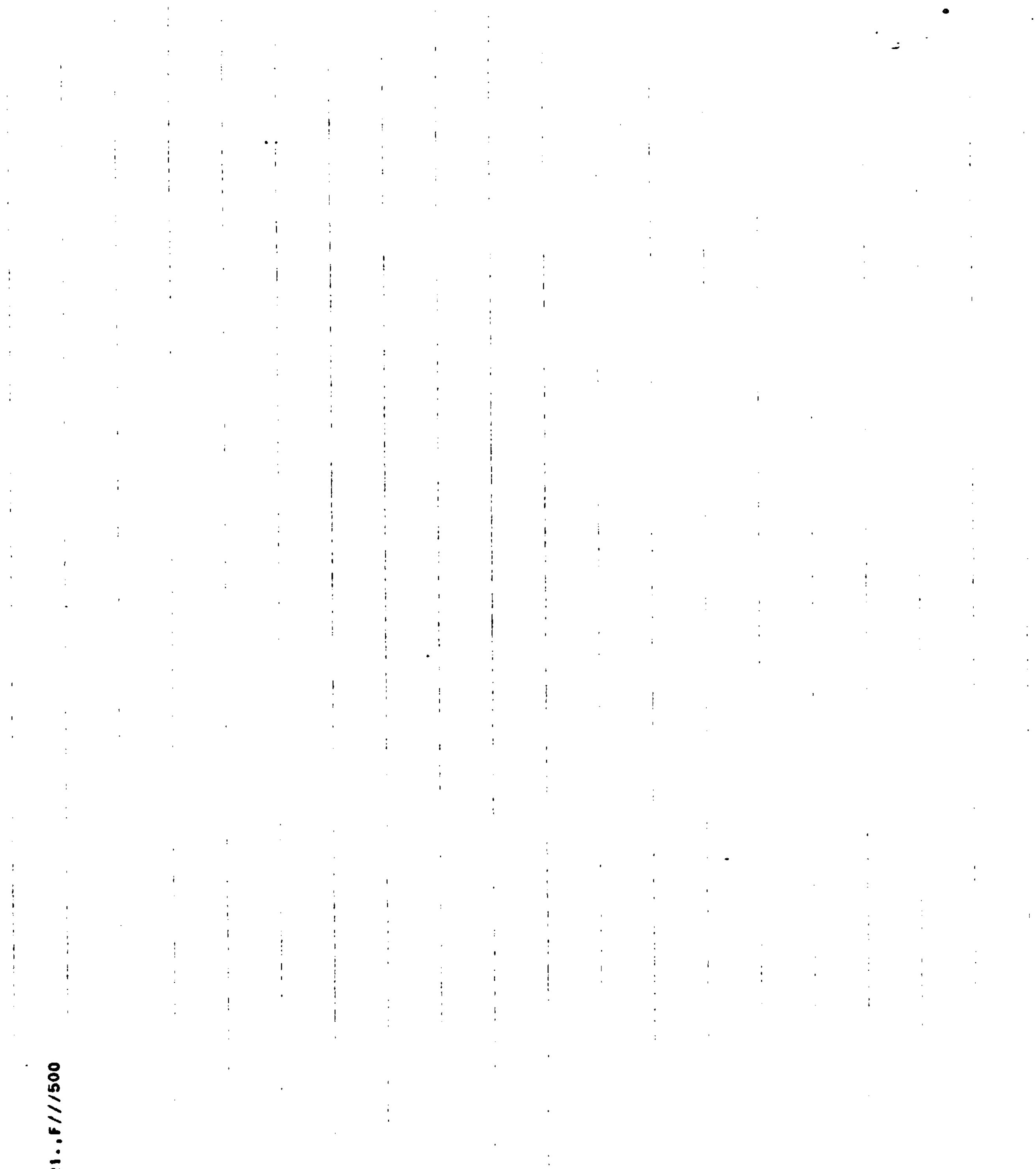
@BRKPT PRINTS
```



@ASG.T 21..F///500

@PASS*NLR.P3R81

```
PAGE    1

BMDP3R - NONLINEAR REGRESSION
DEPARTMENT OF BIOMATHEMATICS
UNIVERSITY OF CALIFORNIA, LOS ANGELES, CA 90024
(213) 825-5940           TWX  UCLA LSA
PROGRAM REVISED JUNE 1981
MANUAL REVISED -- 1981
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09/22/82             AT 16:20:14

TO SEE REMARKS AND A SUMMARY OF NEW FEATURES FOR
THIS PROGRAM, STATE NEWS. IN THE PRINT PARAGRAPH.

PROGRAM CONTROL INFORMATION

/PROBLEM
          TITLE IS ' REGRESSION ON REAL PI DATA'.
/INPUT
          VARIABLES ARE 9.
          FORMAT IS '(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))'.
/VARIABLE
          NAMES ARE PERF,HOLD,CASEWT,TIMEWT,I1,I2,I3,I4,I5.
/REGRESS
          TITLE IS ' PARAMETERS FROM REAL DATA SET # 1( 6 SOURCES)'.
          INDEPENDENT IS PERF.
          DEPENDENT IS HOLD.
          NUMBER IS 2.
          PARAMETERS ARE 7.
          WEIGHT IS CASEWT.
          ITERATIONS ARE 10.
          HALVING IS 50.
/PARAMETER
          INITIAL ARE -20.0, 0.125,0.0,0.0,0.0,0.0,0.0.
/PLOT
          RESIDUAL.
          VARIABLE IS PERF.
          NORMAL.
          DNORMAL.
          SIZE IS 50,40.
/END

PROBLEM TITLE IS
 REGRESSION ON REAL PI DATA

NUMBER OF VARIABLES TO READ IN. . . . . . . . . .        9
NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. .        0
TOTAL NUMBER OF VARIABLES . . . . . . . . . . . .        9
NUMBER OF CASES TO READ IN. . . . . . . . . . . . TO END
CASE LABELING VARIABLES . . . . . . . . . . . . .
MISSING VALUES CHECKED BEFORE OR AFTER TRANS. . NEITHER
BLANKS ARE. . . . . . . . . . . . . . . . . . . . MISSING
INPUT UNIT NUMBER . . . . . . . . . . . . . . . .        5
REWIND INPUT UNIT PRIOR TO READING. . DATA. . .       NO
NUMBER OF WORDS OF DYNAMIC STORAGE. . . . . . .    14998
NUMBER OF CASES DESCRIBED BY INPUT FORMAT . . .        1
```

```
VARIABLES TO BE USED
     1 PERF           2 HOLD          3 CASEWT        4 TIMEWT        5 I1
     6 I2             7 I3            8 I4            9 I5

INPUT FORMAT IS
(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))

MAXIMUM LENGTH DATA RECORD IS   43 CHARACTERS.

I N P U T   V A R I A B L E S . . . . .
  VARIABLE      RECORD   COLUMNS    FIELD  TYPE          VARIABLE     RECORD   COLUMNS    FIELD  TYPE
 INDEX   NAME     NO.   BEGIN  END  WIDTH               INDEX   NAME    NO.   BEGIN  END  WIDTH
 ----- --------  ----   ----- -----  -----  ----         ----- -------  ----  ----- -----  -----  ----
     1 PERF         1       1     6    6.2   F               6 I2          1     37    37     1    F
     2 HOLD         1       7    15    9.5   F               7 I3          1     39    39     1    F
     3 CASEWT       1      16    27   12.5   F               8 I4          1     41    41     1    F
     4 TIMEWT       1      28    33    6.1   F               9 I5          1     43    43     1    F
     5 I1           1      35    35    1     F

VARIABLES TO BE PLOTTED
              1  PERF

  PLOT OF PREDICTED VALUES VERSUS RESIDUALS . . .     YES
  NORMAL PROBABILITY PLOT . . . . . . . . . . . .     YES
  DETRENDED NORMAL PROBABILITY PLOT . . . . . . .     YES
```

REGRESSION TITLE
PARAMETERS FROM REAL DATA SET # 1(6 SOURCES)

```
REGRESSION NUMBER . . . . . . . . . . . . . . . . . .          2
INDEPENDENT VARIABLE(FOR BUILT-IN FUNCTION) . .      PERF
DEPENDENT VARIABLE. . . . . . . . . . . . . . . . .   HOLD
WEIGHTING VARIABLE. . . . . . . . . . . . . . . . .   CASEWT
NUMBER OF PARAMETERS. . . . . . . . . . . . . . . .        7
NUMBER OF CONSTRAINTS . . . . . . . . . . . . . . .        0
TOLERANCE FOR PIVOTING. . . . . . . . . . . . . . .  .00000001000
TOLERANCE FOR CONVERGENCE . . . . . . . . . . . . .  .00001000000
MAXIMUM NUMBER OF ITERATIONS. . . . . . . . . . . .       10
MAXIMUM NUMBER OF INCREMENT HALVINGS. . . . . . . .       50
NUMBER OF DATA PASSES PER CASE. . . . . . . . . . .        1
COMPUTE LOSS FUNCTION . . . . . . . . . . . . . . .       NO
```

USING THE ABOVE SPECIFICATIONS THIS PROGRAM COULD PROCESS 897 CASES.

*ADD,P NLRDAT.A1

BASED ON INPUT FORMAT SUPPLIED 1 RECORDS READ PER CASE.

NUMBER OF CASES READ. 71

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
1	PERF	185.095457	2.520794	163.750000	189.250000
2	HOLD	.000924	.008479	.000000	.976670
3	CASEWT	208299.552734	************	9.491480	425715.648438
4	TIMEWT	654.769562	518.261086	1.000000	1217.000000
5	I1	.098641	.300302	.000000	1.000000
6	I2	.139592	.349030	.000000	1.000000
7	I3	.058102	.235602	.000000	1.000000
8	I4	.098862	.300602	.000000	1.000000
9	I5	.549988	.501036	.000000	1.000000

PARAMETER MAXIMA. . . . . .2126765+038 .2126765+038 .2126765+038 .2126765+038 .2126765+038 .2126765+038

PARAMETER MINIMA. . . . . -.2126765+038 -.2126765+038 -.2126765+038 -.2126765+038 -.2126765+038 -.2126765+038

ITERATION NUMBER	INCREMENT HALVINGS	RESIDUAL SUM OF SQUARES	P1	P2	P3	P4	P5	P6
0	0	.847004+002	-20.000000	.125000	.000000	.000000	.000000	.000000
1	0	.352505+002	-23.103750	.145015	.027791	.048653	-.796166	.102245
2	48	.352505+002	-23.103750	.145015	.027791	.048653	-.796166	.102245
3	50	.352505+002	-23.103750	.145015	.027791	.048653	-.796166	.102245
4	47	.352505+002	-23.103750	.145015	.027791	.048653	-.796166	.102245
5	50	.352505+002	-23.103750	.145015	.027791	.048653	-.796166	.102245

4	48	.352505+002	-23.103750	.145015	.027791	.048653	-.796166	.102245

PARAMETER MAXIMA. . . . . .21267648+038
PARAMETER MINIMA. . . . . -.21267648+038

ITERATION NUMBER	INCREMENT HALVINGS	RESIDUAL SUM OF SQUARES	P7
0	0	.847004+002	.000000
1	0	.352505+002	-.538910
2	48	.352505+002	-.538910
3	50	.352505+002	-.538910
4	47	.352505+002	-.538910
5	50	.352505+002	-.538910
4	48	.352505+002	-.538910

ITERATION 4 HAS THE SMALLEST RESIDUAL SUM OF SQUARES(SUBJECT TO CONSTRAINTS, IF ANY).
REMAINING CALCULATIONS ARE BASED ON THE RESULTS OF THIS ITERATION.

 PARAMETERS FROM REAL DATA SET # 1(6 SOURCES)

ASYMPTOTIC CORRELATION MATRIX OF THE PARAMETERS

		P1 1	P2 2	P3 3	P4 4	P5 5	P6 6	P7 7
P1	1	1.0000						
P2	2	-.9990	1.0000					
P3	3	-.0974	.0657	1.0000				
P4	4	-.2397	.2097	.5161	1.0000			
P5	5	-.0424	.0035	.6488	.6160	1.0000		
P6	6	-.4058	.3739	.5624	.5887	.6601	1.0000	
P7	7	.3927	-.4057	.1825	.1133	.2548	.0608	1.0000

RESIDUAL MEAN SQUARE .550789

DEGREES OF FREEDOM 64

PARAMETER	ESTIMATE	ASYMPTOTIC STANDARD DEVIATION	TOLERANCE
P1	-23.103750	3.439177	.0002158155
P2	.145015	.019653	.0002186206
P3	.027791	.206485	.4661567992
P4	.048653	.217663	.4794914293
P5	-.796166	.168583	.2055876625
P6	.102245	.203278	.3138332964
P7	-.538910	.522785	.7528325200

PAGE 4 PARAMETERS FROM REAL DATA SET # 1(6 SOURCES)

CASE NO.	LABEL	PREDICTED HOLD	STD DEV OF PRED VALUE	OBSERVED HOLD	RESIDUAL	CASEWT	PERF	TIMEWT	I1
1		.025732	.009322	.000000	-.025732	1576.689163	172.750000	154.000000	.000000
2		.015189	.005768	.009230	-.005959	6217.934937	174.250000	368.000000	.000000
3		.008594	.003533	.000000	-.008594	11092.098999	175.750000	374.000000	.000000
4		.004659	.002140	.000000	-.004659	14020.418457	177.250000	256.000000	.000000
5		.002419	.001272	.000000	-.002419	10276.496582	178.750000	95.000000	.000000
6		.001202	.000734	.000000	-.001202	9461.960449	180.250000	41.000000	.000000
7		.000572	.000408	.000000	-.000572	49526.041504	181.750000	109.000000	.000000
8		.000260	.000216	.000000	-.000260	42741.062988	183.250000	40.000000	.000000
9		.000113	.000109	.000000	-.000113	106987.363281	184.750000	44.000000	.000000
10		.000047	.000053	.000000	-.000047	199516.130859	186.250000	33.000000	.000000
11		.000019	.000024	.000000	-.000019	135183.197266	187.750000	3.000000	.000000
12		.039385	.012931	.000000	-.039385	164.917891	171.250000	20.000000	1.000000
13		.024112	.008141	.017020	-.007092	2518.738983	172.750000	233.000000	1.000000
14		.014157	.005080	.000000	-.014157	10891.497681	174.250000	604.000000	1.000000
15		.007967	.003156	.000000	-.007967	4969.676147	175.750000	153.000000	1.000000
16		.004295	.001940	.000000	-.004295	6381.258850	177.250000	105.000000	1.000000
17		.002217	.001167	.000000	-.002217	3035.789459	178.750000	22.000000	1.000000
18		.001096	.000678	.000000	-.001096	33605.030762	180.250000	143.000000	1.000000
19		.000518	.000378	.000000	-.000518	47883.004883	181.750000	95.000000	1.000000
20		.000234	.000200	.000000	-.000234	49534.824219	183.250000	42.000000	1.000000
21		.000101	.000101	.000000	-.000101	513205.421875	184.750000	204.000000	1.000000
22		.000042	.000048	.000000	-.000042	436734.957031	186.250000	69.000000	1.000000
23		.000017	.000022	.000000	-.000017	175667.248047	187.750000	5.000000	1.000000
24		.089525	.027879	.000000	-.089525	40.672113	168.250000	7.000000	.000000
25		.059238	.018887	.028860	-.030378	426.998890	169.750000	91.000000	.000000
26		.037642	.012525	.026610	-.011032	884.284004	171.250000	124.000000	.000000
27		.022953	.008203	.000000	-.022953	1662.252701	172.750000	145.000000	.000000
28		.013422	.005319	.000000	-.013422	1702.822601	174.250000	86.000000	.000000
29		.007522	.003308	.000000	-.007522	3959.192963	175.750000	114.000000	.000000
30		.004039	.002118	.000000	-.004039	6660.363342	177.250000	103.000000	.000000
31		.002076	.001275	.000000	-.002076	16425.008789	178.750000	132.000000	.000000
32		.001022	.000736	.000000	-.001022	41910.780762	180.250000	167.000000	.000000
33		.000481	.000405	.000000	-.000481	77013.069336	181.750000	144.000000	.000000
34		.000217	.000212	.000000	-.000217	176707.736328	183.250000	149.000000	.000000
35		.000093	.000105	.000000	-.000093	************	184.750000	392.000000	.000000
36		.000038	.000050	.000000	-.000038	457010.527344	186.250000	66.000000	.000000
37		.308937	.052717	.976670	.667733	10.992023	168.250000	2.000000	.000000
38		.236876	.038648	.505960	.269084	37.153728	169.750000	22.000000	.000000
39		.175175	.026682	.569260	.394085	21.534353	171.250000	6.000000	.000000
40		.124777	.017758	.085040	-.039737	485.492828	172.750000	208.000000	.000000
41		.085507	.012065	.076380	-.009127	1262.996567	174.250000	391.000000	.000000
42		.056315	.008920	.043260	-.013055	1171.656952	175.750000	245.000000	.000000
43		.035616	.007084	.000000	-.035616	1885.627411	177.250000	255.000000	.000000
44		.021613	.005636	.003400	-.018213	2779.173584	178.750000	231.000000	.000000
45		.012576	.004282	.000000	-.012576	593.933365	180.250000	25.000000	.000000
46		.007014	.003057	.000000	-.007014	2557.802917	181.750000	67.000000	.000000
47		.003747	.002043	.000000	-.003747	3175.433258	183.250000	43.000000	.000000
48		.001916	.001281	.000000	-.001916	10225.018677	184.750000	74.000000	.000000
49		.000938	.000755	.000000	-.000938	8971.585815	186.250000	29.000000	.000000
50		.000439	.000419	.000000	-.000439	5342.279175	187.750000	2.000000	.000000
51		.228224	.054954	.000000	-.228224	12.320342	163.750000	1.000000	.000000

52	.167967	.040142	.060000	-.107967	20.839239	165.250000	5.000000	.000000
53	.119049	.027998	.016670	-.102379	73.226260	166.750000	26.000000	.000000
54	.081165	.018894	.000000	-.081165	225.507372	168.250000	63.000000	.000000
55	.053177	.012600	.071710	.018533	889.253212	169.750000	175.000000	.000000
56	.033452	.008489	.000000	-.033452	913.510033	171.250000	114.000000	.000000
57	.020190	.005818	.004010	-.016180	2465.411499	172.750000	191.000000	.000000
58	.011684	.003997	.000000	-.011684	8855.659771	174.250000	405.000000	.000000
59	.006480	.002690	.000000	-.006480	435[illegible].404846	175.750000	108.000000	.000000
60	.003442	.001740	.000000	-.003442	4105.821716	177.250000	52.000000	.000000
61	.001751	.001072	.000000	-.001751	4672.717773	178.750000	28.000000	.000000
62	.000852	.000626	.000000	-.000852	24434.864990	180.250000	79.000000	.000000
63	.000397	.000345	.000000	-.000397	3112[illegible].756348	181.750000	45.000000	.000000
64	.000177	.000180	.000000	-.000177	96551.155273	183.250000	64.000000	.000000
65	.000075	.000089	.002660	.002585	720601.515625	184.750000	213.000000	.000000
66	.000031	.000042	.000000	-.000031	686300.570313	186.250000	80.000000	.000000
67	.000012	.000019	.000000	-.000012	211601.990234	187.750000	3.000000	.000000
68	.000820	.001273	.000000	-.000820	145031.253906	184.750000	471.000000	.000000
69	.000381	.000626	.000660	.000279	801930.007813	186.250000	1217.000000	.000000
70	.000169	.000295	.000000	-.000169	12824.515503	187.750000	1.000000	.000000
71	.000072	.000133	.000000	-.000072	30171.541016	189.250000	1.000000	.000000

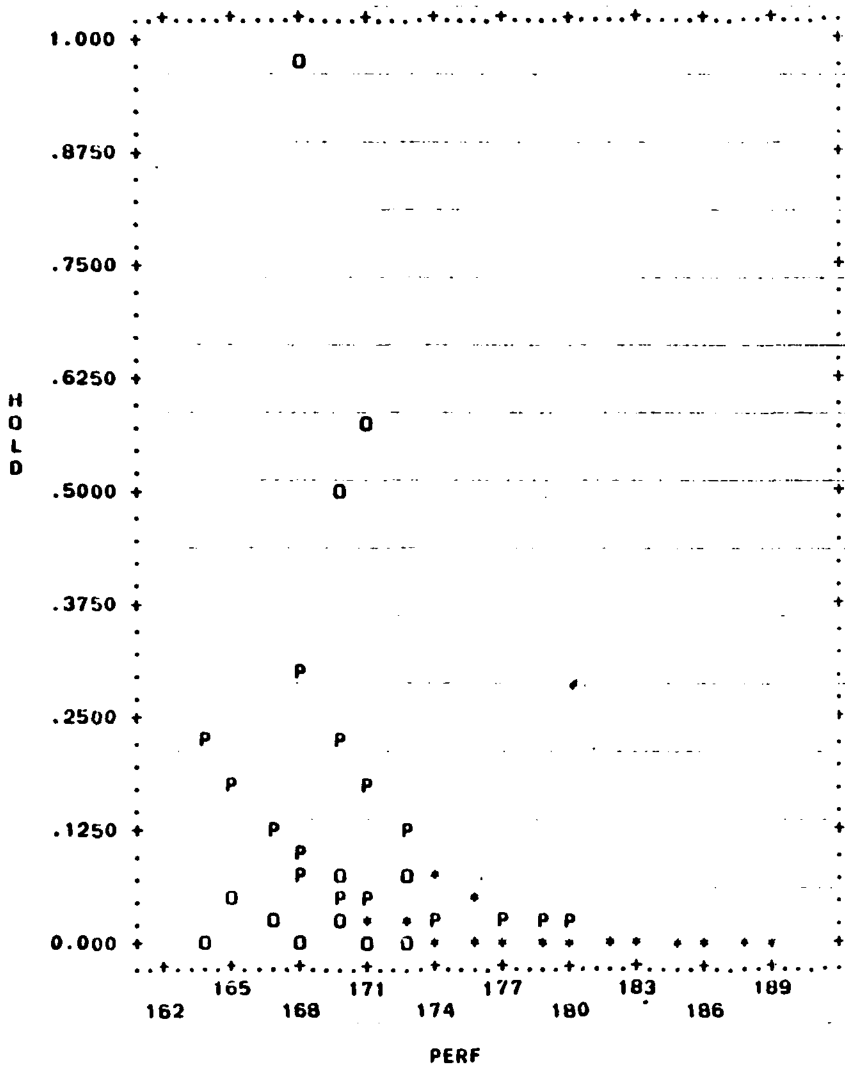
CASE	I2	I3	I4	I5
1	.000000	.000000	.000000	.000000
2	.000000	.000000	.000000	.000000
3	.000000	.000000	.000000	.000000
4	.000000	.000000	.000000	.000000
5	.000000	.000000	.000000	.000000
6	.000000	.000000	.000000	.000000
7	.000000	.000000	.000000	.000000
8	.000000	.000000	.000000	.000000
9	.000000	.000000	.000000	.000000
10	.000000	.000000	.000000	.000000
11	.000000	.000000	.000000	.000000
12	.000000	.000000	.000000	.000000
13	.000000	.000000	.000000	.000000
14	.000000	.000000	.000000	.000000
15	.000000	.000000	.000000	.000000
16	.000000	.000000	.000000	.000000
17	.000000	.000000	.000000	.000000
18	.000000	.000000	.000000	.000000
19	.000000	.000000	.000000	.000000
20	.000000	.000000	.000000	.000000
21	.000000	.000000	.000000	.000000
22	.000000	.000000	.000000	.000000
23	.000000	.000000	.000000	.000000
24	1.000000	.000000	.000000	.000000
25	1.000000	.000000	.000000	.000000
26	1.000000	.000000	.000000	.000000
27	1.000000	.000000	.000000	.000000
28	1.000000	.000000	.000000	.000000
29	1.000000	.000000	.000000	.000000
30	1.000000	.000000	.000000	.000000
31	1.000000	.000000	.000000	.000000
32	1.000000	.000000	.000000	.000000
33	1.000000	.000000	.000000	.000000
34	1.000000	.000000	.000000	.000000

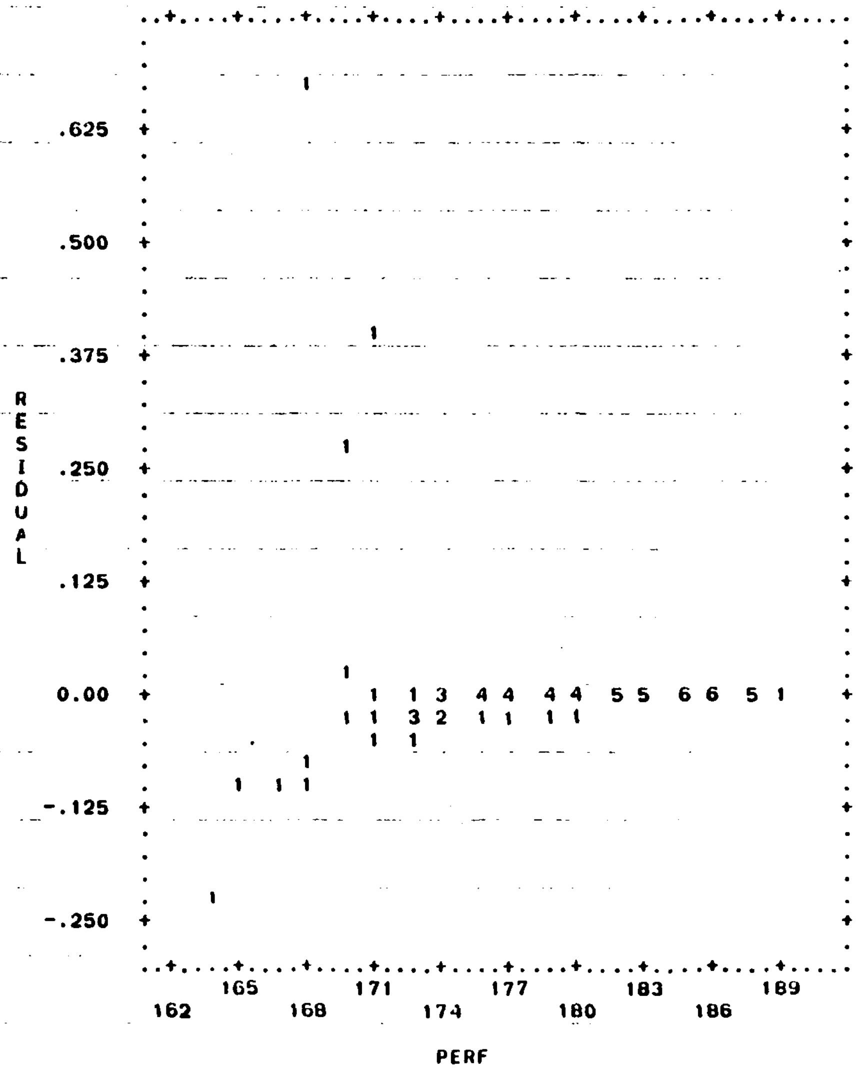
35	1.000000	.000000	.000000	.000000
36	1.000000	.000000	.000000	.000000
37	.000000	1.000000	.000000	.000000
38	.000000	1.000000	.000000	.000000
39	.000000	1.000000	.000000	.000000
40	.000000	1.000000	.000000	.000000
41	.000000	1.000000	.000000	.000000
42	.000000	1.000000	.000000	.000000
43	.000000	1.000000	.000000	.000000
44	.000000	1.000000	.000000	.000000
45	.000000	1.000000	.000000	.000000
46	.000000	1.000000	.000000	.000000
47	.000000	1.000000	.000000	.000000
48	.000000	1.000000	.000000	.000000
49	.000000	1.000000	.000000	.000000
50	.000000	1.000000	.000000	.000000
51	.000000	.000000	1.000000	.000000
52	.000000	.000000	1.000000	.000000
53	.000000	.000000	1.000000	.000000
54	.000000	.000000	1.000000	.000000
55	.000000	.000000	1.000000	.000000
56	.000000	.000000	1.000000	.000000
57	.000000	.000000	1.000000	.000000
58	.000000	.000000	1.000000	.000000
59	.000000	.000000	1.000000	.000000
60	.000000	.000000	1.000000	.000000
61	.000000	.000000	1.000000	.000000
62	.000000	.000000	1.000000	.000000
63	.000000	.000000	1.000000	.000000
64	.000000	.000000	1.000000	.000000
65	.000000	.000000	1.000000	.000000
66	.000000	.000000	1.000000	.000000
67	.000000	.000000	1.000000	.000000
68	.000000	.000000	.000000	1.000000
69	.000000	.000000	.000000	1.000000
70	.000000	.000000	.000000	1.000000
71	.000000	.000000	.000000	1.000000

SERIAL CORRELATION .481

PAGE 5 PARAMETERS FROM REAL DATA SET # 1(6 SOURCES)

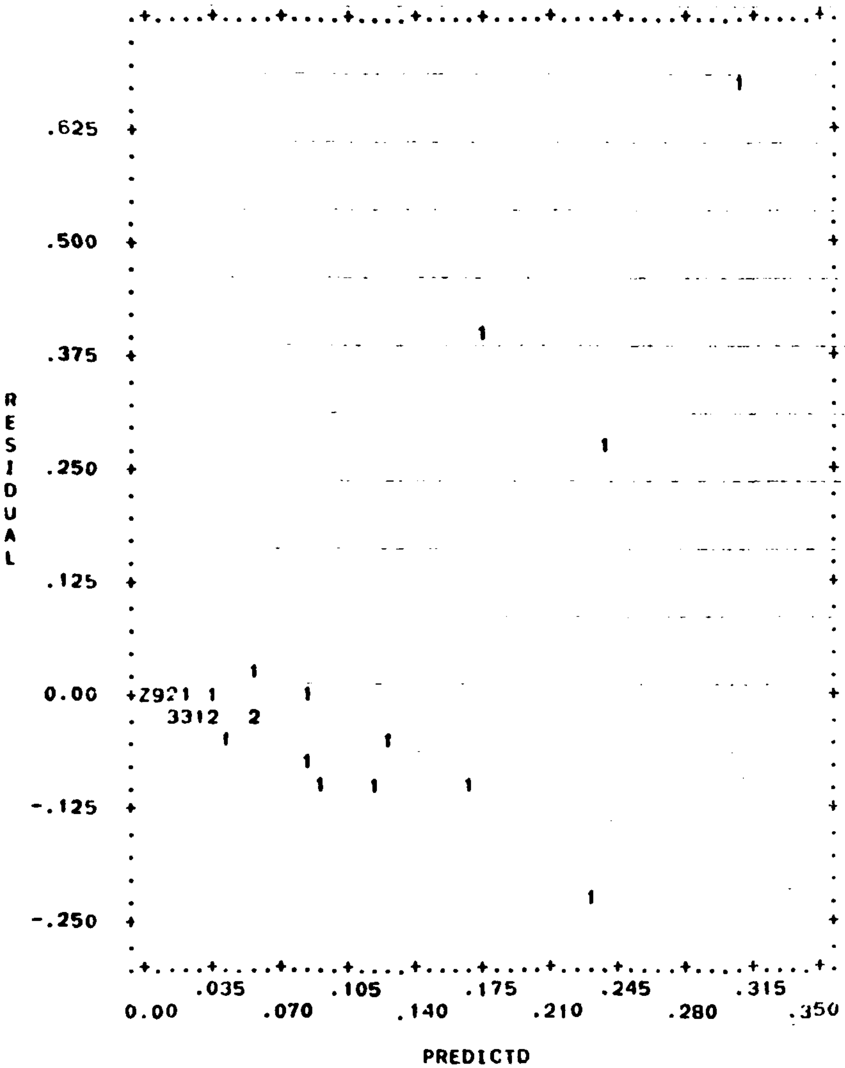
PLOTS OF VARIABLE(1) VERSUS PREDICTED AND OBSERVED VARIABLE(2) AND VERSUS RESIDUALS.

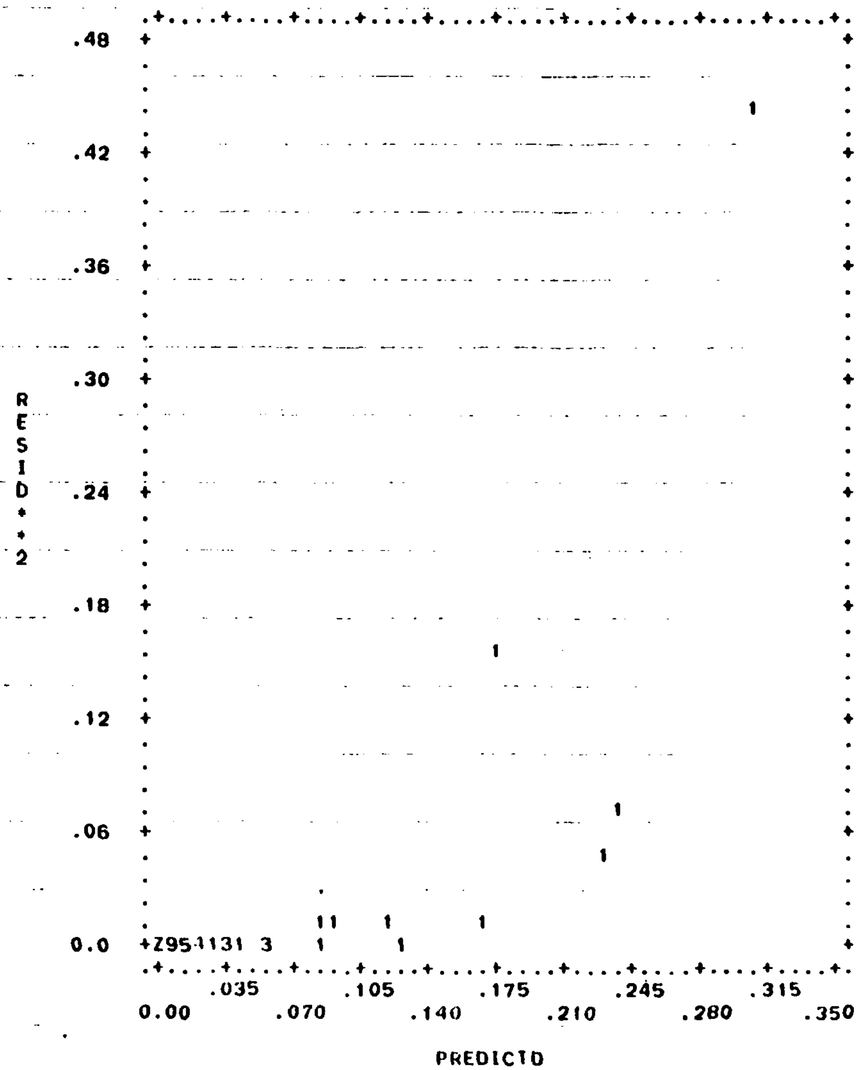




PAGE 6 PARAMETERS FROM REAL DATA SET # 1(6 SOURCES)

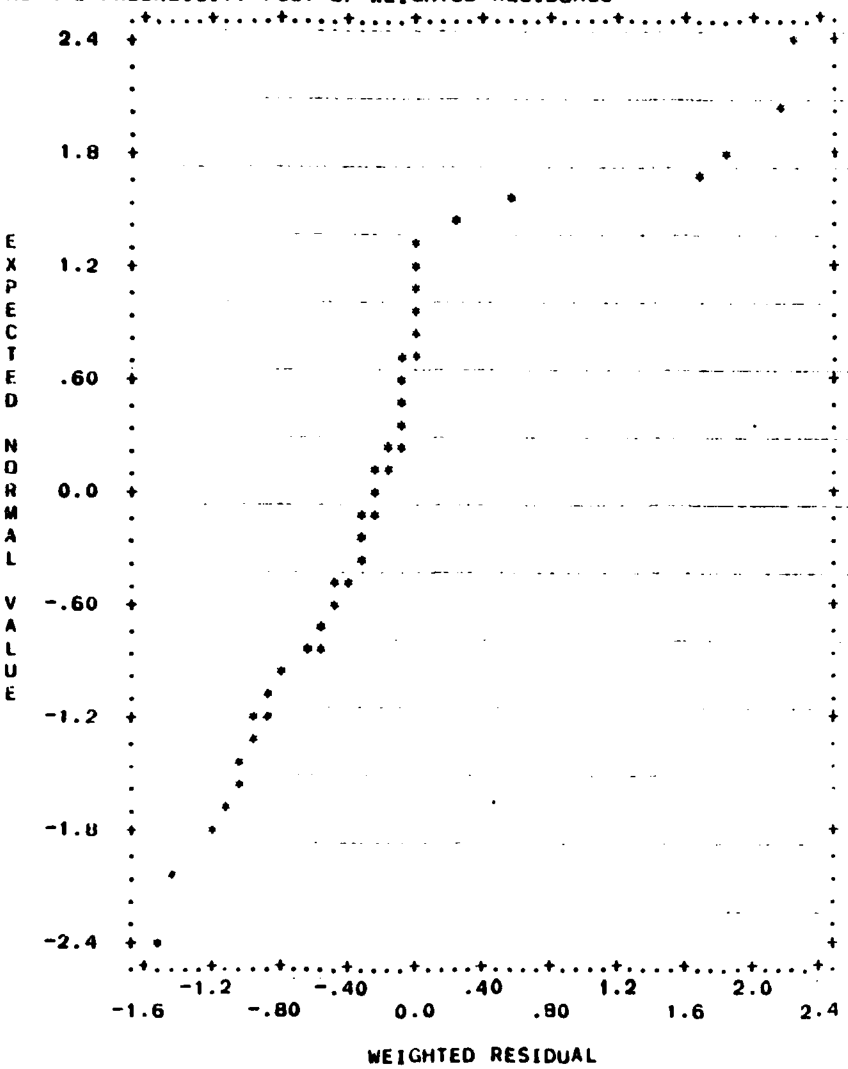
PLOTS OF PREDICTED VARIABLE HOLD VERSUS RESIDUALS AND VERSUS RESIDUALS SQUARED





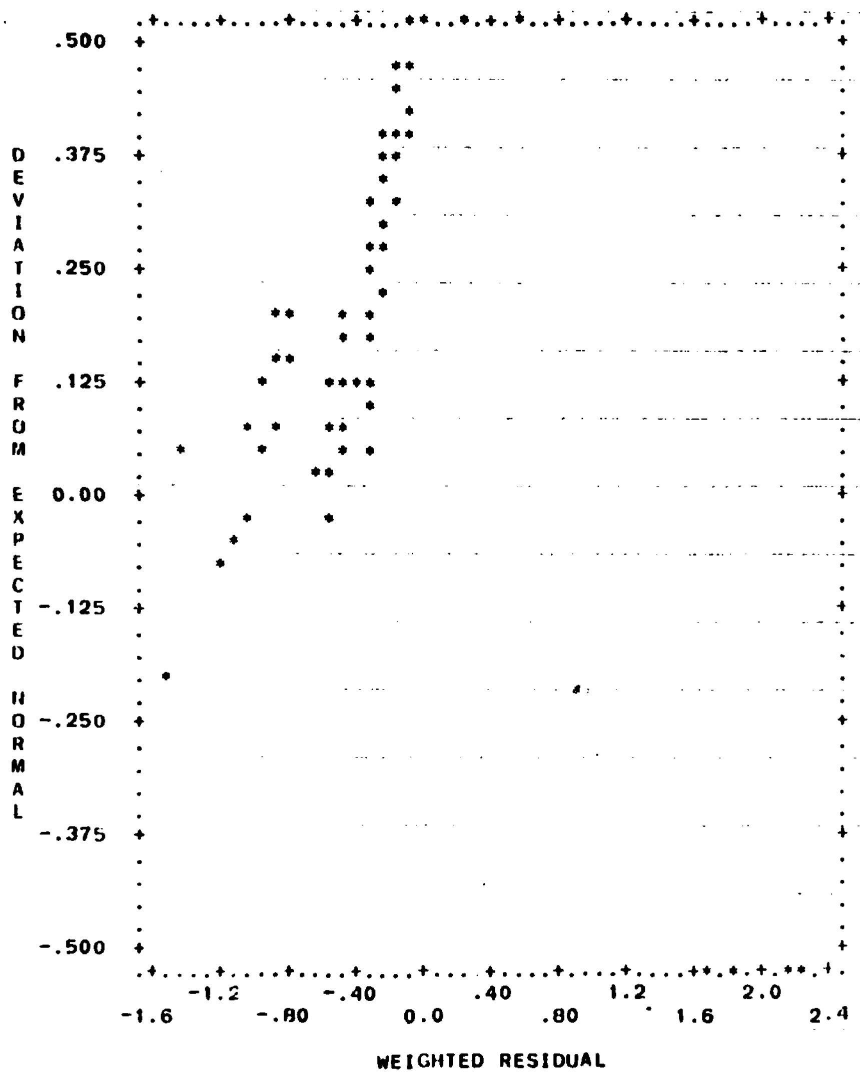
PAGE 7 PARAMETERS FROM REAL DATA SET # 1(6 SOURCES)

NORMAL PROBABILITY PLOT OF WEIGHTED RESIDUALS



PARAMETERS FROM REAL DATA SET # 1(6 SOURCES)

DETRENDED NORMAL PROBABILITY PLOT OF WEIGHTED RESIDUALS



CPU TIME USED 77.473 SECONDS

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PAGE    9

BMDP3R - NONLINEAR REGRESSION
09/22/82              AT 16:22:09

NO MORE CONTROL LANGUAGE.

PROGRAM TERMINATED


@TEST TNE/0/13


@JUMP 3
INTERVENING STATEMENTS SKIPPED


@ERS 21.
FURPUR 28R2 S74R1A 09/22/82 16:22:10
END ERS.
```

@PASS*NLR.P3R81

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BMDP3R - NONLINEAR REGRESSION
DEPARTMENT OF BIOMATHEMATICS
UNIVERSITY OF CALIFORNIA, LOS ANGELES, CA 90024
(213) 825-5940          TWX  UCLA LSA
PROGRAM REVISED JUNE 1981
MANUAL REVISED -- 1981
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09/22/82              AT 16:22:10

TO SEE REMARKS AND A SUMMARY OF NEW FEATURES FOR
THIS PROGRAM, STATE NEWS. IN THE PRINT PARAGRAPH.

PROGRAM CONTROL INFORMATION

/PROBLEM
          TITLE IS ' REGRESSION ON REAL PI DATA'.
/INPUT
          VARIABLES ARE 8.
          FORMAT IS '(F6.2,F9.5,F12.5,F6.0,5(1X,F1.0))'.
/VARIABLE
          NAMES ARE PERF,HOLD,CASEWT,TIMEWT,I1,I2,I3,I4.
/REGRESS
          TITLE IS ' PARAMETERS FROM REAL DATA SET # 2( 5 SOURCES)'.
          INDEPENDENT IS PERF.
          DEPENDENT IS HOLD.
          NUMBER IS 2.
          PARAMETERS ARE 6.
          WEIGHT IS CASEWT.
          ITERATIONS ARE 10.
          HALVING IS 50.
/PARAMETER
          INITIAL ARE -20.0, 0.125,0.0,0.0,0.0,0.0.
/PLOT
          RESIDUAL.
          VARIABLE IS PERF,
          NORMAL.
          DNORMAL.
          SIZE IS 50,40.
/END

PROBLEM TITLE IS
 REGRESSION ON REAL PI DATA

NUMBER OF VARIABLES TO READ IN. . . . . . . . . .          8
NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. .            0
TOTAL NUMBER OF VARIABLES . . . . . . . . . . .            8
NUMBER OF CASES TO READ IN. . . . . . . . . . . . TO END
CASE LABELING VARIABLES . . . . . . . . . . . . .
MISSING VALUES CHECKED BEFORE OR AFTER TRANS. . NEITHER
BLANKS ARE. . . . . . . . . . . . . . . . . . . MISSING
INPUT UNIT NUMBER . . . . . . . . . . . . . . .            5
REWIND INPUT UNIT PRIOR TO READING. . DATA. . .           NO
NUMBER OF WORDS OF DYNAMIC STORAGE. . . . . . .        14998
NUMBER OF CASES DESCRIBED BY INPUT FORMAT . . .            1
```

```
VARIABLES TO BE USED
     1 PERF          2 HOLD          3 CASEWT       4 TIMEWT       5 I1
     6 I2            7 I3            8 I4

INPUT FORMAT IS
(F6.2,F9.5,F12.5,F6.0,5(1X,F1.0))

MAXIMUM LENGTH DATA RECORD IS   41 CHARACTERS.

I N P U T   V A R I A B L E S . . . . .
  VARIABLE      RECORD   COLUMNS     FIELD   TYPE          VARIABLE      RECORD   COLUMNS    FIELD   TYPE
 INDEX   NAME     NO.   BEGIN  END   WIDTH                INDEX   NAME     NO.   BEGIN  END   WIDTH
 -----  --------  ----  -----  ----- -----   ----         -----  --------  ----  -----  ----- -----   ----
     1 PERF         1       1     6    6.2    F               5 I1           1     35    35     1      F
     2 HOLD         1       7    15    9.5    F               6 I2           1     37    37     1      F
     3 CASEWT       1      16    27   12.5    F               7 I3           1     39    39     1      F
     4 TIMEWT       1      28    33    6      F               8 I4           1     41    41     1      F

VARIABLES TO BE PLOTTED
             1  PERF

  PLOT OF PREDICTED VALUES VERSUS RESIDUALS . . .     YES
  NORMAL PROBABILITY PLOT . . . . . . . . . . . .     YES
  DETRENDED NORMAL PROBABILITY PLOT . . . . . . .     YES
```

REGRESSION TITLE
PARAMETERS FROM REAL DATA SET # 2(5 SOURCES)

REGRESSION NUMBER 2
INDEPENDENT VARIABLE(FOR BUILT-IN FUNCTION) . . PERF
DEPENDENT VARIABLE. . . . . HOLD
WEIGHTING VARIABLE. . . . . CASEWT
NUMBER OF PARAMETERS. 6
NUMBER OF CONSTRAINTS 0
TOLERANCE FOR PIVOTING. 00000001000
TOLERANCE FOR CONVERGENCE 00001000000
MAXIMUM NUMBER OF ITERATIONS. 10
MAXIMUM NUMBER OF INCREMENT HALVINGS. 50
NUMBER OF DATA PASSES PER CASE. 1
COMPUTE LOSS FUNCTION . . . . NO

USING THE ABOVE SPECIFICATIONS THIS PROGRAM COULD PROCESS 962 CASES.

#ADD,P N RDAT.A2

BASED ON INPUT FORMAT SUPPLIED 1 RECORDS READ PER CASE.

NUMBER OF CASES READ. 80

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
1	PERF	188.033289	2.274476	160.750000	189.250000
2	HOLD	.019983	.050401	.000000	.993330
3	CASEWT	215238.474609	************	9.599320	398959.062500
4	TIMEWT	189.973511	90.081267	2.000000	328.000000
5	I1	.266483	.444909	.000000	1.000000
6	I2	.240860	.430304	.000000	1.000000
7	I3	.162466	.371205	.000000	1.000000
8	I4	.163953	.372569	.000000	1.000000

PARAMETER MAXIMA.	.2126765+038	.2126765+038	.2126765+038	.2126765+038	.2126765+038	.2126765+038
PARAMETER MINIMA.	-.2126765+038	-.2126765+038	-.2126765+038	-.2126765+038	-.2126765+038	-.2126765+038

ITERATION NUMBER	INCREMENT HALVINGS	RESIDUAL SUM OF SQUARES	P1	P2	P3	P4	P5	P6
0	0	.759808+004	-20.000000	.125000	.000000	.000000	.000000	.000000
1	2	.256848+003	3.191531	-.010508	-.097136	1.163948	-1.398860	.344431
2	0	.710375+002	-3.206516	.026536	.001244	1.118124	-.924117	.506460
3	0	.609974+002	-6.891874	.048034	.073468	1.172880	-1.043976	.682411
4	7	.609973+002	-6.904113	.048106	.073758	1.173642	-1.044521	.683405
5	43	.609973+002	-6.904113	.048106	.073758	1.173642	-1.044521	.683405
6	45	.609973+002	-6.904113	.048106	.073758	1.173642	-1.044521	.683405

7	50	.609973+002	-6.904113	.048106	.073758	1.173642	-1.044521	.683405
6	43	.609973+002	-6.904113	.048106	.073758	1.173642	-1.044521	.683405

ITERATION 6 HAS THE SMALLEST RESIDUAL SUM OF SQUARES(SUBJECT TO CONSTRAINTS, IF ANY).
REMAINING CALCULATIONS ARE BASED ON THE RESULTS OF THIS ITERATION.

 PARAMETERS FROM REAL DATA SET # 2(5 SOURCES)

ASYMPTOTIC CORRELATION MATRIX OF THE PARAMETERS

		P1 1	P2 2	P3 3	P4 4	P5 5	P6 6
P1	1	1.0000					
P2	2	-.9958	1.0000				
P3	3	-.1553	.0863	1.0000			
P4	4	.0563	-.0823	.2052	1.0000		
P5	5	.0940	-.1738	.6413	.2560	1.0000	
P6	6	-.0724	.0203	.4354	.1580	.4902	1.0000

RESIDUAL MEAN SQUARE .824288

DEGREES OF FREEDOM 74

PARAMETER	ESTIMATE	ASYMPTOTIC STANDARD DEVIATION	TOLERANCE
P1	-6.904113	1.310880	.0013238834
P2	.048106	.007419	.0013129434
P3	.073758	.157829	.4160501974
P4	1.173642	.428621	.9150665665
P5	-1.044521	.138632	.2225826522
P6	.683405	.209827	.6734094942

PAGE 4 PARAMETERS FROM REAL DATA SET # 2(5 SOURCES)

CASE NO.	LABEL	PREDICTED HOLD	STD DEV OF PRED VALUE	OBSERVED HOLD	RESIDUAL	CASEWT	PERF	TIMEWT	I1
1		.147924	.033209	.109540	-.038384	43.901085	165.250000	17.000000	.000000
2		.131882	.029469	.082220	-.049662	27.176940	166.750000	6.000000	.000000
3		.117083	.026102	.000000	-.117083	24.470298	168.250000	3.000000	.000000
4		.103501	.023101	.145080	.041579	125.072227	169.750000	42.000000	.000000
5		.091100	.020452	.061740	-.029360	592.040070	171.250000	192.000000	.000000
6		.079837	.018135	.134190	.054353	323.919312	172.750000	91.000000	.000000
7		.069660	.016119	.056670	-.012990	148.642050	174.250000	34.000000	.000000
8		.060512	.014372	.287200	.226688	165.128185	175.750000	33.000000	.000000
9		.052332	.012857	.086980	.034648	268.963570	177.250000	49.000000	.000000
10		.045056	.011539	.000000	-.045056	156.094604	178.750000	22.000000	.000000
11		.038617	.010384	.000000	-.038617	83.609115	180.250000	6.000000	.000000
12		.032948	.009361	.000000	-.032948	356.467453	181.750000	41.000000	.000000
13		.027984	.008444	.000000	-.027984	318.117531	183.250000	30.000000	.000000
14		.023659	.007614	.000000	-.023659	385.188522	184.750000	31.000000	.000000
15		.019911	.006854	.000000	-.019911	1807.929520	186.250000	137.000000	.000000
16		.016679	.006155	.000000	-.016679	2714.793304	187.750000	174.000000	.000000
17		.013906	.005507	.000000	-.013906	1880.856415	189.250000	99.000000	.000000
18		.131541	.025852	.243960	.112419	90.784982	165.250000	37.000000	1.000000
19		.116769	.022674	.081610	-.035159	160.654871	166.750000	62.000000	1.000000
20		.103213	.019884	.232550	.129337	210.675974	168.250000	76.000000	1.000000
21		.090838	.017469	.147630	.056792	611.730278	169.750000	198.000000	1.000000
22		.079599	.015403	.046210	-.033369	447.461529	171.250000	127.000000	1.000000
23		.069446	.013653	.000000	-.069446	248.694382	172.750000	60.000000	1.000000
24		.060320	.012178	.000000	-.060320	309.878658	174.250000	66.000000	1.000000
25		.052161	.010936	.045050	-.007111	279.832489	175.750000	51.000000	1.000000
26		.044904	.009881	.000000	-.044904	607.200905	177.250000	100.000000	1.000000
27		.038483	.008972	.000000	-.038483	300.280350	178.750000	40.000000	1.000000
28		.032831	.008174	.000000	-.032831	311.113548	180.250000	35.000000	1.000000
29		.027882	.007458	.000000	-.027882	464.697273	181.750000	46.000000	1.000000
30		.023570	.006802	.000000	-.023570	501.259804	183.250000	42.000000	1.000000
31		.019833	.006191	.000000	-.019833	635.158020	184.750000	45.000000	1.000000
32		.016612	.005617	.000000	-.016612	649.935638	186.250000	38.000000	1.000000
33		.013850	.005073	.000000	-.013850	2345.410400	187.750000	124.000000	1.000000
34		.011493	.004559	.000000	-.011493	6448.937073	189.250000	289.000000	1.000000
35		.004001	.004892	.000000	-.004001	1159.029999	174.250000	13.000000	.000000
36		.003224	.004018	.000000	-.003224	3683.756927	175.750000	43.000000	.000000
37		.002585	.003286	.000000	-.002585	8649.981689	177.250000	85.000000	.000000
38		.002062	.002675	.000000	-.002062	21140.721680	178.750000	170.000000	.000000
39		.001638	.002168	.000000	-.001638	28601.078125	180.250000	183.000000	.000000
40		.001294	.001749	.003550	.002256	38887.701172	181.750000	197.000000	.000000
41		.001018	.001405	.000000	-.001018	81620.277344	183.250000	328.000000	.000000
42		.000797	.001123	.000000	-.000797	4962.029358	184.750000	10.000000	.000000
43		.000621	.000894	.000000	-.000621	13551.436768	186.250000	29.000000	.000000
44		.000481	.000709	.000000	-.000481	6895.410339	187.750000	7.000000	.000000
45		.000371	.000559	.000000	-.000371	194173.244141	189.250000	284.000000	.000000
46		.585358	.059136	.000000	-.585358	12.819499	160.750000	6.000000	.000000
47		.557037	.055974	.000000	-.557037	9.510729	162.250000	2.000000	.000000
48		.528421	.052520	.000000	-.528421	12.486235	163.750000	6.000000	.000000
49		.499658	.048848	.993330	.493672	11.649482	165.250000	5.000000	.000000
50		.470897	.045037	.000000	-.470897	10.910091	166.750000	4.000000	.000000
51		.442286	.041176	.660200	.217914	16.901707	168.250000	11.000000	.000000

52	.413974	.037363	.630000	.216026	21.850699	169.750000	16.000000	.000000
53	.386102	.033698	.480480	.094378	31.449305	171.250000	28.000000	.000000
54	.358806	.030288	.186780	-.172026	109.854238	172.750000	96.000000	.000000
55	.332213	.027240	.257220	-.074993	63.482011	174.250000	52.000000	.000000
56	.306439	.024655	.278200	-.028239	115.484661	175.750000	94.000000	.000000
57	.281589	.022612	.456990	.175401	112.696852	177.250000	87.000000	.000000
58	.257754	.021148	.336300	.078546	239.251770	178.750000	179.000000	.000000
59	.235010	.020241	.258990	.023980	282.402748	180.250000	199.000000	.000000
60	.213422	.019808	.284660	.071238	174.457430	181.750000	113.000000	.000000
61	.193036	.019721	.142070	-.050966	129.750628	183.250000	71.000000	.000000
62	.173886	.019839	.197030	.023144	183.023705	184.750000	101.000000	.000000
63	.155989	.020037	.080770	-.075219	188.323151	186.250000	95.000000	.000000
64	.139351	.020213	.095070	-.044281	267.094849	187.750000	124.000000	.000000
65	.123964	.020296	.111430	-.012534	253.591486	189.250000	106.000000	.000000
66	.030527	.012435	.000000	-.030527	220.932047	168.250000	22.000000	.000000
67	.025872	.010657	.000000	-.025872	401.739605	169.750000	36.000000	.000000
68	.021826	.009118	.014220	-.007606	2413.174774	171.250000	202.000000	.000000
69	.018328	.007790	.027130	.008802	2571.846008	172.750000	181.000000	.000000
70	.015319	.006648	.017580	.002261	1891.848175	174.250000	110.000000	.000000
71	.012745	.005667	.000000	-.012745	2545.851929	175.750000	124.000000	.000000
72	.010554	.004826	.000000	-.010554	1920.582520	177.250000	76.000000	.000000
73	.008698	.004105	.000000	-.008698	1345.886856	178.750000	42.000000	.000000
74	.007135	.003487	.000000	-.007135	781.054176	180.250000	17.000000	.000000
75	.005826	.002958	.000000	-.005826	3290.677826	181.750000	72.000000	.000000
76	.004734	.002504	.000000	-.004734	7329.161316	183.250000	134.000000	.000000
77	.003828	.002115	.000000	-.003828	6632.207092	184.750000	97.000000	.000000
78	.003081	.001782	.000000	-.003081	7909.113525	186.250000	93.000000	.000000
79	.002468	.001497	.000000	-.002468	18692.990234	187.750000	180.000000	.000000
80	.001968	.001253	.000000	-.001968	11229.131714	189.250000	84.000000	.000000

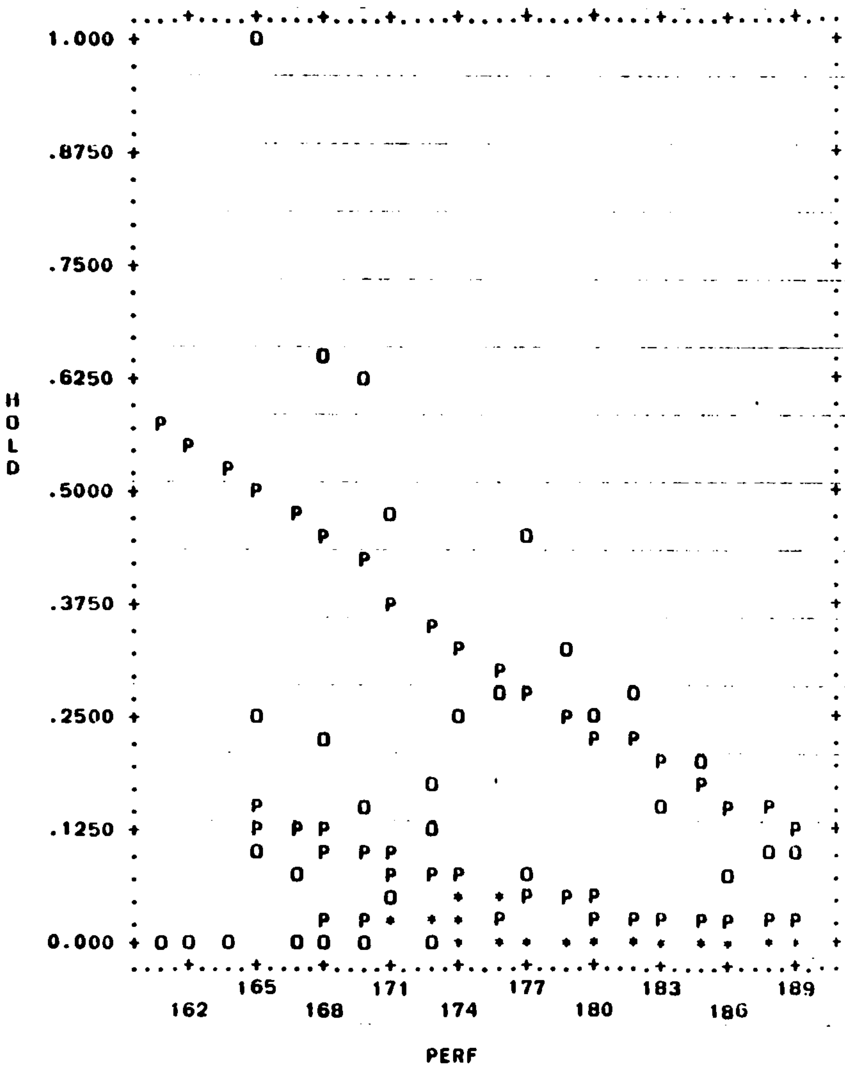
CASE	I2	I3	I4
1	.000000	.000000	.000000
2	.000000	.000000	.000000
3	.000000	.000000	.000000
4	.000000	.000000	.000000
5	.000000	.000000	.000000
6	.000000	.000000	.000000
7	.000000	.000000	.000000
8	.000000	.000000	.000000
9	.000000	.000000	.000000
10	.000000	.000000	.000000
11	.000000	.000000	.000000
12	.000000	.000000	.000000
13	.000000	.000000	.000000
14	.000000	.000000	.000000
15	.000000	.000000	.000000
16	.000000	.000000	.000000
17	.000000	.000000	.000000
18	.000000	.000000	.000000
19	.000000	.000000	.000000
20	.000000	.000000	.000000
21	.000000	.000000	.000000
22	.000000	.000000	.000000
23	.000000	.000000	.000000
24	.000000	.000000	.000000
25	.000000	.000000	.000000

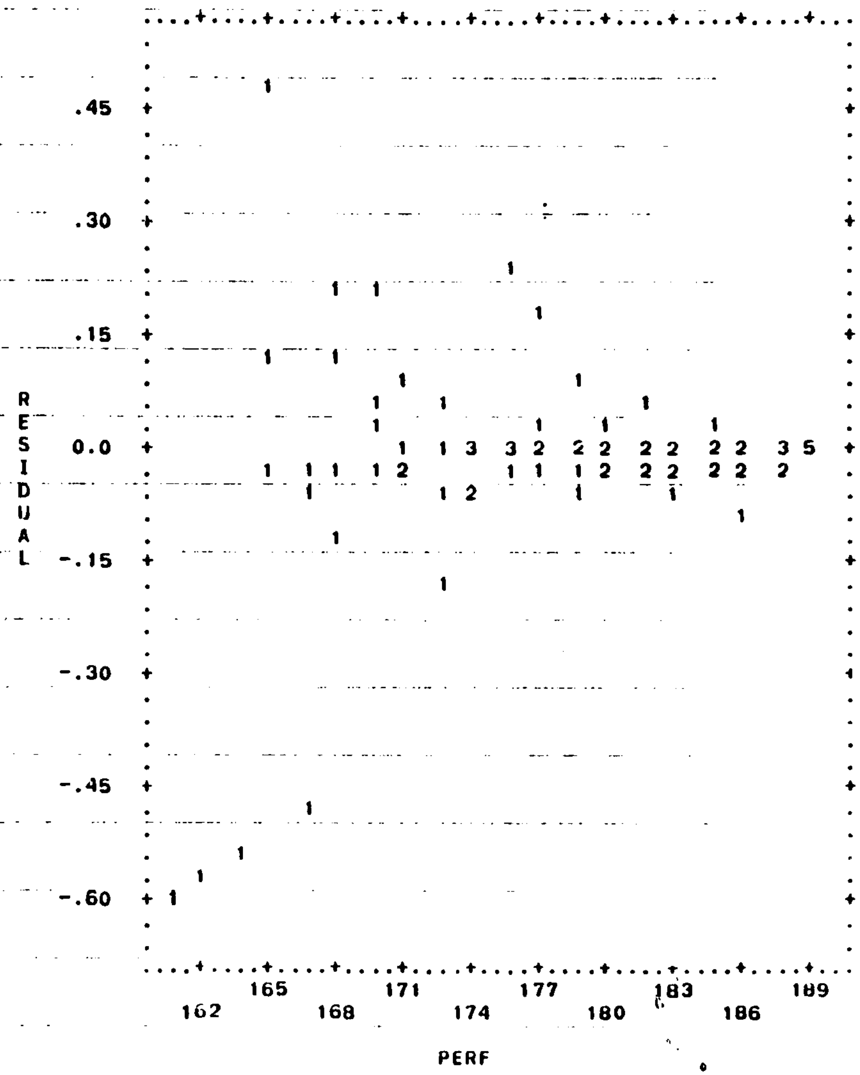
26	.000000	.000000	.000000
27	.000000	.000000	.000000
28	.000000	.000000	.000000
29	.000000	.000000	.000000
30	.000000	.000000	.000000
31	.000000	.000000	.000000
32	.000000	.000000	.000000
33	.000000	.000000	.000000
34	.000000	.000000	.000000
35	1.000000	.000000	.000000
36	1.000000	.000000	.000000
37	1.000000	.000000	.000000
38	1.000000	.000000	.000000
39	1.000000	.000000	.000000
40	1.000000	.000000	.000000
41	1.000000	.000000	.000000
42	1.000000	.000000	.000000
43	1.000000	.000000	.000000
44	1.000000	.000000	.000000
45	1.000000	.000000	.000000
46	.000000	1.000000	.000000
47	.000000	1.000000	.000000
48	.000000	1.000000	.000000
49	.000000	1.000000	.000000
50	.000000	1.000000	.000000
51	.000000	1.000000	.000000
52	.000000	1.000000	.000000
53	.000000	1.000000	.000000
54	.000000	1.000000	.000000
55	.000000	1.000000	.000000
56	.000000	1.000000	.000000
57	.000000	1.000000	.000000
58	.000000	1.000000	.000000
59	.000000	1.000000	.000000
60	.000000	1.000000	.000000
61	.000000	1.000000	.000000
62	.000000	1.000000	.000000
63	.000000	1.000000	.000000
64	.000000	1.000000	.000000
65	.000000	1.000000	.000000
66	.000000	.000000	1.000000
67	.000000	.000000	1.000000
68	.000000	.000000	1.000000
69	.000000	.000000	1.000000
70	.000000	.000000	1.000000
71	.000000	.000000	1.000000
72	.000000	.000000	1.000000
73	.000000	.000000	1.000000
74	.000000	.000000	1.000000
75	.000000	.000000	1.000000
76	.000000	.000000	1.000000
77	.000000	.000000	1.000000
78	.000000	.000000	1.000000
79	.000000	.000000	1.000000
80	.000000	.000000	1.000000

SERIAL CORRELATION .104

PAGE 5 PARAMETERS FROM REAL DATA SET # 2(5 SOURCES)

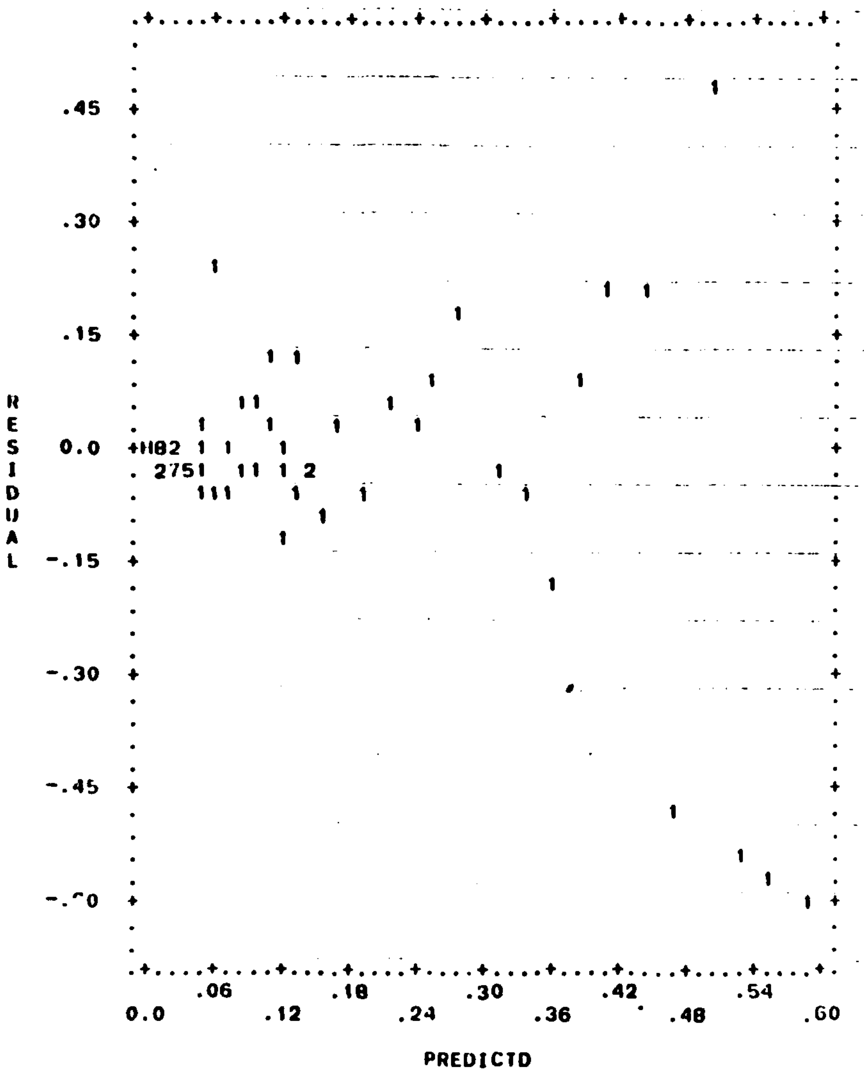
PLOTS OF VARIABLE(1) VERSUS PREDICTED AND OBSERVED VARIABLE(2) AND VERSUS RESIDUALS.

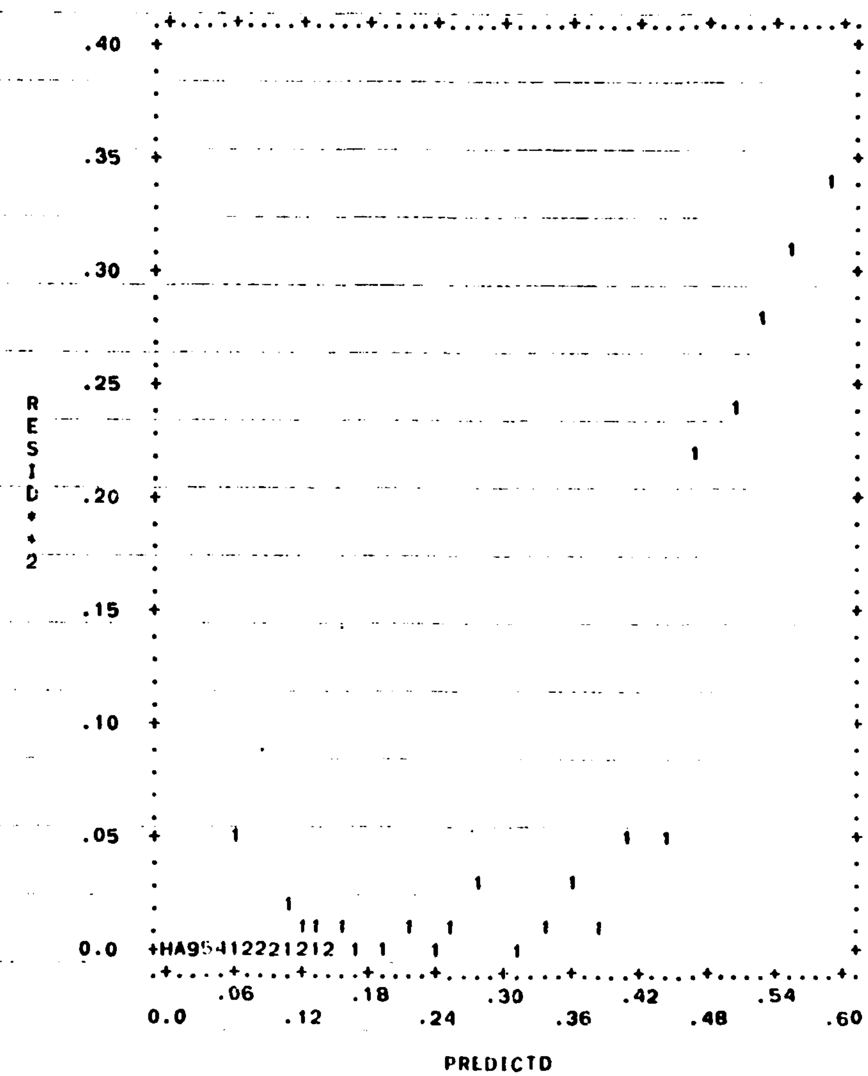




PAGE 6 PARAMETERS FROM REAL DATA SET # 2(5 SOURCES)

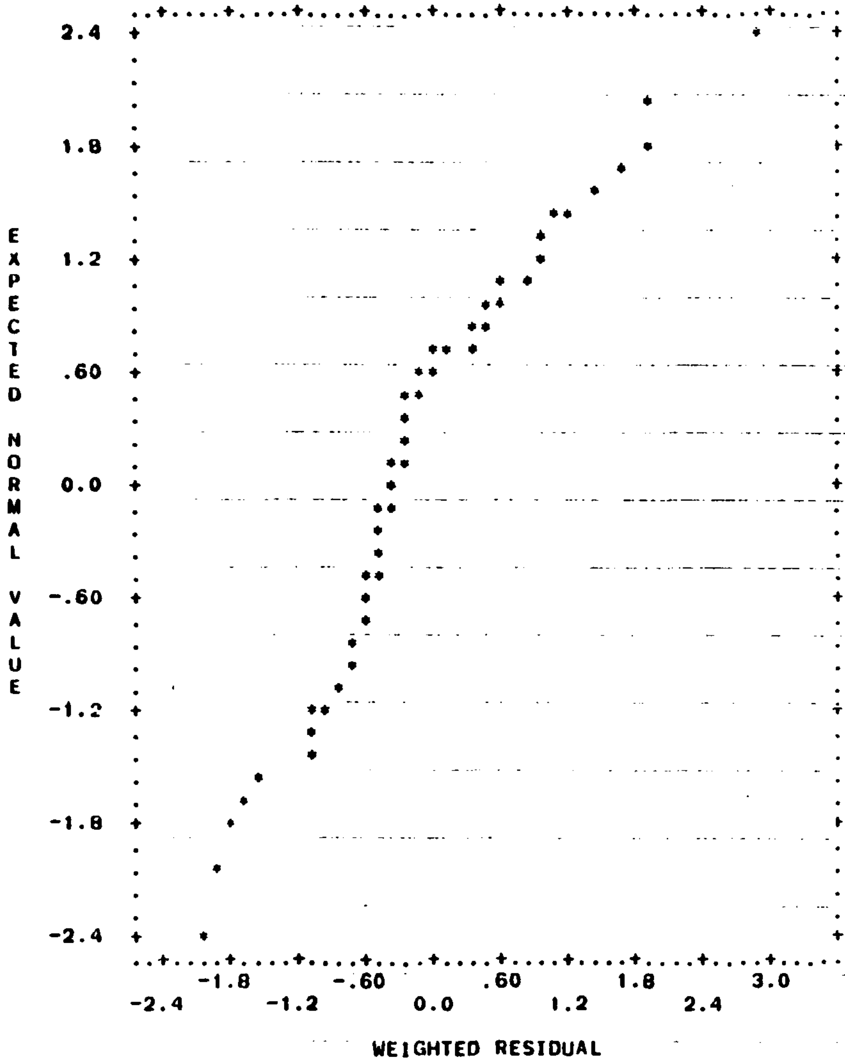
PLOTS OF PREDICTED VARIABLE HOLD VERSUS RESIDUALS AND VERSUS RESIDUALS SQUARED





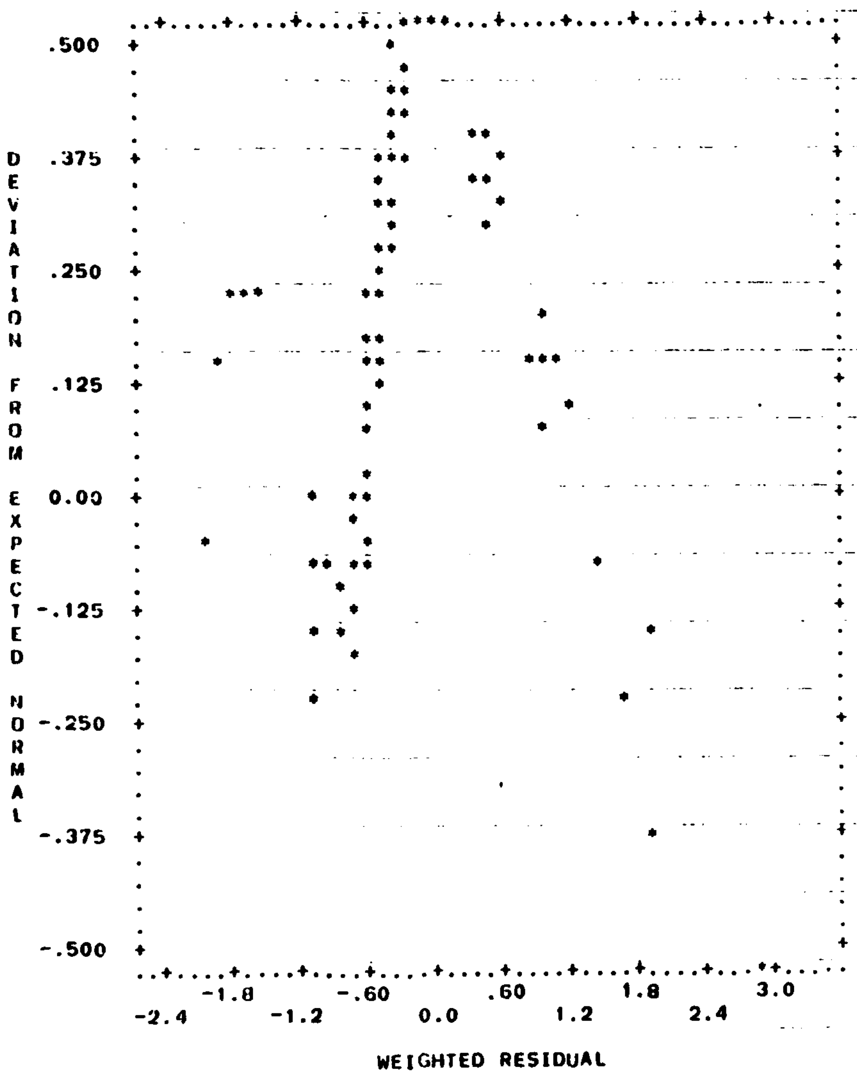
PAGE 7 PARAMETERS FROM REAL DATA SET # 2(5 SOURCES)

NORMAL PROBABILITY PLOT OF WEIGHTED RESIDUALS



PAGE 8 PARAMETERS FROM REAL DATA SET # 2(5 SOURCES)

DETRENDED NORMAL PROBABILITY PLOT OF WEIGHTED RESIDUALS



CPU TIME USED 51.731 SECONDS

```
BMDP3R - NONLINEAR REGRESSION
09/22/82            AT 16:23:17

NO MORE CONTROL LANGUAGE.

PROGRAM TERMINATED

@TEST INE/O/T3
INTERVENING STATEMENTS SKIPPED
```

```
@DATA,L 21.
DATA 8R1 73R1QC 09/22/82 16:23:17 (0)
    1.             141           61 -.925006163196818824+001  .112181631856640547-019  .000000000000000000
    2.             142           62 -.987560663692034151+001  .265553082191972661-022  .000000000000000000
    3.             143           63 -.105011516418724948+002  .426663168976743376-025  .000000000000000000
    4.             144           64 -.111266966468246480+002  .465095390136626022-028  .000000000000000000
    5.             145           65 -.117522416517768013+002  .343849814149754272-031  .000000000000000000
END DATA.

@ERS 21.
FURPUR 28R2 S74R1A 09/22/82 16:23:17
END ERS.
```

@PASS•NLR.P3RB1

```
PAGE    1

BMDP3R - NONLINEAR REGRESSION
DEPARTMENT OF BIOMATHEMATICS
UNIVERSITY OF CALIFORNIA, LOS ANGELES, CA 90024
(213) 825-5940           TWX  UCLA LSA
PROGRAM REVISED JUNE 1981
MANUAL REVISED -- 1981
COPYRIGHT (C) 1981 REGENTS OF UNIVERSITY OF CALIFORNIA
09/22/82              AT 16:23:18

TO SEE REMARKS AND A SUMMARY OF NEW FEATURES FOR
THIS PROGRAM, STATE NEWS. IN THE PRINT PARAGRAPH.

PROGRAM CONTROL INFORMATION

/PROBLEM
          TITLE IS ' REGRESSION ON REAL PI DATA'.
/INPUT
          VARIABLES ARE 8.
          FORMAT IS '(F6.2,F9.5,F12.5,F6.0,5(1X,F1.0))'.
/VARIABLE
          NAMES ARE PERF,HOLD,CASEWT,TIMEWT,I1,I2,I3,I4.
/REGRESS
          TITLE IS ' PARAMETERS FROM REAL DATA SET # 3( 5 SOURCES)'.
          INDEPENDENT IS PERF.
          DEPENDENT IS HOLD.
          NUMBER IS 2.
          PARAMETERS ARE 6.
          WEIGHT IS CASEWT.
          ITERATIONS ARE 10.
          HALVING IS 50.
/PARAMETER
          INITIAL ARE -20.0, 0.125,0.0,0.0,0.0,0.0.
/PLOT
          RESIDUAL.
          VARIABLE IS PERF.
          NORMAL.
          DNORMAL.
          SIZE IS 50,40.
/END

PROBLEM TITLE IS
 REGRESSION ON REAL PI DATA

NUMBER OF VARIABLES TO READ IN. . . . . . . . . .        8
NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. .        0
TOTAL NUMBER OF VARIABLES . . . . . . . . . . .        8
NUMBER OF CASES TO READ IN. . . . . . . . . . . . TO END
CASE LABELING VARIABLES . . . . . . . . . . . .
MISSING VALUES CHECKED BEFORE OR AFTER TRANS. . NEITHER
BLANKS ARE. . . . . . . . . . . . . . . . . . . MISSING
INPUT UNIT NUMBER . . . . . . . . . . . . . . .        5
REWIND INPUT UNIT PRIOR TO READING. . DATA. . .       NO
NUMBER OF WORDS OF DYNAMIC STORAGE. . . . . . .    14998
NUMBER OF CASES DESCRIBED BY INPUT FORMAT . . .        1
```

```
VARIABLES TO BE USED
    1 PERF          2 HOLD          3 CASEWT        4 TIMEWT        5 I1
    6 I2            7 I3            8 I4

INPUT FORMAT IS
(F6.2,F9.5,F12.5,F6.0,5(1X,F1.0))

MAXIMUM LENGTH DATA RECORD IS   41 CHARACTERS.

I N P U T   V A R I A B L E S . . . . .
  VARIABLE      RECORD   COLUMNS     FIELD  TYPE          VARIABLE      RECORD   COLUMNS     FIELD  TYPE
INDEX   NAME     NO.   BEGIN  END    WIDTH              INDEX   NAME     NO.   BEGIN  END    WIDTH
----- --------  ----   ----- -----  -----  ----         ----- --------  ----   ----- -----  -----  ----
    1 PERF         1       1     6    6.2  F                5 I1         1      35    35      1  F
    2 HOLD         1       7    15    9.5  F                6 I2         1      37    37      1  F
    3 CASEWT       1      16    27   12.5  F                7 I3         1      39    39      1  F
    4 TIMEWT       1      28    33    6    F                8 I4         1      41    41      1  F

VARIABLES TO BE PLOTTED
             1  PERF

  PLOT OF PREDICTED VALUES VERSUS RESIDUALS . . .     YES
  NORMAL PROBABILITY PLOT . . . . . . . . . . . .     YES
  DETRENDED NORMAL PROBABILITY PLOT . . . . . . .     YES
```

REGRESSION TITLE
PARAMETERS FROM REAL DATA SET # 3(5 SOURCES)

REGRESSION NUMBER	2
INDEPENDENT VARIABLE(FOR BUILT-IN FUNCTION) . .	PERF
DEPENDENT VARIABLE.	HOLD
WEIGHTING VARIABLE.	CASEWT
NUMBER OF PARAMETERS.	6
NUMBER OF CONSTRAINTS	0
TOLERANCE FOR PIVOTING.	.00000001000
TOLERANCE FOR CONVERGENCE	.00001000000
MAXIMUM NUMBER OF ITERATIONS.	10
MAXIMUM NUMBER OF INCREMENT HALVINGS.	50
NUMBER OF DATA PASSES PER CASE.	1
COMPUTE LOSS FUNCTION	NO

USING THE ABOVE SPECIFICATIONS THIS PROGRAM COULD PROCESS 962 CASES.

@ADD,P NLRDAT.A3

BASED ON INPUT FORMAT SUPPLIED 1 RECORDS READ PER CASE.

NUMBER OF CASES READ. 65

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
1	PERF	180.907249	3.718233	160.750000	186.250000
2	HOLD	.012998	.061371	.000000	.726670
3	CASEWT	7245.684448	5112.085327	32.906340	15407.879639
4	TIMEWT	155.281631	151.562706	1.000000	594.000000
5	I1	.171645	.380006	.000000	1.000000
6	I2	.287964	.456338	.000000	1.000000
7	I3	.096512	.297590	.000000	1.000000
8	I4	.220145	.417569	.000000	1.000000

	P1	P2	P3	P4	P5	P6
PARAMETER MAXIMA.	.2126765+038	.2126765+038	.2126765+038	.2126765+038	.2126765+038	.2126765+038
PARAMETER MINIMA.	-.2126765+038	-.2126765+038	-.2126765+038	-.2126765+038	-.2126765+038	-.2126765+039

ITERATION NUMBER	INCREMENT HALVINGS	RESIDUAL SUM OF SQUARES	P1	P2	P3	P4	P5	P6
0	0	.433158+003	-20.000000	.125000	.000000	.000000	.000000	.000000
1	0	.212884+003	-6.935413	.048928	.471733	.285710	-1.710621	.446901
2	0	.814419+002	-13.093196	.084623	.750075	.113337	-1.014664	.656335
3	0	.777890+002	-16.453600	.104266	.927957	.011956	-.945776	.755732
4	50	.777890+002	-16.453600	.104266	.927957	.011956	-.945776	.755732
5	50	.777890+002	-16.453600	.104266	.927957	.011956	-.945776	.755732
6	50	.777890+002	-16.453600	.104266	.927957	.011956	-.945776	.755732

7	50	.777890+002	-16.453600	.104266	.927957	.011956	-.945776	.755732
3	50	.777890+002	-16.453600	.104266	.927957	.011956	-.945776	.755732

ITERATION 3 HAS THE SMALLEST RESIDUAL SUM OF SQUARES(SUBJECT TO CONSTRAINTS, IF ANY).
REMAINING CALCULATIONS ARE BASED ON THE RESULTS OF THIS ITERATION.

 PARAMETERS FROM REAL DATA SET # 3(5 SOURCES)

ASYMPTOTIC CORRELATION MATRIX OF THE PARAMETERS

		P1	P2	P3	P4	P5	P6
		1	2	3	4	5	6
P1	1	1.0000					
P2	2	-.9970	1.0000				
P3	3	-.1017	.0622	1.0000			
P4	4	.1811	-.2316	.3185	1.0000		
P5	5	-.1952	.1279	.4607	.5394	1.0000	
P6	6	-.0896	.0458	.2961	.3579	.5070	1.0000

RESIDUAL MEAN SQUARE 1.31846

DEGREES OF FREEDOM 59

PARAMETER	ESTIMATE	ASYMPTOTIC STANDARD DEVIATION	TOLERANCE
P1	-16.453600	2.053434	.0009375322
P2	.104266	.011876	.0009498240
P3	.927957	.307186	.7312296661
P4	.011956	.244407	.5278922157
P5	-.945776	.179740	.2099044194
P6	.755732	.277510	.6733147651

PAGE 4 PARAMETERS FROM REAL DATA SET # 3(5 SOURCES)

CASE NO.	LABEL	PREDICTED HOLD	STD DEV OF PRED VALUE	OBSERVED HOLD	RESIDUAL	CASEWT	PERF	TIMEWT	I1
1		.175491	.044341	.676050	.500559	39.859459	166.750000	18.000000	.000000
2		.138058	.036504	.079360	-.058698	283.883129	168.250000	131.000000	.000000
3		.106477	.029606	.160150	.053673	88.386488	169.750000	29.000000	.000000
4		.080475	.023697	.062860	-.017615	392.398651	171.250000	112.000000	.000000
5		.059583	.018738	.047770	-.011813	531.579445	172.750000	115.000000	.000000
6		.043202	.014642	.097340	.054138	304.706917	174.250000	46.000000	.000000
7		.030667	.011299	.035640	.004973	665.282595	175.750000	75.000000	.000000
8		.021307	.008598	.013860	-.007447	2183.057892	177.250000	178.000000	.000000
9		.014486	.006439	.000000	-.014486	2278.864929	178.750000	126.000000	.000000
10		.009635	.004737	.000000	-.009635	1268.078674	180.250000	44.000000	.000000
11		.006268	.003416	.000000	-.006268	2540.190979	181.750000	59.000000	.000000
12		.003988	.002411	.000000	-.003988	5425.451233	183.250000	82.000000	.000000
13		.001509	.001120	.000000	-.001509	6719.093445	186.250000	36.000000	.000000
14		.031397	.018866	.033560	.002163	438.614731	166.750000	49.000000	1.000000
15		.021845	.013795	.014050	-.007795	1671.427750	168.250000	139.000000	1.000000
16		.014874	.009886	.022240	.007366	2576.292206	169.750000	147.000000	1.000000
17		.009907	.006946	.000000	-.009907	5226.784424	171.250000	201.000000	1.000000
18		.006455	.004784	.017750	.011295	5617.830078	172.750000	140.000000	1.000000
19		.004113	.003230	.000000	-.004113	8551.813232	174.250000	136.000000	1.000000
20		.002563	.002137	.000000	-.002563	5898.156128	175.750000	56.000000	1.000000
21		.001561	.001385	.000000	-.001561	19750.139160	177.250000	119.000000	1.000000
22		.000930	.000879	.000000	-.000930	78612.295898	178.750000	288.000000	1.000000
23		.000541	.000546	.000000	-.000541	43534.672363	180.250000	90.000000	1.000000
24		.000308	.000332	.000000	-.000308	76517.977539	181.750000	90.000000	1.000000
25		.000171	.000198	.000000	-.000171	79412.331055	183.250000	50.000000	1.000000
26		.000093	.000115	.000000	-.000093	31333.180664	184.750000	5.000000	1.000000
27		.058180	.021527	.260570	.202390	270.616295	172.750000	55.000000	.000000
28		.042117	.016255	.114840	.072723	524.024307	174.250000	81.000000	.000000
29		.029848	.012085	.000000	-.029848	1546.204254	175.750000	175.000000	.000000
30		.020703	.008654	.018020	-.002683	3884.773987	177.250000	311.000000	.000000
31		.014052	.006393	.000000	-.014052	10791.158936	178.750000	594.000000	.000000
32		.009331	.004549	.000000	-.009331	2083.800018	180.250000	73.000000	.000000
33		.006060	.003187	.000000	-.006060	1926.712585	181.750000	42.000000	.000000
34		.003849	.002195	.000000	-.003849	9852.636230	183.250000	147.000000	.000000
35		.002391	.001484	.000000	-.002391	1741.187729	184.750000	11.000000	.000000
36		.001452	.000984	.000000	-.001452	1497.214767	186.250000	1.000000	.000000
37		.738485	.046085	.556390	-.182095	194.201160	160.750000	149.000000	.000000
38		.685198	.045309	.587160	-.098038	125.358218	162.250000	104.000000	.000000
39		.627744	.043336	.718580	.090836	90.091168	163.750000	80.000000	.000000
40		.567293	.040493	.468890	-.098403	49.292777	165.250000	44.000000	.000000
41		.505221	.037245	.531500	.026279	73.254141	166.750000	69.000000	.000000
42		.443023	.034121	.308820	-.134203	65.131493	168.250000	60.000000	.000000
43		.382200	.031571	.726670	.344470	77.550821	169.750000	69.000000	.000000
44		.324156	.029801	.608830	.284674	174.720436	171.250000	149.000000	.000000
45		.270102	.028686	.602480	.332378	28.067449	172.750000	17.000000	.000000
46		.220975	.027866	.208460	-.012515	231.063688	174.250000	155.000000	.000000
47		.177404	.026941	.102600	-.074804	108.425321	175.750000	59.000000	.000000
48		.139693	.025624	.089530	-.050163	617.945175	177.250000	293.000000	.000000
49		.107840	.023802	.077860	-.029980	366.097651	178.750000	137.000000	.000000
50		.081584	.021505	.000000	-.081584	191.272533	180.250000	53.000000	.000000
51		.060463	.018663	.000000	-.060463	169.573952	181.750000	34.000000	.000000

52	.043884	.016054	.000000	-.043884	89.019274	183.250000	9.000000	.000000
53	.045665	.022452	.000000	-.045665	277.650055	166.750000	44.000000	.000000
54	.032532	.016779	.015490	-.017042	581.805786	168.250000	69.000000	.000000
55	.022684	.012306	.011480	-.011204	2761.514771	169.750000	241.000000	.000000
56	.015479	.008860	.014410	-.001069	2495.380035	171.250000	148.000000	.000000
57	.010333	.006263	.026530	.016197	2861.748932	172.750000	113.000000	.000000
58	.006748	.004346	.021220	.014472	6456.590637	174.250000	169.000000	.000000
59	.004309	.002960	.012290	.007981	4961.456970	175.750000	81.000000	.000000
60	.002691	.001977	.002750	.000059	18459.722900	177.250000	194.000000	.000000
61	.001643	.001295	.000000	-.001643	22572.321777	178.750000	144.000000	.000000
62	.000981	.000831	.000000	-.000981	35498.653320	180.250000	135.000000	.000000
63	.000572	.000522	.000000	-.000572	92717.832031	181.750000	208.000000	.000000
64	.000326	.000321	.000000	-.000326	53092.965820	183.250000	65.000000	.000000
65	.000182	.000193	.000000	-.000182	12911.523804	184.750000	2.000000	.000000

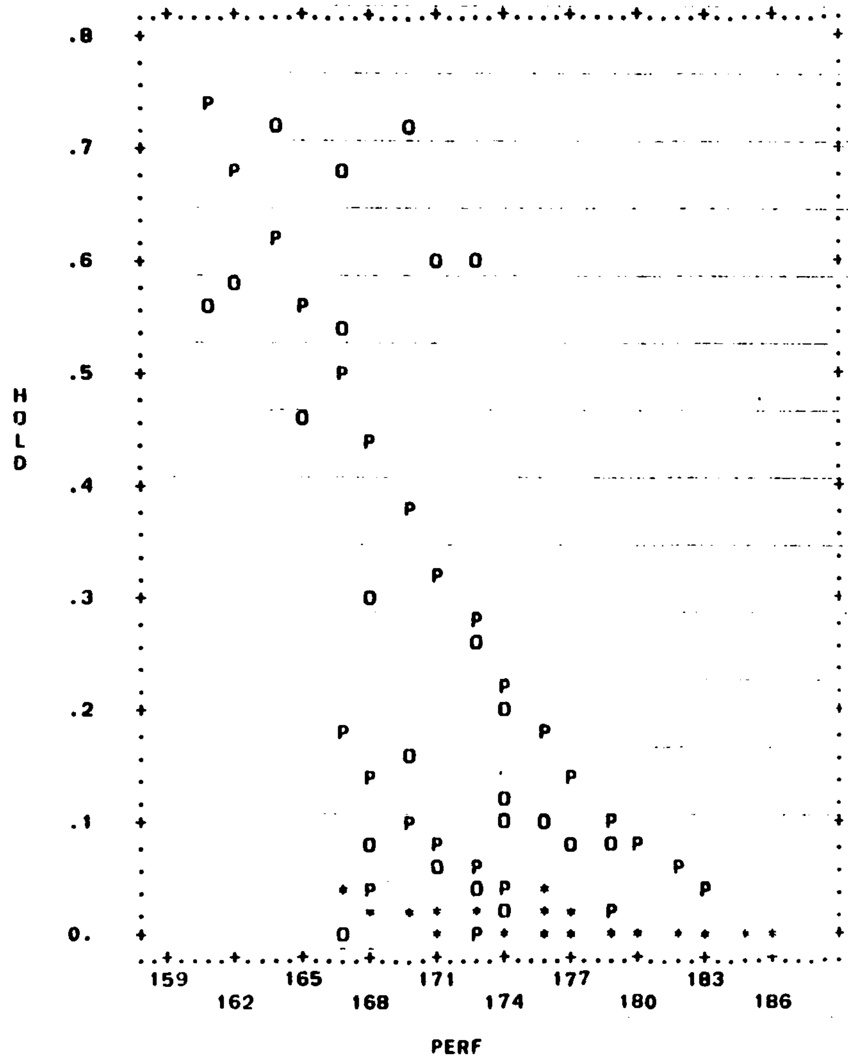
CASE	I2	I3	I4
1	.000000	.000000	.000000
2	.000000	.000000	.000000
3	.000000	.000000	.000000
4	.000000	.000000	.000000
5	.000000	.000000	.000000
6	.000000	.000000	.000000
7	.000000	.000000	.000000
8	.000000	.000000	.000000
9	.000000	.000000	.000000
10	.000000	.000000	.000000
11	.000000	.000000	.000000
12	.000000	.000000	.000000
13	.000000	.000000	.000000
14	.000000	.000000	.000000
15	.000000	.000000	.000000
16	.000000	.000000	.000000
17	.000000	.000000	.000000
18	.000000	.000000	.000000
19	.000000	.000000	.000000
20	.000000	.000000	.000000
21	.000000	.000000	.000000
22	.000000	.000000	.000000
23	.000000	.000000	.000000
24	.000000	.000000	.000000
25	.000000	.000000	.000000
26	.000000	.000000	.000000
27	1.000000	.000000	.000000
28	1.000000	.000000	.000000
29	1.000000	.000000	.000000
30	1.000000	.000000	.000000
31	1.000000	.000000	.000000
32	1.000000	.000000	.000000
33	1.000000	.000000	.000000
34	1.000000	.000000	.000000
35	1.000000	.000000	.000000
36	1.000000	.000000	.000000
37	.000000	1.000000	.000000
38	.000000	1.000000	.000000
39	.000000	1.000000	.000000
40	.000000	1.000000	.000000

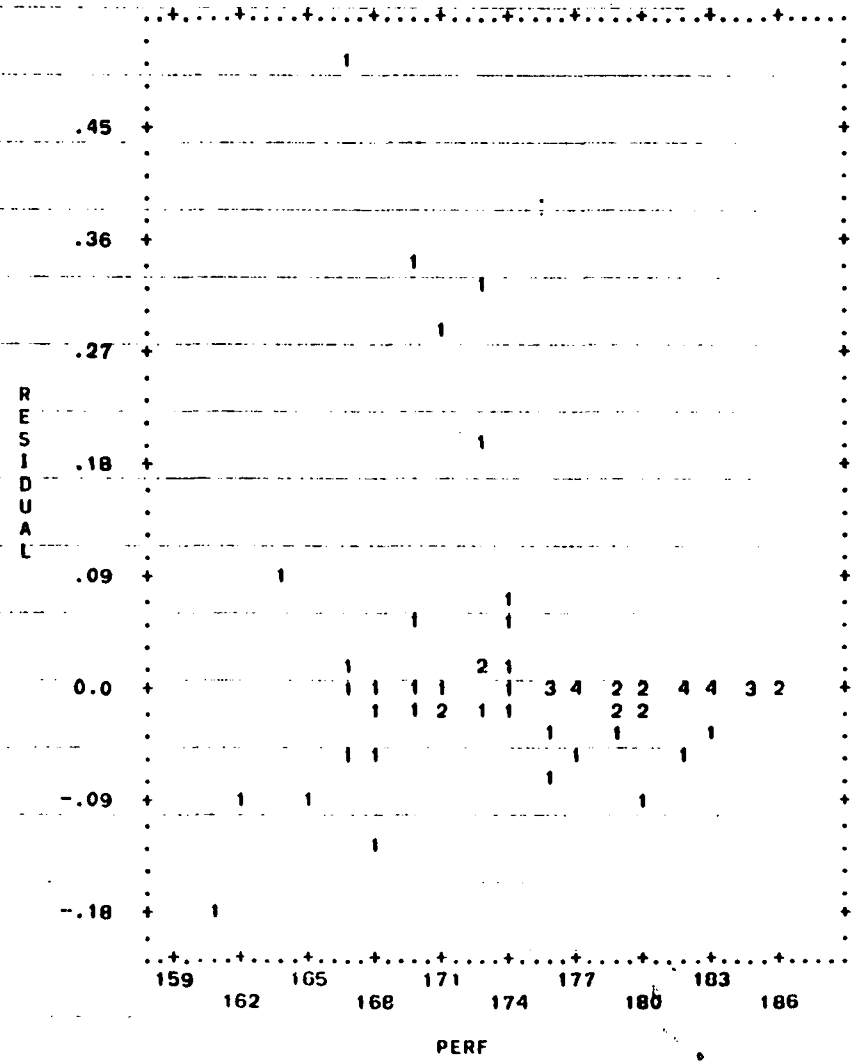
41	.000000	1.000000	.000000
42	.000000	1.000000	.000000
43	.000000	1.000000	.000000
44	.000000	1.000000	.000000
45	.000000	1.000000	.000000
46	.000000	1.000000	.000000
47	.000000	1.000000	.000000
48	.000000	1.000000	.000000
49	.000000	1.000000	.000000
50	.000000	1.000000	.000000
51	.000000	1.000000	.000000
52	.000000	1.000000	.000000
53	.000000	.000000	1.000000
54	.000000	.000000	1.000000
55	.000000	.000000	1.000000
56	.000000	.000000	1.000000
57	.000000	.000000	1.000000
58	.000000	.000000	1.000000
59	.000000	.000000	1.000000
60	.000000	.000000	1.000000
61	.000000	.000000	1.000000
62	.000000	.000000	1.000000
63	.000000	.000000	1.000000
64	.000000	.000000	1.000000
65	.000000	.000000	1.000000

SERIAL CORRELATION .284

PAGE 5 PARAMETERS FROM REAL DATA SET # 3(5 SOURCES)

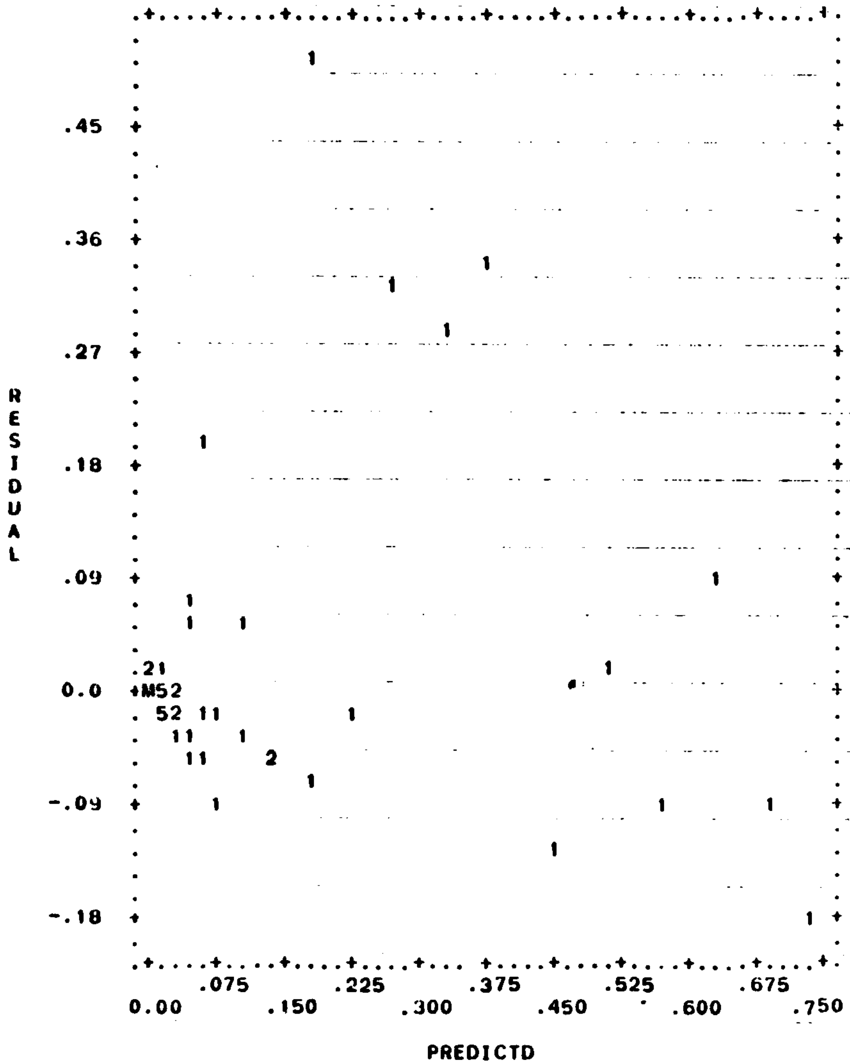
PLOTS OF VARIABLE(1) VERSUS PREDICTED AND OBSERVED VARIABLE(2) AND VERSUS RESIDUALS.

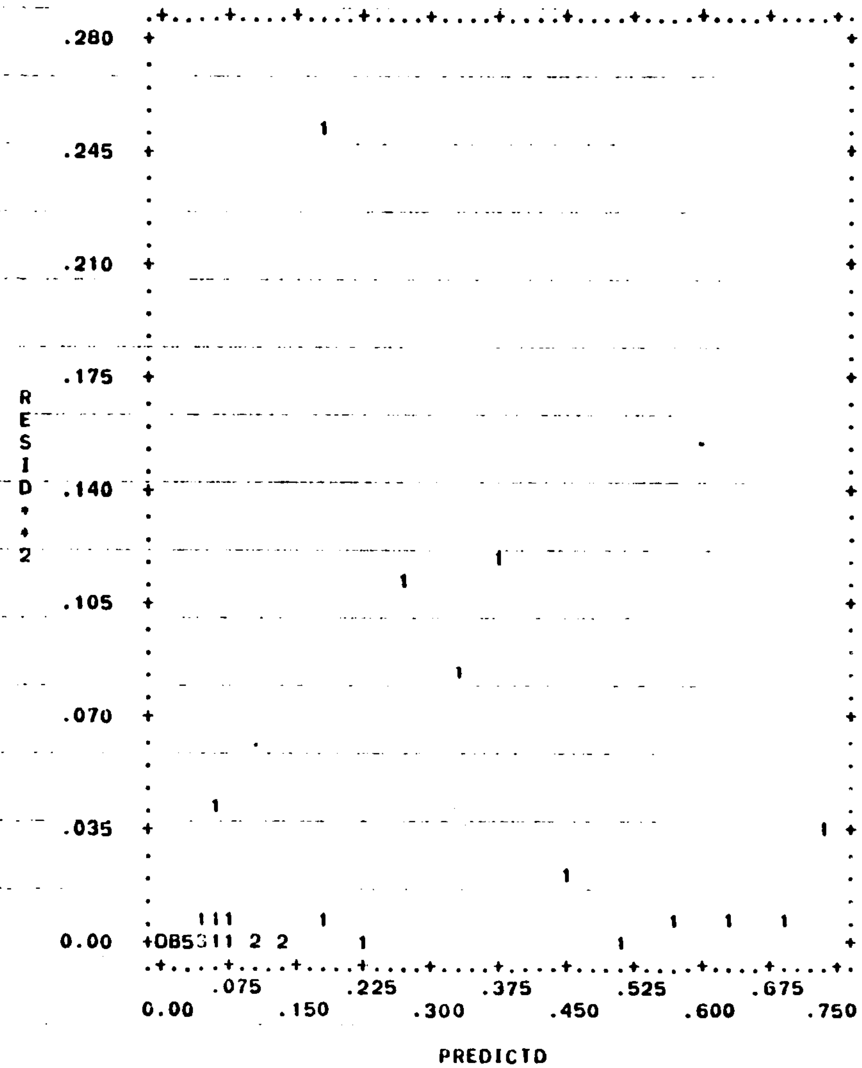




PAGE 6 PARAMETERS FROM REAL DATA SET # 3(5 SOURCES)

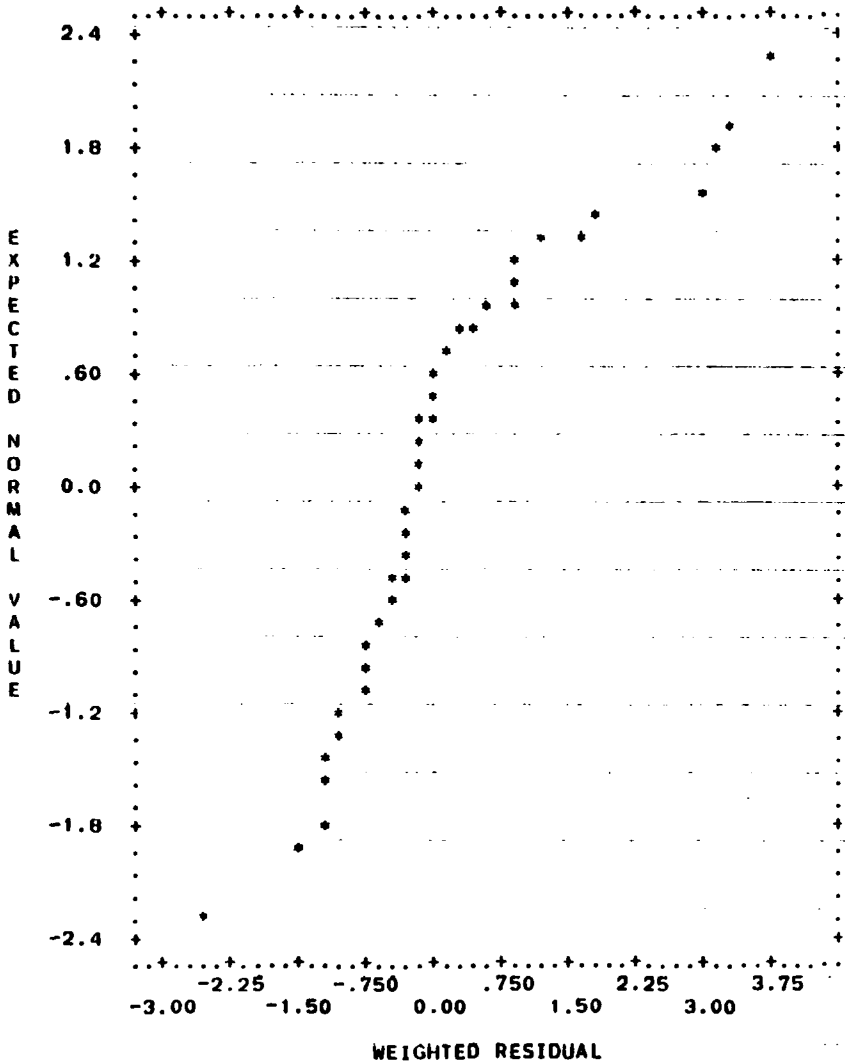
PLOTS OF PREDICTED VARIABLE HOLD VERSUS RESIDUALS AND VERSUS RESIDUALS SQUARED





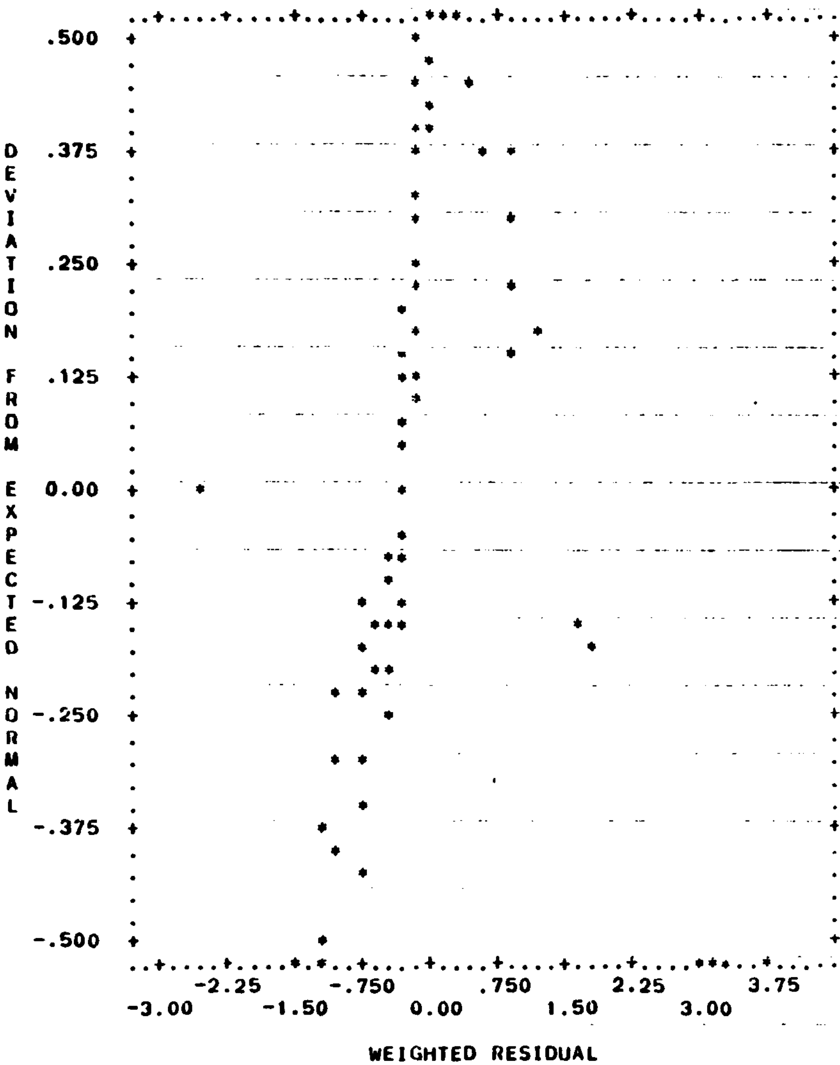
PAGE 7 PARAMETERS FROM REAL DATA SET # 3(5 SOURCES)

NORMAL PROBABILITY PLOT OF WEIGHTED RESIDUALS



PAGE 8 PARAMETERS FROM REAL DATA SET # 3(5 SOURCES)

DETRENDED NORMAL PROBABILITY PLOT OF WEIGHTED RESIDUALS



CPU TIME USED 57.714 SECONDS

PAGE 9

```
BMDP3R - NONLINEAR REGRESSION
09/22/82            AT 16:24:32

NO MORE CONTROL LANGUAGE.

PROGRAM TERMINATED

@TEST TNE/0/T3
INTERVENING STATEMENTS SKIPPED
```

P3R81A

HOFMOCK

7213

07OCT82

FILENAME • PRT1 USERID • HOFMOCKEL-JL ACCOUNT • DTA72130230A CREATED AT: 17:21:54 07 OCT 82

```
@ELT,L NLR.P3RFUN/CUMGAUSS
ELT0T7 RLIB70 10/07-17:21:54-(40,)
003          SUBROUTINE P3RFUN (
003      *                    F,                @ OUTPUT
003      *                    DF,               @ OUTPUT
003      *                    P,                @ INPUT
003      *                    X,                @ INPUT
003      *                    N,                @ INPUT
003      *                    KASE,             @ INPUT
003      *                    NVAR,             @ INPUT
003      *                    NPAR,             @ INPUT
003      *                    IPASS,            @ INPUT
003      *                    XLOSS,            @ INPUT
003      *                    INDP              @ INPUT
003      *                         )
003 C**  NAME: PASS*NLR.P3RFUN/CUMGAUSS
003 C**
003 C**  USAGE: CALL P3RFUN ( F, DF, P, X, N, KASE, NVAR, NPAR, IPASS,
003 C**                           XLOSS, INDP )
003 C**
003 C**  PURPOSE: OBTAIN THE VALUE OF THE CUMULATIVE GAUSSIAN FUNCTION FROM
006 C**           THE INDEPENDENT VARIABLE X(1) AND THE REGRESSION
006 C**           EQUATION PARAMETERS P(1), P(2), ... P(N).  THIS FUNCTION
006 C**           IS FOR USE WITH THE P3R PROGRAM DESCRIBED IN THE
032 C**           UCLA BMDP 1977 USERS'S MANUAL PG 464.  OR THE 1981
032 C**           USER'S MANUAL PG 290. A NONLINEAR REGRESSION OF THE
032 C**           CUMULATIVE GAUSSIAN FUNCTION IS MADE USINT THE RAW
032 C**           STATISTIC P(1) + P(2)*X(1), ... +P(N)*X(M).
003 C**
032 C**  LIMITATIONS: THE INDEPENDENT VARIABLE (PERFORMANCE INDEX) MUST BE
032 C**               IN THE FIRST POSITION I.E. X(1) AND THE DEPENDENT
032 C**               (FRACTIONAL HOLDING TIME) MUST BE IN THE SECOND
006 C**               POSITION X(2).  X(3) AND X(4) SHOULD HAVE INITIAL
006 C**               ESTIMATES OF CASE WEIGHT AND AVAILABILITY TIME
032 C**               RESPECTIVELY. X(5)... X(NVAR) ARE DUMMY VARIABLES
032 C**               TO ALLOW FOR DIFFERENT Y-INTERCEPTS IF MORE THAN
033 C**               ONE SOUND PROJECTOR IS USED IN THE REGRESSION AND
032 C**               SHOULD BE SET TO 0 OR 1 TO CONTROL THE INTRODUCTION
032 C**               OF ADDITIONAL DATA SETS FOR A COMPUTER RUN
032 C**               ESTABLISHING THE PARAMETERS ESTIMATES.
003 C**
008 C**  WARNINGS: NO. OF VARIABLES MUST BE TWO GREATER THAN THE
008 C**            NO. OF PARAMETERS. A MESSAGE PRINTS OUT IF THE CONDITION
006 C**            IS NOT MET.
003 C**
017 C**  SUBPROGRAMS REQUIRED: MDNORD - OBTAINED FROM PASS*NLR.MDNORD
003 C**
003 C**  ARGUMENTS: .
003 C**
003 C**     INPUT: P   - REGRESSION PARAMETERS
003 C**            X   - REGRESSION VARIABLES
003 C**            N   - ID FOR REGRESSION FUNCTION
015 C**                  N = 1,  USE INPUT CASEWT X(3)
015 C**                  N = 2,  RECALCULATE X(3)
032 C**                  N = 3,  SAM AS N = 2, + WRITES DEBUG ON LU 20
```

```
003 C**           NPAR  - NUMBER OF FUNCTION PARAMETERS
003 C**           IPASS - NUMBER OF DATA PASSES
003 C**           XLOSS - UTILITY VRBL
015 C**           INDP  - INDEX OF DEP VRBL(NOT USED)
003 C**
003 C**    INPUT/OUTPUT: NONE
003 C**
003 C**    OUTPUT: F  - FUNCTION VALUE
003 C**            DF - DERIVATIVES OF FUNCTION W/R PARAMATERS
003 C**
032 C** NOTES: IF EVALUATION OF THE WEIGHTING FUNCTION WOULD
032 C**        CAUSE DIVISION BY ZERO THEN THE ZERO FACTOR
032 C**        IS RESET TO 10**-38 AND THE FACTORS OF THE
032 C**        WEIGHTING FUNCTION ARE WRITTEN ON LU 21.  THE
032 C**        CONDITION WORD IS ALSO SET TO 1 SO THAT IT MAY
032 C**        MAY BE SENSED IN THE RUNSTREAM AND A BRANCH
032 C**        PROVIDED TO DUMP FILE 21.
003 C**
003 C** PROGRAMMER/ORGANIZATION: HOFMOCKEL-JL, CSC
003 C**
005 C** ALGORITHM:  THE RAW STATISTIC P(1) + P(2)*X(1)+ ... + P(N)*X(M) IS
005 C**             FORMED AS THE ARGUMENT TO SUBROUTINE MDNOR WHICH YIELDS
005 C**             THE AREA UNDER THE GAUSSIAN CURVE.  THE FIRST DERIVATIVES
003 C**             OF THE CUMULATIVE GAUSSIAN FUNCTION WITH RESPECT TO
005 C**             PARAMETERS P(1), P(2),..., P(N) ARE ALSO EVALUATED.
003 C**
003 C** APPLICABILITY: ASCII FORTRAN
003 C**
003 C** KEYWORDS: BMDP77, NONLINEAR, REGRESSION, STATISTICS, GAUSSIAN
003 C**
003 C** RECORD OF MODIFICATIONS: INITIAL PROGRAM 4-7-82
003 C**
003 C** WAIVERS: NONE
003 C
003        START EDIT PAGE
003 C
014        DOUBLE PRECISION A                  @ AREA UNDER GAUSSIAN
003        DOUBLE PRECISION DF ( NPAR )        @ DERIVATIVES W/R PARAMETERS
003        DOUBLE PRECISION F                  @ VALUE OF FUNCTION
010        DOUBLE PRECISION FACTOR             @ (1-F)*F LIMITED, DIV FLT PROT
007        INTEGER I                           @ LOOP INDEX
007        INTEGER IEND                        @ LIMIT ON LOOP INDEX
015        INTEGER INDP                        @ DEP VRBL INDEX(UNUSED)
006        INTEGER IP                          @ PARAM INDEX
016        INTEGER IPASS                       @ NUM DATA PASSES(UNUSED)
006        INTEGER IV                          @ VRBL INDEX
016        INTEGER KASE                        @ CASE SEQ NUM(UNUSED)
029        DOUBLE PRECISION LMBTEE             @ TIME AVAIL / 4
003        INTEGER N                           @ FUNCTION ID
021        INTEGER NCALL / 0 /                 @ COUNT OF SUB CALLS
003        INTEGER NPAR                        @ NUMBER PARAMS IN FUNCTION
003        INTEGER NVAR                        @ TOTAL NO. VRBLS
003        DOUBLE PRECISION P ( NPAR )         @ REGRESSION PARAMETERS
006        DOUBLE PRECISION STPINV             @ SQRT(TWOPI) INVERTED
006      * / 0.39894228040143267800 /
036        DOUBLE PRECISION SUMWTS             @ SUM OF CASE WTS
```

```
003        DOUBLE PRECISION XLOSS             @ UTILITY VRBL(UNUSED)
003        DOUBLE PRECISION Z                 @ NORMALIZED STATISTIC
003 C
036        IF ( IPASS .EQ. 1 ) THEN           @ GET UN NORM WTS 1ST PASS
021        NCALL = NCALL + 1
034        IF ( NCALL .EQ. 1 .AND.
034       *      KASE .EQ. 1 )
034       *   CALL FSETC ( 0 )                @ CLR COND WD 1ST PASS
009        IF ( NVAR-NPAR .NE. 2 ) THEN       @ ERROR IN INPUTS
009          WRITE ( 6, 10 ) NVAR, NPAR
009 10       FORMAT ( ' VRBLS/PARAMS ERROR:',
006       *  ' NVAR= ', I2, ' NPAR= ', I2 )
009          STOP ' ERROR STOP P3RFUN'
010        ENDIF
005          Z =  P(1)+P(2)*X(1)              @ FORM STAT
021        IF ( NPAR .GT. 2 ) THEN            @ ADD XTRA VRBLS EFFECT
021          IV = 4
021          IP = 2
021          IEND = NPAR -2
036          DO 20 I = 1, IEND
021            IP = IP + 1
021            IV = IV + 1
021            Z = Z + P(IP)*X(IV)
036 20       CONTINUE
021        ENDIF
009          DF ( 1 ) = -STPINV *             @ DERIVATIVE W/R P(1)
024       *    DEXP ( -0.5D0*Z*Z)
006          DF ( 2 ) = X ( 1 ) * DF ( 1 )    @ DERIVATIVE W/R P ( 2 )
015        IF ( NPAR .GT. 2 ) THEN            @ ADD XTRA VRBLS EFFECT
006          IV = 4
006          IP = 2
006          IEND = NPAR -2
036          DO 30 I = 1, IEND
006            IP = IP + 1
006            IV = IV + 1
006            DF ( IP ) = X ( IV ) * DF ( 1 )
036 30       CONTINUE
006        ENDIF
015        CALL MDNORD ( Z, A )               @ AREA UNDER GAUSSIAN
015        F = 1.0 - A
021        IF ( N .GT. 1 ) THEN               @ RESET CASEWT
015          FACTOR = F - F*F
031            IF ( FACTOR .LE. 0.0D0 ) THEN @ SHOULD NOT BE 0
031              WRITE ( 21, * ) NCALL, KASE,
031       *        Z, A, FACTOR               @ SAV DATA IN FILE
031              CALL FSETC ( 1 )             @ SET CONDITION WORD
034              FACTOR = 1.0D-18             @ PREVENT DIVFLT
031            ENDIF
034          X ( 3 ) = X ( 4 ) / FACTOR
034 C        LMBTEE = 0.25D0 * X ( 4 )
034 C        X ( 3 ) =
034 C     *  ( LMBTEE * LMBTEE ) /
034 C     *  ( ( DEXP( -LMBTEE )
034 C     *  + LMBTEE-1.0D0 )*FACTOR )
040          X ( 3 ) = X ( 3 ) * 5.0D-5       @ LIM MAX CASEWTS FOR PRT
```

```
027          WRITE ( 20, * ) NCALL, KASE,
027      *      Z, A, X(3)
027        ENDIF
036      ENDIF                                @ END 1ST PASS LOGIC
036      IF ( IPASS .EQ. 2 ) THEN             @ NORM WTS TO NCAS SUM
036        IF ( KASE .EQ. 1 )
037      *   SUMWTS = 0.0D0                   @ INITIALIZE SUM
036        SUMWTS = SUMWTS + X ( 3 )          @ ACCUMULATE WTS
036        IF ( KASE .EQ. NCAS ) THEN         @ NORM TO NCAS SUM
036          DO 40 I = 1, NCAS                @ LOOP THRU CASES
036            X ( 3 ) =X ( 3 ) *
036      *     DFLOAT ( NCAS ) / SUMWTS
036 40       CONTINUE
036        ENDIF                              @ NOW SUMWTS=NCAS
036      ENDIF                                @ END 2ND PASS LOGIC
036      RETURN                               @ ONLY PROG EXIT
003      END

END ELT.
```

```
@ELT,L PASS*NLR.MDNORD
ELT0T7 RLIB70 10/07-17:21:56-(15,)
        011        SUBROUTINE MDNORD (
        012       *                    Z,              @ INPUT
        012       *                    A               @ OUTPUT
        012       *                      )
        011 C**  NAME: PASS*NLR.MDNORD
        011 C**
        013 C**  USAGE: CALL MDNORD ( Z, A )
        011 C**
        012 C**  PURPOSE: EVALUATE THE AREA UNDER THE GAUSSIAN DISTRIBUTION
        012 C**           BY SERIES EXPANSION USING ART. 26.2.10 OR 26.2.12,
        011 C**           HANDBOOK OF MATHEMATICAL FUNCTIONS, AMS 55.
        011 C**
        011 C**  LIMITATIONS: INPUT ARGUMENTS Z AND A MUST BE DOUBLE PRECISION
        012 C**               MDNORD MUST BE CALLED FROM ASCII COMPILED PROGRAM.
        011 C**
        011 C**  WARNINGS: NONE
        011 C**
        011 C**  SUBPROGRAMS REQUIRED: NONE
        011 C**
        011 C**  ARGUMENTS: .
        011 C**
        011 C**     INPUT: Z                               @ NO. STD. DEV. FR. MEAN OF 0
        011 C**
        011 C**     INPUT/OUTPUT: NONE
        011 C**
        011 C**     OUTPUT: A                              @ AREA UNDER THE GAUSSIAN
        011 C**
        011 C**  NOTES: NONE
        011 C**
        011 C**  PROGRAMMER/ORGANIZATION: HOFMOCKEL-JL/CSC
        011 C**
        013 C**  ALGORITHM: IF ( ABS(Z) .LE. 6 ) THEN USING ART 26.2.10
        012 C**             EVALUATE THE POWER SERIES IN THE FORM:
        011 C**             P(X)=0.5+X/SQRT(TWOPI)*( 1.0-(X**2)/6+(X**4)/40-(X**6)/336+...
        011 C**                 + ( (-1)**N )*( X**(2*N) )/( N!*( 2**N )*( 2*N+1 ) )
        012 C**             OTHERWISE IF ( ABS(Z) .GT. 5 ) THEN USING ART 26.2.12
        012 C**             EVALUATE THE ASYMPTOTIC EXPANSION IN THE FORM:
        012 C**             Q(X)=( 1.0/SQRT(TWOPI) )*( EXP(-0.5*X**2) )*
        012 C**                  ( (X**-1)-(X**-3)+3*(X**-5)-15*(X**-7)+...
        012 C**                  +( (-1)**N )*(1*3*...*(2*N-1) )*( X**-(2*N+1) ) )
        012 C**            WHERE P(X) + Q(X) = 1.
        011 C**
        011 C**  APPLICABILITY: ASCII FORTRAN
        011 C**
        011 C**  KEYWORDS: CUMULATIVE GAUSSIAN, AREA UNDER GAUSSIAN, NORMAL CURVE
        011 C**
        011 C**  RECORD OF MODIFICATIONS: INITIAL PROGRAM 4-27-82
        011 C**
        011 C**  WAIVERS: NONE
        011 C
        011        START EDIT PAGE
        011 C
        011        DOUBLE PRECISION A                  @ AREA UNDER THE GAUSSIAN
```

```
011       DOUBLE PRECISION D1                 @ N!*2**N (FORMED RECURSIVELY)
011       DOUBLE PRECISION D2                 @ (2*N+1) (FORMED RECURSIVELY)
011       DOUBLE PRECISION DENOM              @ DENOMINATOR OF SUM (-D1*D2)
011       INTEGER N                           @ SUMMATION INDEX
011       DOUBLE PRECISION NEXTN              @ NEXT VALUE OF N
011       DOUBLE PRECISION NUMER              @ NUMERATOR OF SUM (=X**(2*N))
011       DOUBLE PRECISION SGN                @ SIGN VRBL (=-1**N)
011       DOUBLE PRECISION STPINV             @ SQRT(TWOPI) INVERTED
011      *          / 0.39894228040143267800 /
011       DOUBLE PRECISION SUM                @ ACCUMULATION VRBL FOR SUMMATION
011       DOUBLE PRECISION X                  @ ABSOLUTE VALUE OF Z (ARG INPUT)
012       DOUBLE PRECISION XI                 @ X INVERTED, I.E., 1/X
012       DOUBLE PRECISION XISQ               @ XI**2
011       DOUBLE PRECISION XSQ                @ X**2
011       DOUBLE PRECISION Z                  @ GAUSS ARG (#S.D. FR MEAN)
011       A = 0.50D0                          @ PRESET A FOR MEAN Z
011       X = DABS ( Z )                      @ ARG FOR POWER SERIES
011       IF ( X .GT. 0.0D0 ) THEN            @ EVAL POWER SERIES
012        XSQ = X * X                        @ PRESETS FOR RECURSIVE CALC
012        SGN = -1.0D0
013        IF ( X .LE. 6.0D0 ) THEN           @ ART 26.2.10 SERIES
012         NUMER = 1.0D0                     @ POWER SERIES PRESETS(N=0)
011         D1 = 2.0D0
011         D2 = 3.0D0
011         SUM = 1.0D0
012         DO 10 N = 1, 100                  @ EVALUATE SUMMATION
011           NUMER = NUMER * XSQ
011           DENOM = D1 * D2
011           ADD = NUMER / DENOM             @ NTH TERM OF SERIES
011           SUM = SUM + DSIGN ( ADD, SGN )@ ACCUMULATE SUM
012           IF ( ADD .LT. 1.0D-25 )         @ ENOUGH ACCURACY,GO
012      *       GO TO 20
011           NEXTN = DFLOAT ( N + 1 )        @ SET UP FOR NEXT TERM
011           D1 = D1 * NEXTN * 2.0D0
011           D2 = D2 + 2.0D0
011           SGN = - SGN
011 10      CONTINUE
012 20    CONTINUE
011         A = A +
012      *    STPINV * X * DSIGN ( SUM, Z ) @ A=0.5 +OR- SUM
012        ELSE                               @ ASYMPTOTIC EXPANSION, 26.2.12
012         XI = 1.0D0 / X                    @ ASYMPT. EXP. PRESETS(N=0)
012         XISQ = XI * XI
012         SUM = XI
012         ADD = XI
012         ADDSAV = ADD + 1.0D0              @ PRESET TO .GT. ADD
012         DO 30 N = 1, 100                  @ EVALUATE N TERMS
012           ADD = DFLOAT ( 2*N-1 ) *         @ NTH TERM
012      *    XISQ * ADD
012           IF ( ADD .GT. ADDSAV )          @ END OF USEFUL ITER.
012      *    GO TO 40
012           SUM = SUM + DSIGN ( ADD, SGN ) @ ACCUMULATE TERMS
012           ADDSAV = ADD                    @ SAVE LAST TERM
012           SGN = -SGN                      @ CHG SIGN OF NEXT TERM
012 30      CONTINUE
012 40     CONTINUE
```

```
012        *  DEXP ( -0.5D0*XSQ ) * SUM
014           IF ( Z .GT. 0.0D0 ) A = 1.0D0-A
012          ENDIF
011        ENDIF
011        RETURN
011        END
```

END ELT.

```
@ELT,L NLR.RUN/P3R81A
ELT017 RLIB70 01/21-09:38:23-(11,)
     011 @RUN,S/NR P3R81A,DTA7213030A/HOFMOCKEL-UL,PASS,10,300
     011 @ASG,A PRT1.
     011 @USE PRT,PRT1
     007 @PRX,U PRT.
     007 @ELT,L PASS+NLR.RUN/P3R81
     011 @ELT,L NLRDAT.A1
     011 @ELT,L NLRDAT.A2
     011 @ELT,L NLRDAT.A3
     007 @ASG,T 21.,F///500
     008 @PASS+NLR.P3R81
     007 /PROBLEM
     011           TITLE IS ' REGRESSION ON REAL PI DATA'.
     007 /INPUT
     011           VARIABLES ARE 9.
     011           FORMAT IS '(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))'.
     007 /VARIABLE
     011           NAMES ARE PERF,HOLD,CASEWT,TIMEWT,I1,I2,I3,I4,I5.
     007 /REGRESS
     011           TITLE IS ' PARAMETERS FROM DATA SET # 1 ( 6 PLATFORMS)'.
     007           INDEPENDENT IS PERF.
     007           DEPENDENT IS HOLD.
     007           NUMBER IS 2.
     011           PARAMETERS ARE 7.
     007           WEIGHT IS CASEWT.
     011           ITERATIONS ARE 15.
     007           HALVING IS 0.
     007           MEANSQUARE IS 1.0.
     007           CONVERGENCE IS -1.0.
     007 /PARAMETER
     011           INITIAL ARE -10.,.06,0.0,0.0,0.0,0.0.0.0.
     007 /PLOT
     007           RESIDUAL.
     007           VARIABLE IS PERF.
     007           NORMAL.
     007           DNORMAL.
     007           SIZE IS 50,40.
     007 /END
     011 @ADD,P NLRDAT.A1
     007 @EOF
     007 @TEST TNE/0/T3
     007 @JUMP 3
     007 @DATA,L 21.
     007 @END
     007 @RS 21.
     008 @PASS+NLR.P3R81
     007 /PROBLEM
     011           TITLE IS ' REGRESSION ON REAL DATA'.
     007 /INPUT
     011           VARIABLES ARE 8.
     011           FORMAT IS '(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))'.
     007 /VARIABLE
     011           NAMES ARE PERF,HOLD,CASEWT,TIMEWT,I1,I2,I3,I4.
     007 /REGRESS
     011           TITLE IS ' PARAMETERS FROM DATA SET # 2 ( 5 PLATFORMS)'.
     007           INDEPENDENT IS PERF.
```

```
007          DEPENDENT IS HOLD.
007          NUMBER IS 2.
011          PARAMETERS ARE 6.
007          WEIGHT IS CASEWT.
011          ITERATIONS ARE 15.
007          HALVING IS 0.
007          MEANSQUARE IS 1.0.
007          CONVERGENCE IS -1.0.
007 /PARAMETER
008          INITIAL ARE -10.,.06,0.,0.,0.,0.,0.,0.,0.,0.,0.,0.,0..
007 /PLOT
007          RESIDUAL.
007          VARIABLE IS PERF.
007          NORMAL.
007          DNORMAL.
007          SIZE IS 50,40.
007 /END
011 @ADD,P NLRDAT.A2
007 @EOF
007 @TEST TNE/0/T3
007 @JUMP 3
007 @DATA,L 21.
007 @END
007 @FRS 21.
010 @ELT,L PASS*NLRDAT1.A3DAT/WSE6-10
008 @PASS*NLR.P3R81
007 /PROBLEM
011          TITLE IS ' REGRESSION ON REAL DATA'.
007 /INPUT
011          VARIABLES ARE 8.
011          FORMAT IS '(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))'.
007 /VARIABLE
011          NAMES ARE PERF,HOLD,CASEWT,TIMEWT,T1,T2,T3,T4.
007 /REGRESS
011          TITLE IS ' PARAMETERS FROM DATA SET # 3 ( 5 PLATFORMS)'.
007          INDEPENDENT IS PERF.
007          DEPENDENT IS HOLD.
007          NUMBER IS 2.
011          PARAMETERS ARE 6.
007          WEIGHT IS CASEWT.
011          ITERATIONS ARE 15.
007          HALVING IS 0.
007          MEANSQUARE IS 1.0.
007          CONVERGENCE IS -1.0.
007 /PARAMETER
011          INITIAL ARE -10.,.06,0.0,0.0,0.0,0.0.
007 /PLOT
007          RESIDUAL.
007          VARIABLE IS PERF.
007          NORMAL.
007          DNORMAL.
007          SIZE IS 50,40.
007 /END
011 @ADD,P NLRDAT.A3
007 @EOF
007 @TEST TNE/0/T3
007 @JUMP 3
```

```
000113      007 @DATA,L 21.
000114      007 @END
000115      007 @BRKPT PRINT$
000116      011 @SYM,U PRT.,,PR
000117      007 @FIN

END ELT.

@BRKPT PRINT$
```

```
@ELT,L NLRDAT.A1
ELT0T7 RLIB70 10/07-17:21:58-(0,)
000001      000 172.75   .00000      .06340 154.0 0 0 0 0 0
000002      000 174.25   .00923      .21303 368.0 0 0 0 0 0
000003      000 175.75   .00000      .32068 374.0 0 0 0 0 0
000004      000 177.25   .00000      .33868 256.0 0 0 0 0 0
000005      000 178.75   .00000      .20533  95.0 0 0 0 0 0
000006      000 180.25   .00000      .15474  41.0 0 0 0 0 0
000007      000 181.75   .00000      .65578 109.0 0 0 0 0 0
000008      000 183.25   .00000      .45317  40.0 0 0 0 0 0
000009      000 184.75   .00000      .89758  44.0 0 0 0 0 0
000010      000 186.25   .00000     1.30922  33.0 0 0 0 0 0
000011      000 187.75   .00000      .68562   3.0 0 0 0 0 0
000012      000 171.25   .00000      .00728  20.0 1 0 0 0 0
000013      000 172.75   .01702      .09507 233.0 1 0 0 0 0
000014      000 174.25   .00000      .34816 604.0 1 0 0 0 0
000015      000 175.75   .00000      .13327 153.0 1 0 0 0 0
000016      000 177.25   .00000      .14216 105.0 1 0 0 0 0
000017      000 178.75   .00000      .05562  22.0 1 0 0 0 0
000018      000 180.25   .00000      .50108 143.0 1 0 0 0 0
000019      000 181.75   .00000      .57477  95.0 1 0 0 0 0
000020      000 183.25   .00000      .47332  42.0 1 0 0 0 0
000021      000 184.75   .00000     3.85884 204.0 1 0 0 0 0
000022      000 186.25   .00000     2.55378  69.0 1 0 0 0 0
000023      000 187.75   .00000      .78937   5.0 1 0 0 0 0
000024      000 168.25   .00000      .00230   7.0 0 1 0 0 0
000025      000 169.75   .02886      .02100  91.0 0 1 0 0 0
000026      000 171.25   .02661      .03737 124.0 0 1 0 0 0
000027      000 172.75   .00000      .05979 145.0 0 1 0 0 0
000028      000 174.25   .00000      .05165  86.0 0 1 0 0 0
000029      000 175.75   .00000      .10022 114.0 0 1 0 0 0
000030      000 177.25   .00000      .13956 103.0 0 1 0 0 0
000031      000 178.75   .00000      .28183 132.0 0 1 0 0 0
000032      000 180.25   .00000      .58276 167.0 0 1 0 0 0
000033      000 181.75   .00000      .85840 144.0 0 1 0 0 0
000034      000 183.25   .00000     1.56116 149.0 0 1 0 0 0
000035      000 184.75   .00000     7.34458 392.0 0 1 0 0 0
000036      000 186.25   .00000     2.44960  66.0 0 1 0 0 0
000037      000 168.25   .97667      .00163   2.0 0 0 1 0 0
000038      000 169.75   .50596      .00593  22.0 0 0 1 0 0
000039      000 171.25   .56926      .00363   6.0 0 0 1 0 0
000040      000 172.75   .08504      .08504 208.0 0 0 1 0 0
000041      000 174.25   .07638      .22620 391.0 0 0 1 0 0
000042      000 175.75   .04326      .21127 245.0 0 0 1 0 0
000043      000 177.25   .00000      .33738 255.0 0 0 1 0 0
000044      000 178.75   .00340      .48669 231.0 0 0 1 0 0
000045      000 180.25   .00000      .10133  25.0 0 0 1 0 0
000046      000 181.75   .00000      .41295  67.0 0 0 1 0 0
000047      000 183.25   .00000      .48341  43.0 0 0 1 0 0
000048      000 184.75   .00000     1.45075  74.0 0 0 1 0 0
000049      000 186.25   .00000     1.17275  29.0 0 0 1 0 0
000050      000 187.75   .00000      .63606   2.0 0 0 1 0 0
000051      000 163.75   .00000      .00095   1.0 0 0 0 1 0
000052      000 165.25   .06000      .00142   5.0 0 0 0 1 0
000053      000 166.75   .01667      .00438  26.0 0 0 0 1 0
```

000056	000	171.25	.00000	.03446	114.0	0	0	0	1	0
000057	000	172.75	.00401	.07823	191.0	0	0	0	1	0
000058	000	174.25	.00000	.23422	405.0	0	0	0	1	0
000059	000	175.75	.00000	.09513	108.0	0	0	0	1	0
000060	000	177.25	.00000	.07336	52.0	0	0	0	1	0
000061	000	178.75	.00000	.06762	28.0	0	0	0	1	0
000062	000	180.25	.00000	.28343	79.0	0	0	0	1	0
000063	000	181.75	.00000	.28624	45.0	0	0	0	1	0
000064	000	183.25	.00000	.69607	64.0	0	0	0	1	0
000065	000	184.75	.00266	4.02568	213.0	0	0	0	1	0
000066	000	186.25	.00000	2.93606	80.0	0	0	0	1	0
000067	000	187.75	.00000	.68562	3.0	0	0	0	1	0
000068	000	184.75	.00000	8.80950	471.0	0	0	0	0	1
000069	000	186.25	.00066	42.57157	1217.0	0	0	0	0	1
000070	000	167.75	.00000	.58818	1.0	0	0	0	0	1
000071	000	189.25	.00000	1.18172	1.0	0	0	0	0	1

END ELT.

@ELT,L NLRDAT.A2
ELT017 RLIB70 10/07-17:21:59-(0,)

000001	000	165.25	.10954	.00270	17.0	0	0	0	0	0
000002	000	166.75	.08222	.00178	6.0	0	0	0	0	0
000003	000	168.25	.00000	.00176	3.0	0	0	0	0	0
000004	000	169.75	.14508	.01024	42.0	0	0	0	0	0
000005	000	171.25	.06174	.05719	192.0	0	0	0	0	0
000006	000	172.75	.13419	.03817	91.0	0	0	0	0	0
000007	000	174.25	.05667	.02206	34.0	0	0	0	0	0
000008	000	175.75	.28720	.03185	33.0	0	0	0	0	0
000009	000	177.25	.08698	.06949	49.0	0	0	0	0	0
000010	000	178.75	.00000	.05562	22.0	0	0	0	0	0
000011	000	180.25	.00000	.04239	6.0	0	0	0	0	0
000012	000	181.75	.00000	.26330	41.0	0	0	0	0	0
000013	000	183.25	.00000	.35292	30.0	0	0	0	0	0
000014	000	184.75	.00000	.66002	31.0	0	0	0	0	0
000015	000	186.25	.00000	4.92027	137.0	0	0	0	0	0
000016	000	187.75	.00000	12.06761	174.0	0	0	0	0	0
000017	000	189.25	.00000	14.04508	99.0	0	0	0	0	0
000018	000	165.25	.24396	.00507	37.0	1	0	0	0	0
000019	000	166.75	.08161	.00945	62.0	1	0	0	0	0
000020	000	168.25	.23255	.01394	76.0	1	0	0	0	0
000021	000	169.75	.14763	.04458	198.0	1	0	0	0	0
000022	000	171.25	.04621	.03825	127.0	1	0	0	0	0
000023	000	172.75	.00000	.02578	60.0	1	0	0	0	0
000024	000	174.25	.00000	.04023	66.0	1	0	0	0	0
000025	000	175.75	.04505	.04694	51.0	1	0	0	0	0
000026	000	177.25	.00000	.13566	100.0	1	0	0	0	0
000027	000	178.75	.00000	.09202	40.0	1	0	0	0	0
000028	000	180.25	.00000	.13459	35.0	1	0	0	0	0
000029	000	181.75	.00000	.29198	46.0	1	0	0	0	0
000030	000	183.25	.00000	.47332	42.0	1	0	0	0	0
000031	000	184.75	.00000	.91594	45.0	1	0	0	0	0
000032	000	186.25	.00000	1.48076	38.0	1	0	0	0	0
000033	000	187.75	.00000	8.68228	124.0	1	0	0	0	0
000034	000	189.25	.00000	39.89591	289.0	1	0	0	0	0
000035	000	174.25	.00000	.01057	13.0	0	1	0	0	0
000036	000	175.75	.00000	.04022	43.0	0	1	0	0	0
000037	000	177.25	.00000	.11616	85.0	0	1	0	0	0
000038	000	178.75	.00000	.36045	170.0	0	1	0	0	0
000039	000	180.25	.00000	.63723	183.0	0	1	0	0	0
000040	000	181.75	.00355	1.16538	197.0	0	1	0	0	0
000041	000	183.25	.00000	3.38569	328.0	0	1	0	0	0
000042	000	184.75	.00000	.29305	10.0	0	1	0	0	0
000043	000	186.25	.00000	1.17275	29.0	0	1	0	0	0
000044	000	187.75	.00000	.89855	7.0	0	1	0	0	0
000045	000	189.25	.00000	39.21536	284.0	0	1	0	0	0
000046	000	160.75	.00000	.00124	6.0	0	0	1	0	0
000047	000	162.25	.00000	.00096	2.0	0	0	1	0	0
000048	000	163.75	.00000	.00136	6.0	0	0	1	0	0
000049	000	165.25	.99333	.00142	5.0	0	0	1	0	0
000050	000	166.75	.00000	.00155	4.0	0	0	1	0	0
000051	000	168.25	.66020	.00290	11.0	0	0	1	0	0
000052	000	169.75	.63000	.00468	16.0	0	0	1	0	0
000053	000	171.25	.48048	.00953	28.0	0	0	1	0	0

000056	000	175.75	.27820	.08328	94.0	0	0	1	0	0
000057	000	177.25	.45699	.11876	87.0	0	0	1	0	0
000058	000	178.75	.33630	.37907	179.0	0	0	1	0	0
000059	000	180.25	.25899	.69170	199.0	0	0	1	0	0
000060	000	181.75	.28466	.67893	113.0	0	0	1	0	0
000061	000	183.25	.14207	.76716	71.0	0	0	1	0	0
000062	000	184.75	.19703	1.95028	101.0	0	0	1	0	0
000063	000	186.25	.08077	3.45784	95.0	0	0	1	0	0
000064	000	187.75	.09507	8.68228	124.0	0	0	1	0	0
000065	000	189.25	.11143	14.99647	106.0	0	0	1	0	0
000066	000	168.25	.00000	.00467	22.0	0	0	0	1	0
000067	000	169.75	.00000	.00893	36.0	0	0	0	1	0
000068	000	171.25	.01422	.06011	202.0	0	0	0	1	0
000069	000	172.75	.02713	.07422	181.0	0	0	0	1	0
000070	000	174.25	.01758	.06536	110.0	0	0	0	1	0
000071	000	175.75	.00000	.10869	124.0	0	0	0	1	0
000072	000	177.25	.00000	.10447	76.0	0	0	0	1	0
000073	000	178.75	.00000	.09611	42.0	0	0	0	1	0
000074	000	180.25	.00000	.07539	17.0	0	0	0	1	0
000075	000	181.75	.00000	.44182	72.0	0	0	0	1	0
000076	000	183.25	.00000	1.40835	134.0	0	0	0	1	0
000077	000	184.75	.00000	1.87623	97.0	0	0	0	1	0
000078	000	186.25	.00000	3.38825	93.0	0	0	0	1	0
000079	000	187.75	.00000	12.47395	180.0	0	0	0	1	0
000080	000	189.25	.00000	12.00732	84.0	0	0	0	1	0

ND ELT.

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ELT017 RLIB70 10/07-17:22:00-(0,)
000001      000 166.75  .67605      .00329  18.0 0 0 0 0 0
000002      000 168.25  .07936      .02348 131.0 0 0 0 0 0
000003      000 169.75  .16015      .00742  29.0 0 0 0 0 0
000004      000 171.25  .06286      .03388 112.0 0 0 0 0 0
000005      000 172.75  .04777      .04778 115.0 0 0 0 0 0
000006      000 174.25  .09734      .02885  46.0 0 0 0 0 0
000007      000 175.75  .03564      .06720  75.0 0 0 0 0 0
000008      000 177.25  .01386      .23714 178.0 0 0 0 0 0
000009      000 178.75  .00000      .26942 126.0 0 0 0 0 0
000010      000 180.25  .00000      .16485  44.0 0 0 0 0 0
000011      000 181.75  .00000      .36680  59.0 0 0 0 0 0
000012      000 183.25  .00000      .87898  82.0 0 0 0 0 0
000013      000 186.25  .00000     1.41204  36.0 0 0 0 0 0
000014      000 166.75  .03356      .00761  49.0 1 0 0 0 0
000015      000 168.25  .01405      .02487 139.0 1 0 0 0 0
000016      000 169.75  .02224      .03334 147.0 1 0 0 0 0
000017      000 171.25  .00000      .05982 201.0 1 0 0 0 0
000018      000 172.75  .01775      .05779 140.0 1 0 0 0 0
000019      000 174.25  .00000      .08023 136.0 1 0 0 0 0
000020      000 175.75  .00000      .05116  56.0 1 0 0 0 0
000021      000 177.25  .00000      .16036 119.0 1 0 0 0 0
000022      000 178.75  .00000      .60467 288.0 1 0 0 0 0
000023      000 180.25  .00000      .32080  90.0 1 0 0 0 0
000024      000 181.75  .00000      .54586  90.0 1 0 0 0 0
000025      000 183.25  .00000      .55415  50.0 1 0 0 0 0
000026      000 184.75  .00000      .21604   5.0 1 0 0 0 0
000027      000 172.75  .26057      .02378  55.0 0 1 0 0 0
000028      000 174.25  .11484      .04879  81.0 0 1 0 0 0
000029      000 175.75  .00000      .15192 175.0 0 1 0 0 0
000030      000 177.25  .01802      .41029 311.0 0 1 0 0 0
000031      000 178.75  .00000     1.23815 594.0 0 1 0 0 0
000032      000 180.25  .00000      .26305  73.0 0 1 0 0 0
000033      000 181.75  .00000      .26903  42.0 0 1 0 0 0
000034      000 183.25  .00000     1.54079 147.0 0 1 0 0 0
000035      000 184.75  .00000      .30927  11.0 0 1 0 0 0
000036      000 186.25  .00000      .30265   1.0 0 1 0 0 0
000037      000 160.75  .55639      .01531 149.0 0 0 1 0 0
000038      000 162.25  .58716      .01106 104.0 0 0 1 0 0
000039      000 163.75  .71858      .00921  80.0 0 0 1 0 0
000040      000 165.25  .46889      .00591  44.0 0 0 1 0 0
000041      000 166.75  .53150      .01045  69.0 0 0 1 0 0
000042      000 168.25  .30882      .01117  60.0 0 0 1 0 0
000043      000 169.75  .72667      .01616  63.0 0 0 1 0 0
000044      000 171.25  .60883      .04466 149.0 0 0 1 0 0
000045      000 172.75  .60248      .00888  17.0 0 0 1 0 0
000046      000 174.25  .20846      .09110 155.0 0 0 1 0 0
000047      000 175.75  .10260      .05369  59.0 0 0 1 0 0
000048      000 177.25  .08953      .38686 293.0 0 0 1 0 0
000049      000 178.75  .07786      .29217 137.0 0 0 1 0 0
000050      000 180.25  .00000      .19526  53.0 0 0 1 0 0
000051      000 181.75  .00000      .22331  34.0 0 0 1 0 0
000052      000 183.25  .00000      .15234   9.0 0 0 1 0 0
000053      000 166.75  .00000      .00690  44.0 0 0 0 1 0
```

```
000056     000 171.25   .01441      .04437 148.0 0 0 0 1 0
000057     000 172.75   .02653      .04698 113.0 0 0 0 1 0
000058     000 174.25   .02122      .09912 169.0 0 0 0 1 0
000059     000 175.75   .01229      .07228  81.0 0 0 0 1 0
000060     000 177.25   .00275      .25797 194.0 0 0 0 1 0
000061     000 178.75   .00000      .30665 144.0 0 0 0 1 0
000062     000 180.25   .00000      .47385 135.0 0 0 0 1 0
000063     000 181.75   .00000     1.22910 208.0 0 0 0 1 0
000064     000 183.25   .00000      .70622  65.0 0 0 0 1 0
000065     000 184.75   .00000      .17408   2.0 0 0 0 1 0

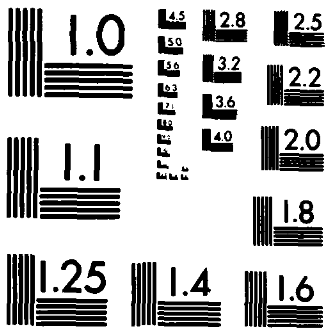
END ELT.

@ASG,T 21.,F///500
```

@PASS*NLR.P3R81

AD-A134 078 NONLINEAR REGRESSION ANALYSIS METHODOLOGY FOR THE ESTIMATION OF DETECTION..(U) COMPUTER SCIENCES CORP SAN DIEGO CALIF J L HOFMOCKEL SEP 82 NOSC-CR-153

UNCLASSIFIED N00123-79-D-0272 F/G 9/2 NL



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

```
PAGE   1

BMDP3R - NONLINEAR REGRESSION
DEPARTMENT OF BIOMATHEMATICS
UNIVERSITY OF CALIFORNIA, LOS ANGELES, CA 90024
(213) 825-5940          TWX  UCLA LSA
PROGRAM REVISED JUNE 1981
MANUAL REVISED -- 1981
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10/07/82            AT 17:22:01

TO SEE REMARKS AND A SUMMARY OF NEW FEATURES FOR
THIS PROGRAM, STATE NEWS. IN THE PRINT PARAGRAPH.

PROGRAM CONTROL INFORMATION

/PROBLEM
          TITLE IS ' REGRESSION ON REAL DATA'.
/INPUT
          VARIABLES ARE 9.
          FORMAT IS '(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))'.
/VARIABLE
          NAMES ARE PERF,HOLD,CASEWT,TIMEWT,I1,I2,I3,I4,I5.
/REGRESS
          TITLE IS ' PARAMETERS FROM DATA SET # 1 ( 6 PLATFORMS)'.
          INDEPENDENT IS PERF.
          DEPENDENT IS HOLD.
          NUMBER IS 2.
          PARAMETERS ARE 7.
          WEIGHT IS CASEWT.
          ITERATIONS ARE 15.
          HALVING IS 0.
          MEANSQUARE IS 1.0.
          CONVERGENCE IS -1.0.
/PARAMETER
          INITIAL ARE -10.0,0.06,0.0,0.0,0.0,0.0,0.0.
/PLOT
          RESIDUAL.
          VARIABLE IS PERF.
          NORMAL.
          DNORMAL.
          SIZE IS 50,40.
/END

PROBLEM TITLE IS
 REGRESSION ON REAL DATA

NUMBER OF VARIABLES TO READ IN. . . . . . . . . .         9
NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. . .         0
TOTAL NUMBER OF VARIABLES . . . . . . . . . . . .         9
NUMBER OF CASES TO READ IN. . . . . . . . . . . . TO END
CASE LABELING VARIABLES . . . . . . . . . . . . .
MISSING VALUES CHECKED BEFORE OR AFTER TRANS. . NEITHER
BLANKS ARE. . . . . . . . . . . . . . . . . . . MISSING
INPUT UNIT NUMBER . . . . . . . . . . . . . . . .         5
REWIND INPUT UNIT PRIOR TO READING. . DATA. . .        NO
```

```
NUMBER OF CASES DESCRIBED BY INPUT FORMAT . . .         1

VARIABLES TO BE USED
      1 PERF         2 HOLD         3 CASEWT       4 TIMEWT       5 I1
      6 I2           7 I3           8 I4           9 I5

INPUT FORMAT IS
(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))

MAXIMUM LENGTH DATA RECORD IS   43 CHARACTERS.

I N P U T   V A R I A B L E S . . . . .
  VARIABLE     RECORD   COLUMNS    FIELD  TYPE            VARIABLE      RECORD   COLUMNS     FIELD  TYPE
INDEX  NAME      NO.  BEGIN  END   WIDTH                INDEX   NAME      NO.  BEGIN  END   WIDTH
----- --------  ----  ----- -----  -----  ----          ----- --------   ----  ----- -----  -----  ----
    1 PERF        1      1     6    6.2   F                 6 I2          1     37    37      1    F
    2 HOLD        1      7    15    9.5   F                 7 I3          1     39    39      1    F
    3 CASEWT      1     16    27   12.5   F                 8 I4          1     41    41      1    F
    4 TIMEWT      1     28    33    6.1   F                 9 I5          1     43    43      1    F
    5 I1          1     35    35    1     F

VARIABLES TO BE PLOTTED
            1  PERF

  PLOT OF PREDICTED VALUES VERSUS RESIDUALS . . .      YES
  NORMAL PROBABILITY PLOT . . . . . . . . . . . .      YES
  DETRENDED NORMAL PROBABILITY PLOT . . . . . . .      YES
```

PAGE 2 PARAMETERS FROM DATA SET # 1 (6 PLATFORMS)

REGRESSION TITLE
PARAMETERS FROM DATA SET # 1 (6 PLATFORMS)

REGRESSION NUMBER	2
INDEPENDENT VARIABLE(FOR BUILT-IN FUNCTION) . .	PERF
DEPENDENT VARIABLE.	HOLD
WEIGHTING VARIABLE.	CASEWT
NUMBER OF PARAMETERS.	7
NUMBER OF CONSTRAINTS	0
TOLERANCE FOR PIVOTING.	.00000001000
TOLERANCE FOR CONVERGENCE	-1.00000000000
MAXIMUM NUMBER OF ITERATIONS.	15
MAXIMUM NUMBER OF INCREMENT HALVINGS.	0
NUMBER OF DATA PASSES PER CASE.	1
COMPUTE LOSS FUNCTION	NO
SPECIFIED RESIDUAL MEAN SQUARE.	1.000

USING THE ABOVE SPECIFICATIONS THIS PROGRAM COULD PROCESS 897 CASES.

@ADD,P NLRDAT.A1

BASED ON INPUT FORMAT SUPPLIED 1 RECORDS READ PER CASE.

NUMBER OF CASES READ. 71

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
1	PERF	185.095459	2.520789	163.750000	189.250000
2	HOLD	.000924	.008479	.000000	.976670
3	CASEWT	20.829962	19.572454	.000950	42.571570
4	TIMEWT	654.769707	518.261055	1.000000	1217.000000
5	I1	.098641	.300302	.000000	1.000000
6	I2	.139592	.349030	.000000	1.000000
7	I3	.058102	.235602	.000000	1.000000
8	I4	.098862	.300601	.000000	1.000000
9	I5	.549988	.501036	.000000	1.000000

	P1	P2	P3	P4	P5	P6
PARAMETER MAXIMA.	.2126765+038	.2126765+038	.2126765+038	.2126765+038	.2126765+038	.2126765+038
PARAMETER MINIMA.	-.2126765+038	-.2126765+038	-.2126765+038	-.2126765+038	-.2126765+038	-.2126765+038

ITERATION NUMBER	INCREMENT HALVINGS	RESIDUAL SUM OF SQUARES	P1	P2	P3	P4	P5	P6
0	0	.159127+000	-10.000000	.060000	.000000	.000000	.000000	.000000
1	0	.342195-001	-5.326100	.038222	.003723	-.002657	-.130396	.011608
2	0	.139222-001	-5.941164	.044671	.000424	-.033228	-.343947	-.005805
3	0	.788906-002	-9.836592	.069059	.000735	-.079082	-.640520	-.027245

5	0	.273488-001	-28.048932	.175794	.067805	.025155	-1.104663	.090823
6	0	.654152+000	-35.420432	.218528	.102855	.177340	-1.167357	.219545
7	0	.164031+001	-37.271401	.229249	.113417	.227599	-1.174427	.259432
8	0	.168236+001	-37.332281	.229601	.114781	.230556	-1.173899	.259879
9	0	.168241+001	-37.332933	.229605	.114817	.230588	-1.173871	.259855
10	0	.168246+001	-37.333001	.229605	.114817	.230589	-1.173871	.259856
11	0	.168246+001	-37.333001	.229605	.114817	.230589	-1.173871	.259856
12	0	.168245+001	-37.332998	.229605	.114817	.230589	-1.173871	.259856
13	0	.168245+001	-37.332997	.229605	.114817	.230589	-1.173871	.259856
14	0	.168246+001	-37.333003	.229605	.114817	.230589	-1.173871	.259856
15	0	.168245+001	-37.332998	.229605	.114817	.230589	-1.173871	.259856

PARAMETER MAXIMA. . . . . .21267648+038
PARAMETER MINIMA. . . . . -.21267648+038

ITERATION NUMBER	INCREMENT HALVINGS	RESIDUAL SUM OF SQUARES	P7
0	0	.159127+000	.000000
1	0	.342195-001	-.021655
2	0	.139222-001	-.146972
3	0	.788906-002	-.406172
4	0	.512350-002	-.864416
5	0	.273488-001	-1.471622
6	0	.654152+000	-1.897708
7	0	.164031+001	-1.998182
8	0	.168236+001	-2.000550
9	0	.168241+001	-2.000590
10	0	.168246+001	-2.000595
11	0	.168246+001	-2.000595
12	0	.168245+001	-2.000595
13	0	.168245+001	-2.000595
14	0	.168246+001	-2.000595
15	0	.168245+001	-2.000595

PAGE 3 PARAMETERS FROM DATA SET # 1 (6 PLATFORMS)

ASYMPTOTIC CORRELATION MATRIX OF THE PARAMETERS

		P1 1	P2 2	P3 3	P4 4	P5 5	P6 6	P7 7
P1	1	1.0000						
P2	2	-.9990	1.0000					
P3	3	-.0841	.0523	1.0000				
P4	4	-.3140	.2828	.5277	1.0000			
P5	5	-.0282	-.0138	.6841	.6726	1.0000		
P6	6	-.4615	.4278	.5786	.6705	.7277	1.0000	
P7	7	.5810	-.5995	.2619	.1201	.3949	.0576	1.0000

RESIDUAL MEAN SQUARE .262883-001

DEGREES OF FREEDOM 64

THE SPECIFIED VALUE OF THE RESIDUAL MEAN SQUARE(1.000), NOT THE COMPUTED VALUE, IS USED IN COMPUTING STANDARD DEVIATIONS FOR PARAMETERS AND PREDICTED VALUES.

PARAMETER	ESTIMATE	ASYMPTOTIC STANDARD DEVIATION	TOLERANCE
P1	-37.332998	585.884191	.0001243331
P2	.229605	3.361551	.0001255298
P3	.114817	35.929572	.4779764460
P4	.230589	36.373252	.4133143665
P5	-1.173871	27.243224	.0965782315
P6	.259856	33.542516	.2211476789
P7	-2.000595	63.638868	.4750250456

PAGE 4 PARAMETERS FROM DATA SET # 1 (6 PLATFORMS)

CASE NO.	LABEL	PREDICTED HOLD	STD DEV OF PRED VALUE	OBSERVED HOLD	RESIDUAL	CASEWT	PERF	TIMEWT	I1
1		.009869	344590.312500	.000000	-.009869	.787981	172.750000	154.000000	.000000
2		.003729	344590.312500	.009230	.005501	4.953076	174.250000	368.000000	.000000
3		.001263	344590.312500	.000000	-.001263	14.819335	175.750000	374.000000	.000000
4		.000383	344590.312500	.000000	-.000383	33.397999	177.250000	256.000000	.000000
5		.000104	344590.312500	.000000	-.000104	45.644907	178.750000	95.000000	.000000
6		.000025	344590.312500	.000000	-.000025	81.197438	180.250000	41.000000	.000000
7		.000005	344590.312500	.000000	-.000005	99[illegible].447151	181.750000	109.000000	.000000
8		.000001	344590.312500	.000000	-.000001	1891.474380	183.250000	40.000000	.000000
9		.000000	344590.312500	.000000	.000000	12066.506958	184.750000	44.000000	.000000
10		.000000	344590.312500	.000000	.000000	58871.680664	186.250000	33.000000	.000000
11		.000000	344590.312500	.000000	.000000	39070.785645	187.750000	3.000000	.000000
12		.017790	344590.312500	.000000	-.017790	.057229	171.250000	20.000000	1.000000
13		.007221	344590.312500	.017020	.009799	1.625190	172.750000	233.000000	1.000000
14		.002631	344590.312500	.000000	-.002631	11.507648	174.250000	604.000000	1.000000
15		.000860	344590.312500	.000000	-.000860	8.908015	175.750000	153.000000	1.000000
16		.000251	344590.312500	.000000	-.000251	20.893265	177.250000	105.000000	1.000000
17		.000066	344590.312500	.000000	-.000066	16.737880	178.750000	22.000000	1.000000
18		.000015	344590.312500	.000000	-.000015	46[illegible].659039	180.250000	143.000000	1.000000
19		.000003	344590.312500	.000000	-.000003	1483.133621	181.750000	95.000000	1.000000
20		.000001	344590.312500	.000000	-.000001	3523.345612	183.250000	42.000000	1.000000
21		.000000	344590.312500	.000000	.000000	103117.198242	184.750000	204.000000	1.000000
22		.000000	344590.312500	.000000	.000000	235765.691406	186.250000	69.000000	1.000000
23		.000000	344590.312500	.000000	.000000	129620.230469	187.750000	5.000000	1.000000
24		.063176	344590.312500	.000000	-.063176	.005914	168.250000	7.000000	.000000
25		.030530	344590.312500	.028860	-.001670	.153726	169.750000	91.000000	.000000
26		.013296	344590.312500	.026610	.013314	.472601	171.250000	124.000000	.000000
27		.005205	344590.312500	.000000	-.005205	1.400052	172.750000	145.000000	.000000
28		.001829	344590.312500	.000000	-.001829	2.355617	174.250000	86.000000	.000000
29		.000576	344590.312500	.000000	-.000576	9.907884	175.750000	114.000000	.000000
30		.000162	344590.312500	.000000	-.000162	31.768559	177.250000	103.000000	.000000
31		.000041	344590.312500	.000000	-.000041	161.671253	178.750000	132.000000	.000000
32		.000009	344590.312500	.000000	-.000009	90[illegible].413704	180.250000	167.000000	.000000
33		.000002	344590.312500	.000000	-.000002	390[illegible].186615	181.750000	144.000000	.000000
34		.000000	344590.312500	.000000	.000000	2256[illegible].654785	183.250000	149.000000	.000000
35		.000000	344590.312500	.000000	.000000	371865.304688	184.750000	392.000000	.000000
36		.000000	344590.312500	.000000	.000000	439941.644531	186.250000	66.000000	.000000
37		.450582	344590.312500	.976670	.526088	.000404	168.250000	2.000000	.000000
38		.319679	344590.312500	.505960	.186281	.005058	169.750000	22.000000	.000000
39		.208108	344590.312500	.569260	.361152	.001820	171.250000	6.000000	.000000
40		.123552	344590.312500	.085040	-.038512	.096041	172.750000	208.000000	.000000
41		.066572	344590.312500	.070380	.009808	.314612	174.250000	391.000000	.000000
42		.032430	344590.312500	.043260	.010830	.390403	175.750000	245.000000	.000000
43		.014239	344590.312500	.000000	-.014239	.908357	177.250000	255.000000	.000000
44		.005622	344590.312500	.003400	-.002222	2.066165	178.750000	231.000000	.000000
45		.001992	344590.312500	.000000	-.001992	.628813	180.250000	25.000000	.000000
46		.000632	344590.312500	.000000	-.000632	5.300809	181.750000	67.000000	.000000
47		.000180	344590.312500	.000000	-.000180	11.968166	183.250000	43.000000	.000000
48		.000046	344590.312500	.000000	-.000046	81.073202	184.750000	74.000000	.000000
49		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

52	.192396	344590.312500	.060000	-.132396	.001609	165.250000	5.000000	.000000
53	.112468	344590.312500	.016670	-.095798	.013024	166.750000	26.000000	.000000
54	.059627	344590.312500	.000000	-.059627	.056179	168.250000	63.000000	.000000
55	.028564	344590.312500	.071710	.043146	.315333	169.750000	175.000000	.000000
56	.012329	344590.312500	.000000	-.012329	.468111	171.250000	114.000000	.000000
57	.004783	344590.312500	.004010	-.000773	2.006278	172.750000	191.000000	.000000
58	.001665	344590.312500	.000000	-.001665	12.183910	174.250000	405.000000	.000000
59	.000519	344590.312500	.000000	-.000519	10.407653	175.750000	108.000000	.000000
60	.000145	344590.312500	.000000	-.000145	17.953750	177.250000	52.000000	.000000
61	.000036	344590.312500	.000000	-.000036	38.758671	178.750000	28.000000	.000000
62	.000008	344590.312500	.000000	-.000008	490.917221	180.250000	79.000000	.000000
63	.000002	344590.312500	.000000	-.000002	1400[illegible].517990	181.750000	45.000000	.000000
64	.000000	344590.312500	.000000	.000000	1127[illegible].404419	183.250000	64.000000	.000000
65	.000000	344590.312500	.002660	.002660	237401.121094	184.750000	213.000000	.000000
66	.000000	344590.312500	.000000	.000000	63271[illegible].523438	186.250000	80.000000	.000000
67	.000000	344590.312500	.000000	.000000	18897[illegible].314453	187.750000	3.000000	.000000
68	.001015	344590.312500	.000000	-.001015	23.236644	184.750000	471.000000	.000000
69	.000301	344590.312500	.000660	.000359	201.956694	186.250000	1217.000000	.000000
70	.000080	344590.312500	.000000	-.000080	.624432	187.750000	1.000000	.000000
71	.000019	344590.312500	.000000	-.000019	2.630005	189.250000	1.000000	.000000

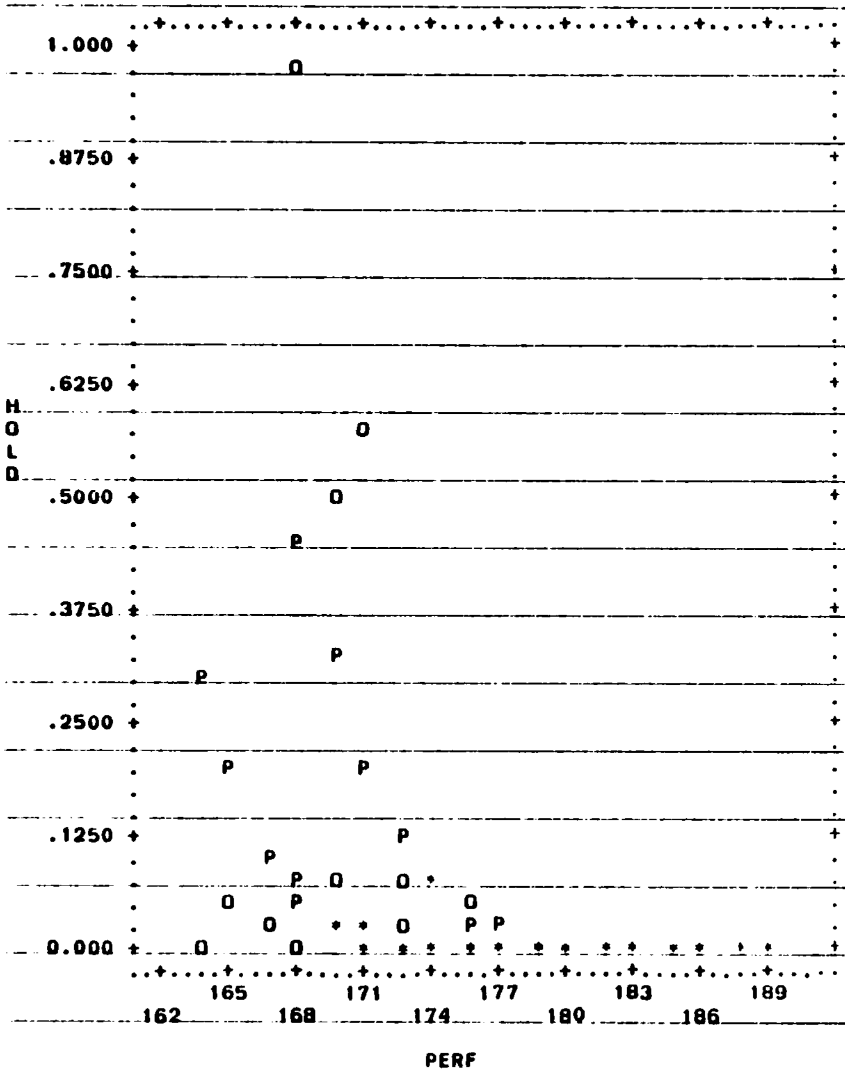
CASE	12	13	14	15
1	.000000	.000000	.000000	.000000
2	.000000	.000000	.000000	.000000
3	.000000	.000000	.000000	.000000
4	.000000	.000000	.000000	.000000
5	.000000	.000000	.000000	.000000
6	.000000	.000000	.000000	.000000
7	.000000	.000000	.000000	.000000
8	.000000	.000000	.000000	.000000
9	.000000	.000000	.000000	.000000
10	.000000	.000000	.000000	.000000
11	.000000	.000000	.000000	.000000
12	.000000	.000000	.000000	.000000
13	.000000	.000000	.000000	.000000
14	.000000	.000000	.000000	.000000
15	.000000	.000000	.000000	.000000
16	.000000	.000000	.000000	.000000
17	.000000	.000000	.000000	.000000
18	.000000	.000000	.000000	.000000
19	.000000	.000000	.000000	.000000
20	.000000	.000000	.000000	.000000
21	.000000	.000000	.000000	.000000
22	.000000	.000000	.000000	.000000
23	.000000	.000000	.000000	.000000
24	1.000000	.000000	.000000	.000000
25	1.000000	.000000	.000000	.000000
26	1.000000	.000000	.000000	.000000
27	1.000000	.000000	.000000	.000000
28	1.000000	.000000	.000000	.000000
29	1.000000	.000000	.000000	.000000
30	1.000000	.000000	.000000	.000000
31	1.000000	.000000	.000000	.000000
32	1.000000	.000000	.000000	.000000
33	1.000000	.000000	.000000	.000000

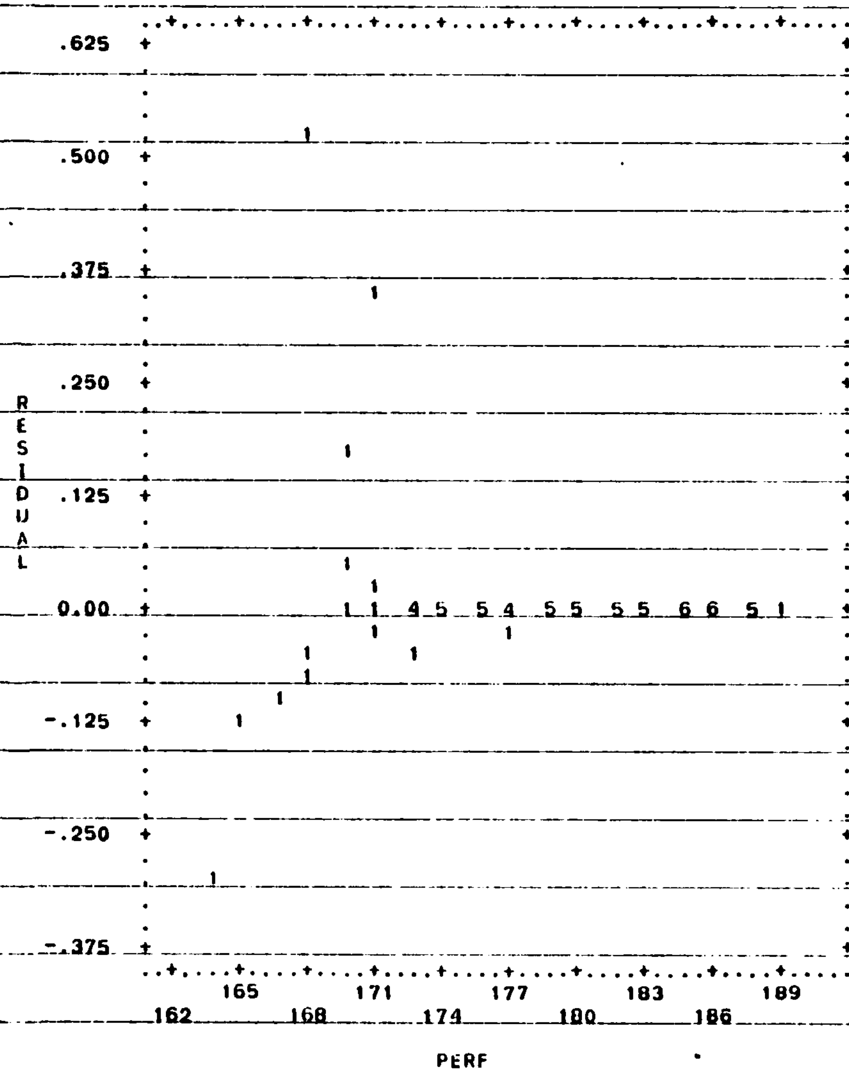
35	1.000000	.000000	.000000	.000000
36	1.000000	.000000	.000000	.000000
37	.000000	1.000000	.000000	.000000
38	.000000	1.000000	.000000	.000000
39	.000000	1.000000	.000000	.000000
40	.000000	1.000000	.000000	.000000
41	.000000	1.000000	.000000	.000000
42	.000000	1.000000	.000000	.000000
43	.000000	1.000000	.000000	.000000
44	.000000	1.000000	.000000	.000000
45	.000000	1.000000	.000000	.000000
46	.000000	1.000000	.000000	.000000
47	.000000	1.000000	.000000	.000000
48	.000000	1.000000	.000000	.000000
49	.000000	1.000000	.000000	.000000
50	.000000	1.000000	.000000	.000000
51	.000000	.000000	1.000000	.000000
52	.000000	.000000	1.000000	.000000
53	.000000	.000000	1.000000	.000000
54	.000000	.000000	1.000000	.000000
55	.000000	.000000	1.000000	.000000
56	.000000	.000000	1.000000	.000000
57	.000000	.000000	1.000000	.000000
58	.000000	.000000	1.000000	.000000
59	.000000	.000000	1.000000	.000000
60	.000000	.000000	1.000000	.000000
61	.000000	.000000	1.000000	.000000
62	.000000	.000000	1.000000	.000000
63	.000000	.000000	1.000000	.000000
64	.000000	.000000	1.000000	.000000
65	.000000	.000000	1.000000	.000000
66	.000000	.000000	1.000000	.000000
67	.000000	.000000	1.000000	.000000
68	.000000	.000000	.000000	1.000000
69	.000000	.000000	.000000	1.000000
70	.000000	.000000	.000000	1.000000
71	.000000	.000000	.000000	1.000000

SERIAL CORRELATION .290

PAGE 5 PARAMETERS FROM DATA SET # 1 (6 PLATFORMS)

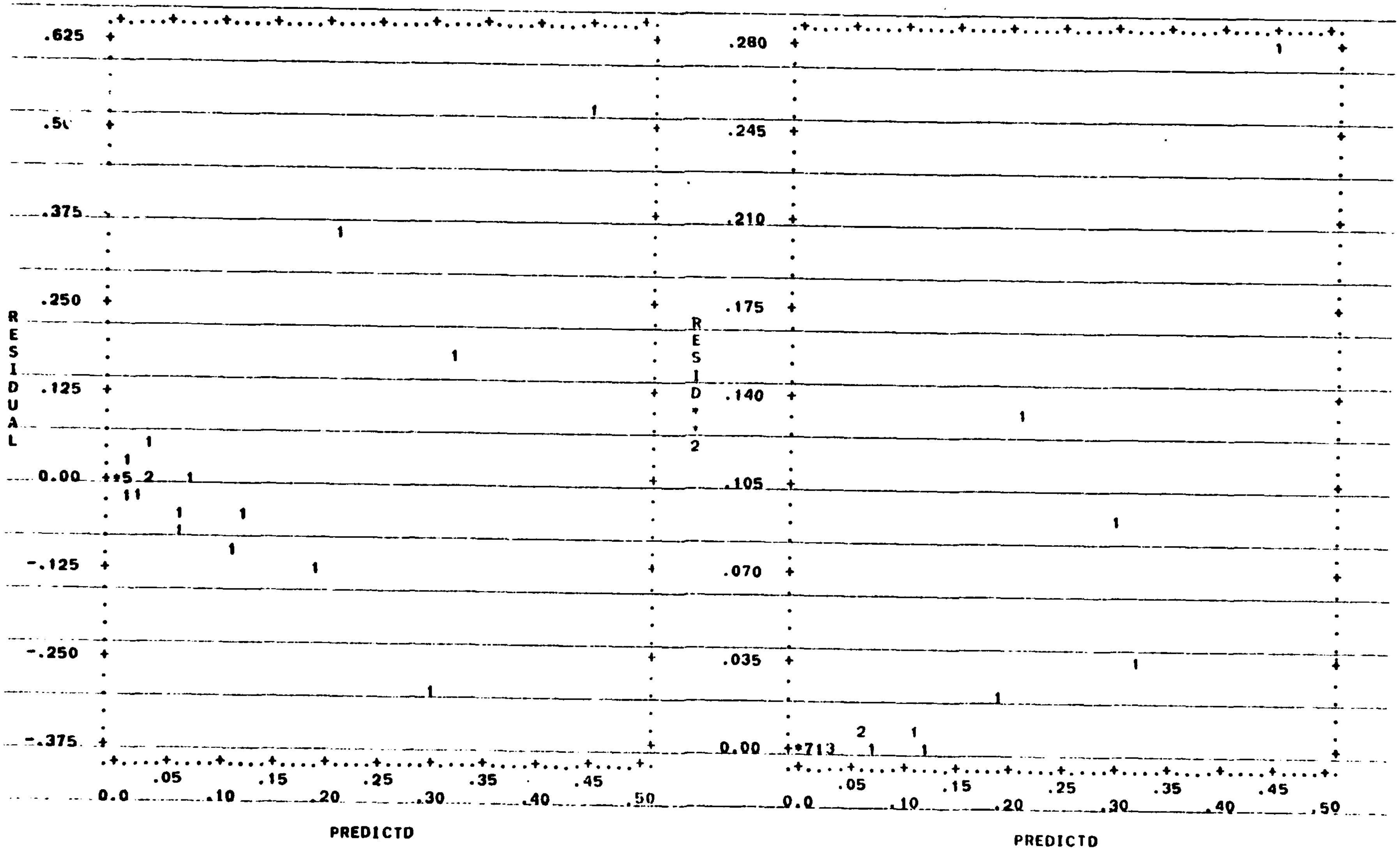
PLOTS OF VARIABLE(1) VERSUS PREDICTED AND OBSERVED VARIABLE(2) AND VERSUS RESIDUALS.





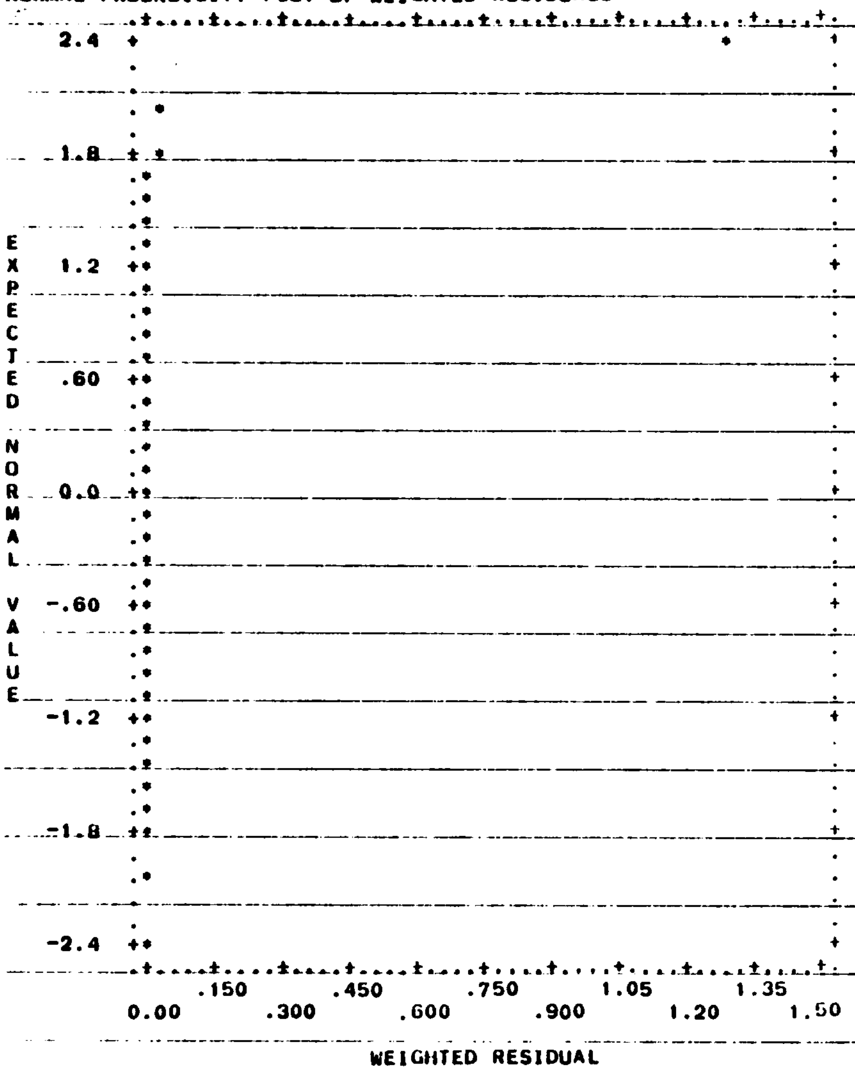
PAGE 6 PARAMETERS FROM DATA SET # 1 (6 PLATFORMS)

PLOTS OF PREDICTED VARIABLE HOLD VERSUS RESIDUALS AND VERSUS RESIDUALS SQUARED



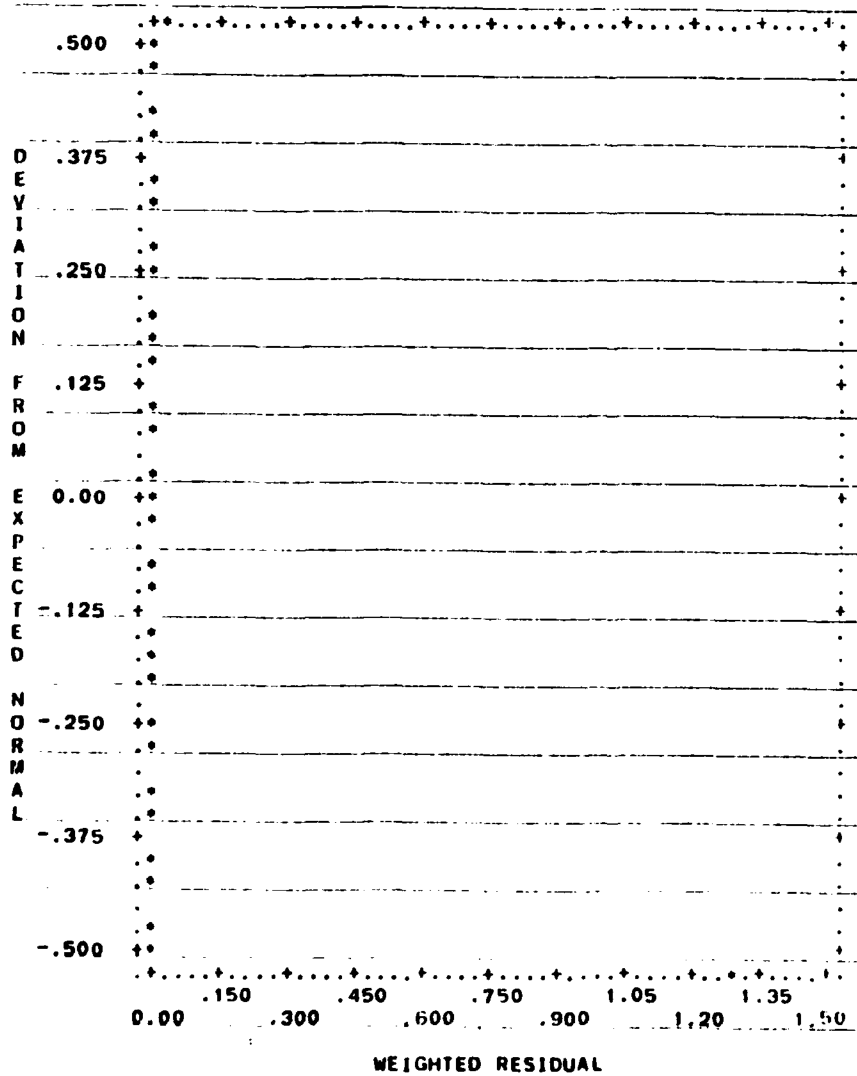
PAGE 7 PARAMETERS FROM DATA SET # 1 (6 PLATFORMS)

NORMAL PROBABILITY PLOT OF WEIGHTED RESIDUALS



PAGE 8 PARAMETERS FROM DATA SET # 1 (6 PLATFORMS)

DETRENDED NORMAL PROBABILITY PLOT OF WEIGHTED RESIDUALS



CPU TIME USED 14.051 SECONDS

```
PAGE    9

BMDP3R - NONLINEAR REGRESSION
10/07/82              AT 17:22:12

NO MORE CONTROL LANGUAGE.

PROGRAM TERMINATED

@TEST TNE/0/T3

@JUMP 3
INTERVENING STATEMENTS SKIPPED

@ERS 21.
FURPUR 28R2 S74R1A 10/07/82 17:22:12
END ERS.
```

@PASS•NLR.P3RB1

```
BMDP3R - NONLINEAR REGRESSION
DEPARTMENT OF BIOMATHEMATICS
UNIVERSITY OF CALIFORNIA, LOS ANGELES, CA 90024
(213) 825-5940          TWX  UCLA LSA
PROGRAM REVISED JUNE 1981
MANUAL REVISED -- 1981
COPYRIGHT (C) 1981 REGENTS OF UNIVERSITY OF CALIFORNIA
10/07/82          AT 17:22:14

TO SEE REMARKS AND A SUMMARY OF NEW FEATURES FOR
THIS PROGRAM, STATE NEWS. IN THE PRINT PARAGRAPH.

PROGRAM CONTROL INFORMATION

/PROBLEM
          TITLE IS ' REGRESSION ON REAL DATA'.
/INPUT
          VARIABLES ARE 8.
          FORMAT IS '(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))'.
/VARIABLE
          NAMES ARE PERF,HOLD,CASEWT,TIMEWT,I1,I2,I3,I4.
/REGRESS
          TITLE IS ' PARAMETERS FROM DATA SET # 2 ( 5 PLATFORMS)'.
          INDEPENDENT IS PERF.
          DEPENDENT IS HOLD.
          NUMBER IS 2.
          PARAMETERS ARE 6.
          WEIGHT IS CASEWT.
          ITERATIONS ARE 15.
          HALVING IS 0.
          MEANSQUARE IS 1.0.
          CONVERGENCE IS -1.0.
/PARAMETER
          INITIAL ARE -10.0,0.06,0.0,0.0,0.0,0.0.
/PLOT
          RESIDUAL.
          VARIABLE IS PERF.
          NORMAL.
          DNORMAL.
          SIZE IS 50,40.
/END

PROBLEM TITLE IS
 REGRESSION ON REAL DATA

NUMBER OF VARIABLES TO READ IN. . . . . . . . . .         8
NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. .          0
TOTAL NUMBER OF VARIABLES . . . . . . . . . . . .         8
NUMBER OF CASES TO READ IN. . . . . . . . . . . . TO END
CASE LABELING VARIABLES . . . . . . . . . . . . .
MISSING VALUES CHECKED BEFORE OR AFTER TRANS. . NEITHER
BLANKS ARE. . . . . . . . . . . . . . . . . . . . MISSING
INPUT UNIT NUMBER . . . . . . . . . . . . . . . .         5
REWIND INPUT UNIT PRIOR TO READING. . DATA. . .          NO
```

```
NUMBER OF CASES DESCRIBED BY INPUT FORMAT . . .        1

VARIABLES TO BE USED
     1 PERF          2 HOLD          3 CASEWT       4 TIMEWT       5 I1
     6 I2            7 I3            8 I4

INPUT FORMAT IS
(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))

MAXIMUM LENGTH DATA RECORD IS   41 CHARACTERS.

I N P U T   V A R I A B L E S . . . . .
  VARIABLE     RECORD   COLUMNS    FIELD  TYPE            VARIABLE     RECORD   COLUMNS    FIELD  TYPE
INDEX  NAME     NO.   BEGIN  END   WIDTH                INDEX . NAME     NO.   BEGIN  END   WIDTH
----- -------  ----   -----  ----  -----  ----          ----- -------  ----   -----  ----  -----  ----
    1 PERF        1       1     6    6.2   F                5 I1         1      35    35     1    F
    2 HOLD        1       7    15    9.5   F                6 I2         1      37    37     1    F
    3 CASEWT      1      16    27   12.5   F                7 I3         1      39    39     1    F
    4 TIMEWT      1      28    33    6.1   F                8 I4         1      41    41     1    F

VARIABLES TO BE PLOTTED
          1  PERF

  PLOT OF PREDICTED VALUES VERSUS RESIDUALS . . .     YES
  NORMAL PROBABILITY PLOT . . . . . . . . . . . .     YES
  DETRENDED NORMAL PROBABILITY PLOT . . . . . . .     YES
```

REGRESSION TITLE
PARAMETERS FROM DATA SET # 2 (5 PLATFORMS)

```
REGRESSION NUMBER . . . . . . . . . . . . . . . . . . .       2
INDEPENDENT VARIABLE(FOR BUILT-IN FUNCTION) . .     PERF
DEPENDENT VARIABLE. . . . . . . . . . . . . . . . . .     HOLD
WEIGHTING VARIABLE. . . . . . . . . . . . . . . . . .     CASEWT
NUMBER OF PARAMETERS. . . . . . . . . . . . . . . . .       6
NUMBER OF CONSTRAINTS . . . . . . . . . . . . . . . .       0
TOLERANCE FOR PIVOTING. . . . . . . . . . . . . . . .  .00000001000
TOLERANCE FOR CONVERGENCE . . . . . . . . . . . . . . -1.00000000000
MAXIMUM NUMBER OF ITERATIONS. . . . . . . . . . . . .      15
MAXIMUM NUMBER OF INCREMENT HALVINGS. . . . . . . . .       0
NUMBER OF DATA PASSES PER CASE. . . . . . . . . . . .       1
COMPUTE LOSS FUNCTION . . . . . . . . . . . . . . . .      NO
SPECIFIED RESIDUAL MEAN SQUARE. . . . . . . . . . . .   1.000
```

USING THE ABOVE SPECIFICATIONS THIS PROGRAM COULD PROCESS 962 CASES.

@ADD,P NLRDAT.A2

BASED ON INPUT FORMAT SUPPLIED 1 RECORDS READ PER CASE.

NUMBER OF CASES READ. 80

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
1	PERF	188.033287	2.274470	160.750000	169.250000
2	HOLD	.019983	.050401	.000000	.993330
3	CASEWT	21.523850	15.399958	.000960	39.895910
4	TIMEWT	189.973524	90.081271	2.000000	326.000000
5	I1	.266483	.444909	.000000	1.000000
6	I2	.240860	.430304	.000000	1.000000
7	I3	.162466	.371205	.000000	1.000000
8	I4	.163953	.372569	.000000	1.000000

	P1	P2	P3	P4	P5	P6
PARAMETER MAXIMA.	.2126765+038	.2126765+038	.2126765+038	.2126765+038	.2126765+038	.2126765+038
PARAMETER MINIMA.	-.2126765+038	-.2126765+038	-.2126765+038	-.2126765+038	-.2126765+038	-.2126765+038

ITERATION NUMBER	INCREMENT HALVINGS	RESIDUAL SUM OF SQUARES	P1	P2	P3	P4	P5	P6
0	0	.761352-001	-10.000000	.060000	.000000	.000000	.000000	.000000
1	0	.184739-001	-6.488757	.044030	.041789	.086461	-.745774	.130246
2	0	.110940-001	-7.602203	.051857	.086246	.268086	-1.032557	.349525
3	0	.980243-002	-9.290592	.061894	.126198	.537745	-1.146931	.616506
4	0	.970211-002	-10.048727	.066299	.142049	.833569	-1.178705	.799210
5	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

6	0	.983490-002	-10.190987	.067124	.145468	1.244194	-1.184252	.859532
7	0	.987287-002	-10.191333	.067126	.145491	1.297318	-1.184272	.859545
8	0	.987701-002	-10.191081	.067125	.145489	1.302426	-1.184265	.859544
9	0	.987704-002	-10.191047	.067124	.145488	1.302480	-1.184264	.859544
10	0	.987704-002	-10.191045	.067124	.145488	1.302481	-1.184264	.859544
11	0	.987704-002	-10.191045	.067124	.145488	1.302481	-1.184264	.859544
12	0	.987704-002	-10.191045	.067124	.145488	1.302481	-1.184264	.859544
13	0	.987704-002	-10.191045	.067124	.145488	1.302481	-1.184264	.859544
14	0	.987704-002	-10.191045	.067124	.145488	1.302481	-1.184264	.859544
15	0	.987704-002	-10.191045	.067124	.145488	1.302481	-1.184264	.859544

PAGE 3 PARAMETERS FROM DATA SET # 2 (5 PLATFORMS)

ASYMPTOTIC CORRELATION MATRIX OF THE PARAMETERS

		P1	P2	P3	P4	P5	P6
		1	2	3	4	5	6
P1	1	1.0000					
P2	2	-.9966	1.0000				
P3	3	-.1765	.1143	1.0000			
P4	4	.0578	-.0754	.1499	1.0000		
P5	5	.2080	-.2794	.6143	.1994	1.0000	
P6	6	-.0687	.0261	.3942	.1060	.4329	1.0000

RESIDUAL MEAN SQUARE .133474-003

DEGREES OF FREEDOM 74

THE SPECIFIED VALUE OF THE RESIDUAL MEAN SQUARE(1.000), NOT THE COMPUTED VALUE, IS USED IN COMPUTING STANDARD DEVIATIONS FOR PARAMETERS AND PREDICTED VALUES.

PARAMETER	ESTIMATE	ASYMPTOTIC STANDARD DEVIATION	TOLERANCE
P1	-10.191045	125.048939	.0010445465
P2	.067124	.713095	.0010239185
P3	.145488	13.629707	.4125857055
P4	1.302481	49.371172	.9505494201
P5	-1.184264	12.114049	.1949017149
P6	.859544	20.008289	.7328008447

PAGE 4 PARAMETERS FROM DATA SET # 2 (5 PLATFORMS)

CASE NO.	LABEL	PREDICTED HOLD	STD DEV OF PRED VALUE	OBSERVED HOLD	RESIDUAL	CASEWT	PERF	TIMEWT	I1
1		.183723	15961.510254	.109540	-.074183	.005668	165.250000	17.000000	.000000
2		.158183	15961.510254	.082220	-.075963	.002253	166.750000	6.000000	.000000
3		.135092	15961.510254	.000000	-.135092	.001284	168.250000	3.000000	.000000
4		.114425	15961.510254	.145080	.030655	.020724	169.750000	42.000000	.000000
5		.096114	15961.510254	.061740	-.034374	.110502	171.250000	192.000000	.000000
6		.080055	15961.510254	.134190	.054135	.061782	172.750000	91.000000	.000000
7		.066112	15961.510254	.056670	-.009442	.027534	174.250000	34.000000	.000000
8		.054129	15961.510254	.287200	.233071	.032227	175.750000	33.000000	.000000
9		.043933	15961.510254	.086980	.043047	.058329	177.250000	49.000000	.000000
10		.035346	15961.510254	.000000	-.035346	.032261	178.750000	22.000000	.000000
11		.028187	15961.510254	.000000	-.028187	.010052	180.250000	6.000000	.000000
12		.022278	15961.510254	.000000	-.022278	.094115	181.750000	41.000000	.000000
13		.017450	15961.510254	.000000	-.017450	.087485	183.250000	30.000000	.000000
14		.013546	15961.510254	.000000	-.013546	.115997	184.750000	31.000000	.000000
15		.010420	15961.510254	.000000	-.010420	.664329	186.250000	137.000000	.000000
16		.007942	15961.510254	.000000	-.007942	1.104203	187.750000	174.000000	.000000
17		.005998	15961.510254	.000000	-.005998	.830236	189.250000	99.000000	.000000
18		.147606	15961.510254	.243960	.096354	.014704	165.250000	37.000000	1.000000
19		.125599	15961.510254	.081610	-.043989	.028227	166.750000	62.000000	1.000000
20		.105992	15961.510254	.232550	.126558	.040102	168.250000	76.000000	1.000000
21		.088698	15961.510254	.147630	.058932	.122478	169.750000	198.000000	1.000000
22		.073599	15961.510254	.046210	-.027389	.093133	171.250000	127.000000	1.000000
23		.060548	15961.510254	.000000	-.060548	.052741	172.750000	60.000000	1.000000
24		.049382	15961.510254	.000000	-.049382	.070297	174.250000	66.000000	1.000000
25		.039925	15961.510254	.045050	.005125	.066527	175.750000	51.000000	1.000000
26		.031995	15961.510254	.000000	-.031995	.161439	177.250000	100.000000	1.000000
27		.025414	15961.510254	.000000	-.025414	.080750	178.750000	40.000000	1.000000
28		.020006	15961.510254	.000000	-.020006	.089259	180.250000	35.000000	1.000000
29		.015608	15961.510254	.000000	-.015608	.149097	181.750000	46.000000	1.000000
30		.012067	15961.510254	.000000	-.012067	.176157	183.250000	42.000000	1.000000
31		.009244	15961.510254	.000000	-.009244	.245662	184.750000	45.000000	1.000000
32		.007017	15961.510254	.000000	-.007017	.272667	186.250000	38.000000	1.000000
33		.005278	15961.510254	.000000	-.005278	1.180894	187.750000	124.000000	1.000000
34		.003933	15961.510254	.000000	-.003933	3.088264	189.250000	289.000000	1.000000
35		.002494	15961.510254	.000000	-.002494	.261326	174.250000	13.000000	.000000
36		.001816	15961.510254	.000000	-.001816	1.186389	175.750000	43.000000	.000000
37		.001310	15961.510254	.000000	-.001310	3.249757	177.250000	85.000000	.000000
38		.000936	15961.510254	.000000	-.000936	9.092958	178.750000	170.000000	.000000
39		.000662	15961.510254	.000000	-.000662	13.825542	180.250000	183.000000	.000000
40		.000464	15961.510254	.003550	.003086	21.223863	181.750000	197.000000	.000000
41		.000322	15961.510254	.000000	-.000322	50.876241	183.250000	328.000000	.000000
42		.000222	15961.510254	.000000	-.000222	2.254679	184.750000	10.000000	.000000
43		.000151	15961.510254	.000000	-.000151	9.596057	186.250000	29.000000	.000000
44		.000102	15961.510254	.000000	-.000102	3.432224	187.750000	7.000000	.000000
45		.000068	15961.510254	.000000	-.000068	208.333168	189.250000	284.000000	.000000
46		.720745	15961.510254	.000000	-.720745	.001491	160.750000	6.000000	.000000
47		.685938	15961.510254	.000000	-.685938	.000164	162.250000	2.000000	.000000
48		.649393	15961.510254	.000000	-.649393	.001318	163.750000	6.000000	.000000
49		.611410	15961.510254	.993330	.381920	.001052	165.250000	5.000000	.000000

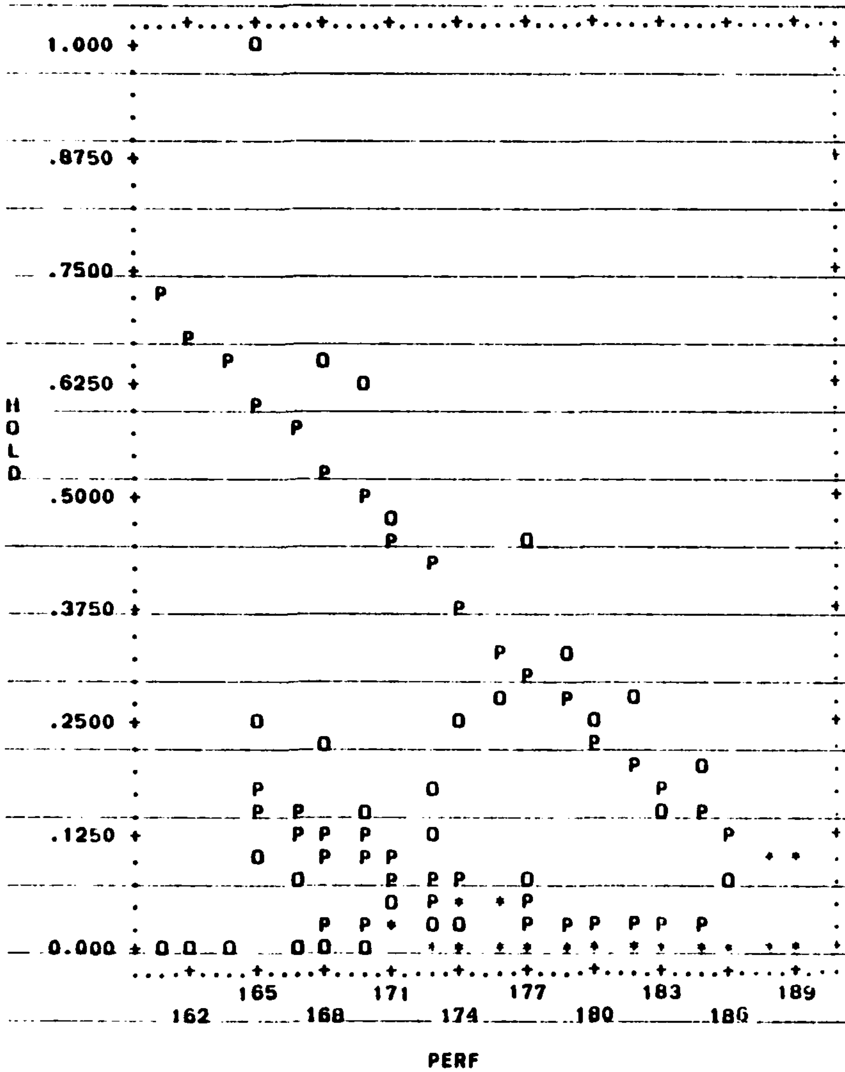
52	.492395	15961.510254	.630000	.137605	.003201	169.750000	16.000000	.000000
53	.452341	15961.510254	.480480	.028139	.005651	171.250000	28.000000	.000000
54	.412766	15961.510254	.186780	-.225986	.019803	172.750000	96.000000	.000000
55	.374058	15961.510254	.257220	-.116838	.011105	174.250000	52.000000	.000000
56	.336582	15961.510254	.278200	-.058382	.021048	175.750000	94.000000	.000000
57	.300662	15961.510254	.456990	.156328	.020688	177.250000	87.000000	.000000
58	.266582	15961.510254	.336300	.069718	.045776	178.750000	179.000000	.000000
59	.234573	15961.510254	.258990	.024417	.055417	180.250000	199.000000	.000000
60	.204812	15961.510254	.284660	.079848	.034692	181.750000	113.000000	.000000
61	.177420	15961.510254	.142070	-.035350	.024325	183.250000	71.000000	.000000
62	.152462	15961.510254	.197030	.044568	.039081	184.750000	101.000000	.000000
63	.129952	15961.510254	.080770	-.049182	.042011	186.250000	95.000000	.000000
64	.109854	15961.510254	.095070	-.014784	.063404	187.750000	124.000000	.000000
65	.092091	15961.510254	.111430	.019339	.063390	189.250000	106.000000	.000000
66	.024871	15961.510254	.000000	-.024871	.045357	168.250000	22.000000	.000000
67	.019562	15961.510254	.000000	-.019562	.093849	169.750000	36.000000	.000000
68	.015249	15961.510254	.014220	-.001029	.672588	171.250000	202.000000	.000000
69	.011780	15961.510254	.027130	.015350	.777439	172.750000	181.000000	.000000
70	.009017	15961.510254	.017580	.008563	.615529	174.250000	110.000000	.000000
71	.006839	15961.510254	.000000	-.006839	.912827	175.750000	124.000000	.000000
72	.005139	15961.510254	.000000	-.005139	.743202	177.250000	76.000000	.000000
73	.003827	15961.510254	.000000	-.003827	.550686	178.750000	42.000000	.000000
74	.002823	15961.510254	.000000	-.002823	.301965	180.250000	17.000000	.000000
75	.002063	15961.510254	.000000	-.002063	1.748639	181.750000	72.000000	.000000
76	.001494	15961.510254	.000000	-.001494	4.492502	183.250000	134.000000	.000000
77	.001071	15961.510254	.000000	-.001071	4.532344	184.750000	97.000000	.000000
78	.000761	15961.510254	.000000	-.000761	6.114374	186.250000	93.000000	.000000
79	.000536	15961.510254	.000000	-.000536	16.811673	187.750000	180.000000	.000000
80	.000373	15961.510254	.000000	-.000373	11.252301	189.250000	84.000000	.000000

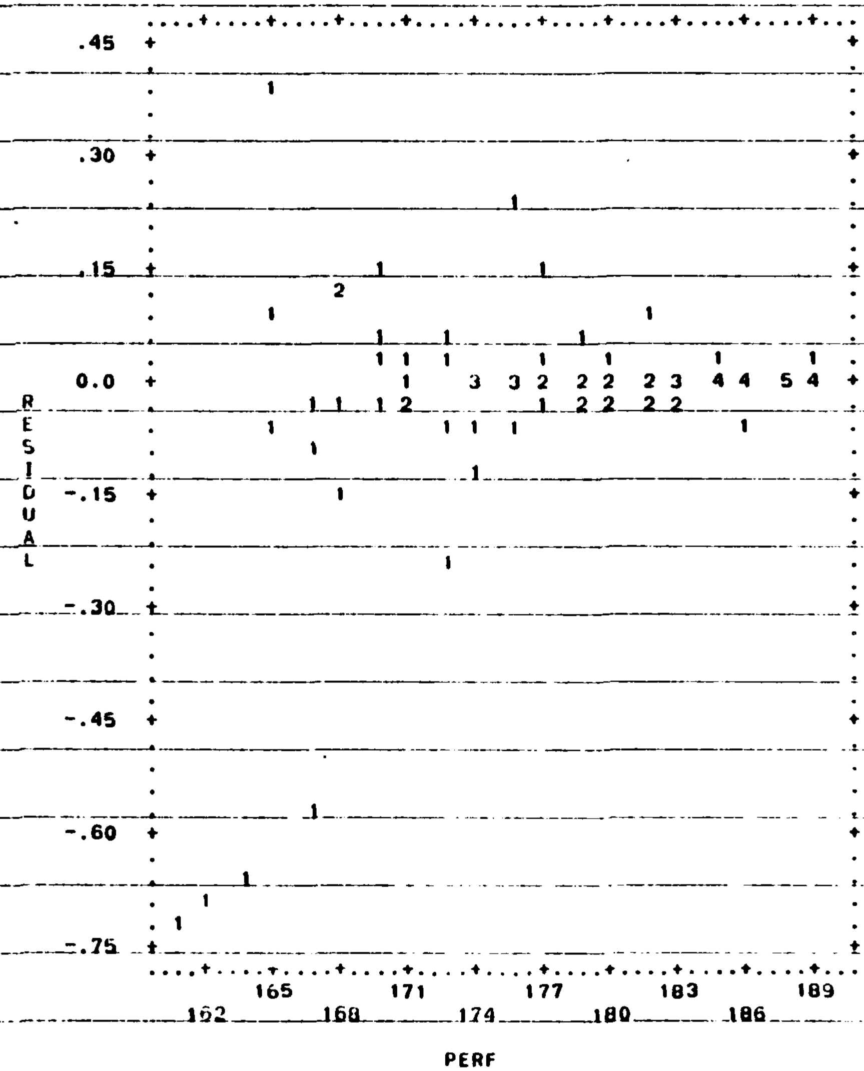
CASE	I2	I3	I4
1	.000000	.000000	.000000
2	.000000	.000000	.000000
3	.000000	.000000	.000000
4	.000000	.000000	.000000
5	.000000	.000000	.000000
6	.000000	.000000	.000000
7	.000000	.000000	.000000
8	.000000	.000000	.000000
9	.000000	.000000	.000000
10	.000000	.000000	.000000
11	.000000	.000000	.000000
12	.000000	.000000	.000000
13	.000000	.000000	.000000
14	.000000	.000000	.000000
15	.000000	.000000	.000000
16	.000000	.000000	.000000
17	.000000	.000000	.000000
18	.000000	.000000	.000000
19	.000000	.000000	.000000
20	.000000	.000000	.000000
21	.000000	.000000	.000000
22	.000000	.000000	.000000
23	.000000	.000000	.000000
24	.000000	.000000	.000000

26	.000000	.000000	.000000
27	.000000	.000000	.000000
28	.000000	.000000	.000000
29	.000000	.000000	.000000
30	.000000	.000000	.000000
31	.000000	.000000	.000000
32	.000000	.000000	.000000
33	.000000	.000000	.000000
34	.000000	.000000	.000000
35	1.000000	.000000	.000000
36	1.000000	.000000	.000000
37	1.000000	.000000	.000000
38	1.000000	.000000	.000000
39	1.000000	.000000	.000000
40	1.000000	.000000	.000000
41	1.000000	.000000	.000000
42	1.000000	.000000	.000000
43	1.000000	.000000	.000000
44	1.000000	.000000	.000000
45	1.000000	.000000	.000000
46	.000000	1.000000	.000000
47	.000000	1.000000	.000000
48	.000000	1.000000	.000000
49	.000000	1.000000	.000000
50	.000000	1.000000	.000000
51	.000000	1.000000	.000000
52	.000000	1.000000	.000000
53	.000000	1.000000	.000000
54	.000000	1.000000	.000000
55	.000000	1.000000	.000000
56	.000000	1.000000	.000000
57	.000000	1.000000	.000000
58	.000000	1.000000	.000000
59	.000000	1.000000	.000000
60	.000000	1.000000	.000000
61	.000000	1.000000	.000000
62	.000000	1.000000	.000000
63	.000000	1.000000	.000000
64	.000000	1.000000	.000000
65	.000000	1.000000	.000000
66	.000000	.000000	1.000000
67	.000000	.000000	1.000000
68	.000000	.000000	1.000000
69	.000000	.000000	1.000000
70	.000000	.000000	1.000000
71	.000000	.000000	1.000000
72	.000000	.000000	1.000000
73	.000000	.000000	1.000000
74	.000000	.000000	1.000000
75	.000000	.000000	1.000000
76	.000000	.000000	1.000000
77	.000000	.000000	1.000000
78	.000000	.000000	1.000000
79	.000000	.000000	1.000000
80	.000000	.000000	1.000000

PAGE 5 PARAMETERS FROM DATA SET # 2 (5 PLATFORMS)

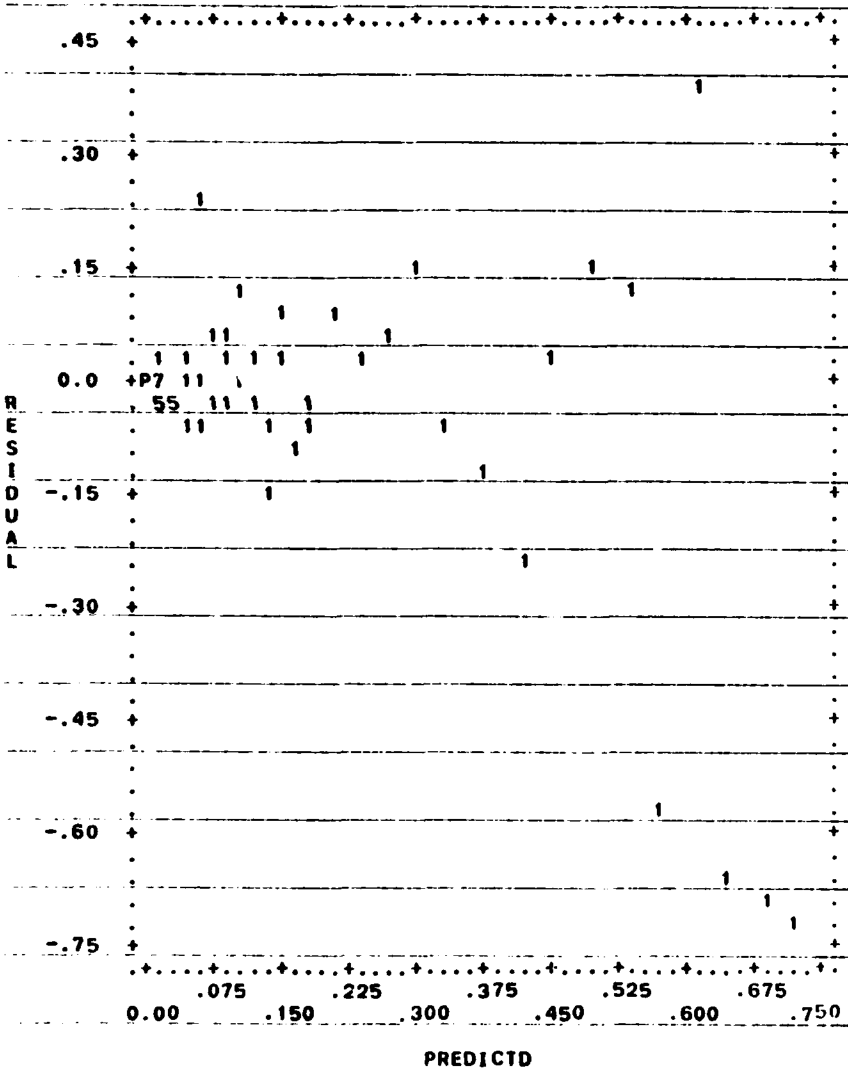
PLOTS OF VARIABLE(1) VERSUS PREDICTED AND OBSERVED VARIABLE(2) AND VERSUS RESIDUALS.

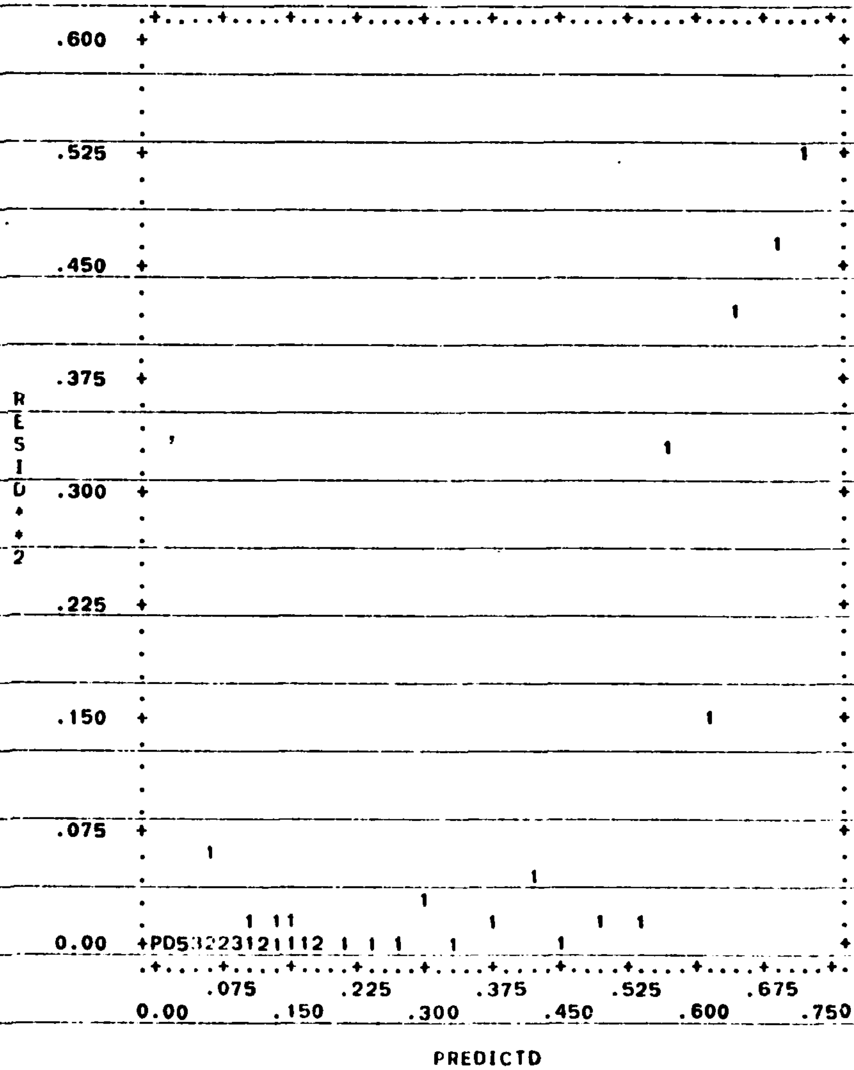




PAGE 6 PARAMETERS FROM DATA SET # 2 (5 PLATFORMS)

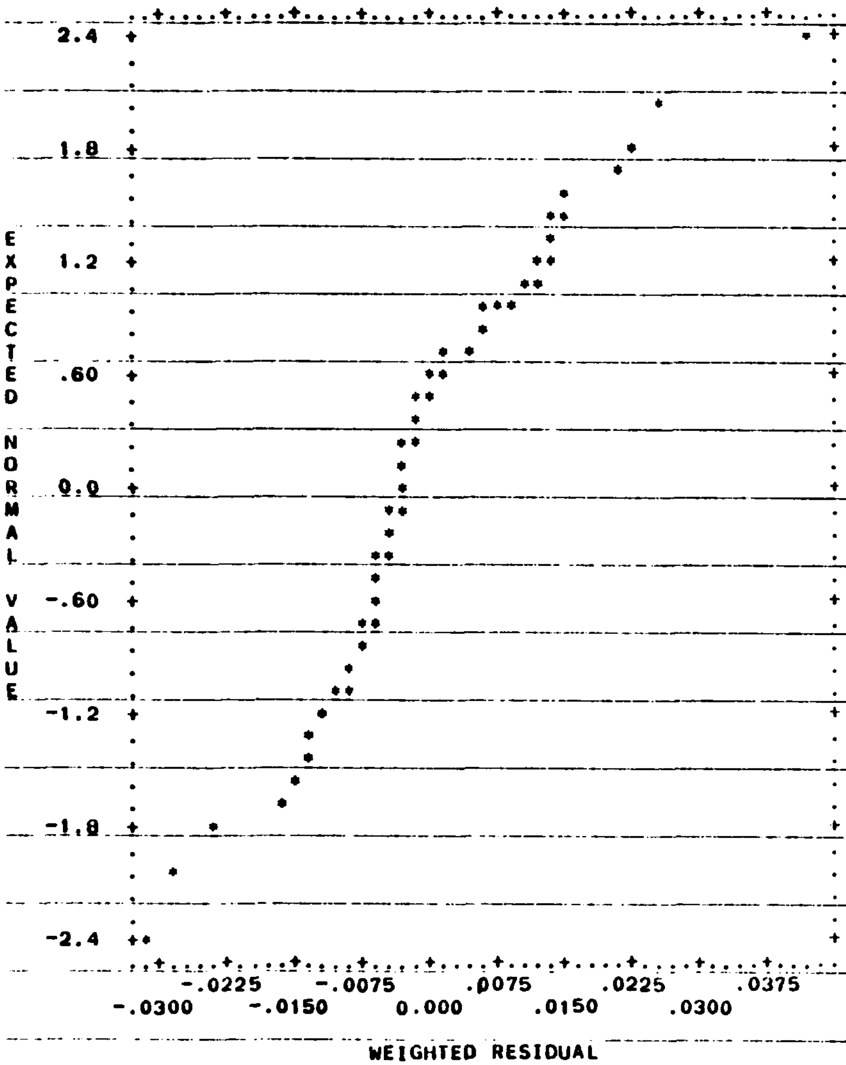
PLOTS OF PREDICTED VARIABLE HOLD VERSUS RESIDUALS AND VERSUS RESIDUALS SQUARED





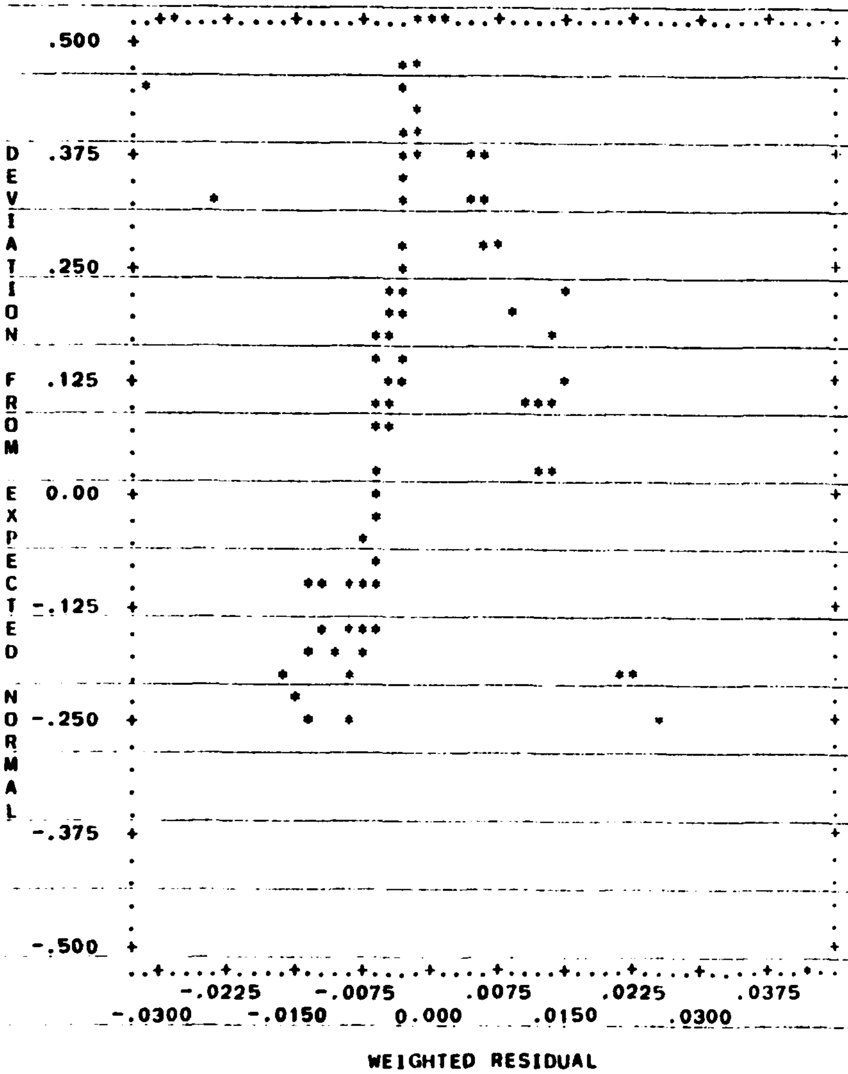
PAGE 7 PARAMETERS FROM DATA SET # 2 (5 PLATFORMS)

NORMAL PROBABILITY PLOT OF WEIGHTED RESIDUALS



PAGE 8 PARAMETERS FROM DATA SET # 2 (5 PLATFORMS)

DETRENDED NORMAL PROBABILITY PLOT OF WEIGHTED RESIDUALS



CPU TIME USED 11.137 SECONDS

```
PAGE   9

BMDP3R - NONLINEAR REGRESSION
10/07/82              AT 17:22:24

NO MORE CONTROL LANGUAGE.

PROGRAM TERMINATED


@TEST TNE/0/T3


@JUMP 3
INTERVENING STATEMENTS SKIPPED


@ERS 21.
FURPUR 28R2 S74R1A 10/07/82 17:22:24
END ERS.
```

@PASS•NLB.P3RB1

```
PAGE   1

BMDP3R - NONLINEAR REGRESSION
DEPARTMENT OF BIOMATHEMATICS
UNIVERSITY OF CALIFORNIA, LOS ANGELES, CA 90024
(213) 825-5940          TWX  UCLA LSA
PROGRAM REVISED JUNE 1981
MANUAL REVISED -- 1981
COPYRIGHT (C) 1981 REGENTS OF UNIVERSITY OF CALIFORNIA
10/07/82              AT 17:22:25

TO SEE REMARKS AND A SUMMARY OF NEW FEATURES FOR
THIS PROGRAM, STATE NEWS. IN THE PRINT PARAGRAPH.

PROGRAM CONTROL INFORMATION

/PROBLEM
          TITLE IS ' REGRESSION ON REAL DATA'.
/INPUT
          VARIABLES ARE 8.
          FORMAT IS '(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))'.
/VARIABLE
          NAMES ARE PERF,HOLD,CASEWT,TIMEWT,I1,I2,I3,I4.
/REGRESS
          TITLE IS ' PARAMETERS FROM DATA SET # 3 ( 5 PLATFORMS)'.
          INDEPENDENT IS PERF.
          DEPENDENT IS HOLD.
          NUMBER IS 2.
          PARAMETERS ARE 6.
          WEIGHT IS CASEWT.
          ITERATIONS ARE 15.
          HALVING IS 0.
          MEANSQUARE IS 1.0.
          CONVERGENCE IS -1.0.
/PARAMETER
          INITIAL ARE -10.0,0.06,0.0,0.0,0.0,0.0.
/PLOT
          RESIDUAL.
          VARIABLE IS PERF.
          NORMAL.
          DNORMAL.
          SIZE IS 50,40.
/END

PROBLEM TITLE IS
 REGRESSION ON REAL DATA

NUMBER OF VARIABLES TO READ IN. . . . . . . . . .        8
NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. .          0
TOTAL NUMBER OF VARIABLES . . . . . . . . . . .          8
NUMBER OF CASES TO READ IN. . . . . . . . . . . . TO END
CASE LABELING VARIABLES . . . . . . . . . . . .
MISSING VALUES CHECKED BEFORE OR AFTER TRANS. . NEITHER
BLANKS ARE. . . . . . . . . . . . . . . . . . . MISSING
INPUT UNIT NUMBER . . . . . . . . . . . . . . .          5
REWIND INPUT UNIT PRIOR TO READING. . DATA. . .         NO
```

```
NUMBER OF CASES DESCRIBED BY INPUT FORMAT . . .        1

VARIABLES TO BE USED
    1 PERF          2 HOLD          3 CASEWT      4 TIMEWT      5 I1
    6 I2            7 I3            8 I4

INPUT FORMAT IS
(F6.2,F9.5,F12.5,F6.1,5(1X,F1.0))

MAXIMUM LENGTH DATA RECORD IS   41 CHARACTERS.

I N P U T   V A R I A B L E S . . . . .
  VARIABLE     RECORD  COLUMNS    FIELD  TYPE            VARIABLE      RECORD  COLUMNS    FIELD  TYPE
 INDEX   NAME    NO.  BEGIN  END  WIDTH                 INDEX   NAME    NO.  BEGIN  END  WIDTH
 ----- -------- ----  ----- ----  -----  ----           ----- --------  ----  ----- ----  -----  ----
     1 PERF        1      1    6    6.2   F                 5 I1          1     35   35      1   F
     2 HOLD        1      7   15    9.5   F                 6 I2          1     37   37      1   F
     3 CASEWT      1     16   27   12.5   F                 7 I3          1     39   39      1   F
     4 TIMEWT      1     28   33    6.1   F                 8 I4          1     41   41      1   F

VARIABLES TO BE PLOTTED
          1  PERF

  PLOT OF PREDICTED VALUES VERSUS RESIDUALS . . .     YES
  NORMAL PROBABILITY PLOT . . . . . . . . . . . .     YES
  DETRENDED NORMAL PROBABILITY PLOT . . . . . . .     YES
```

REGRESSION TITLE
PARAMETERS FROM DATA SET # 3 (5 PLATFORMS)

```
REGRESSION NUMBER . . . . . . . . . . . . . . . . . . .          2
INDEPENDENT VARIABLE(FOR BUILT-IN FUNCTION) . .     PERF
DEPENDENT VARIABLE. . . . . . . . . . . . . . . . .     HOLD
WEIGHTING VARIABLE. . . . . . . . . . . . . . . . .     CASEWT
NUMBER OF PARAMETERS. . . . . . . . . . . . . . . .          6
NUMBER OF CONSTRAINTS . . . . . . . . . . . . . . .          0
TOLERANCE FOR PIVOTING. . . . . . . . . . . . . . .  .00000001000
TOLERANCE FOR CONVERGENCE . . . . . . . . . . . . .-1.00000000000
MAXIMUM NUMBER OF ITERATIONS. . . . . . . . . . . .         15
MAXIMUM NUMBER OF INCREMENT HALVINGS. . . . . . . .          0
NUMBER OF DATA PASSES PER CASE. . . . . . . . . . .          1
COMPUTE LOSS FUNCTION . . . . . . . . . . . . . . .         NO
SPECIFIED RESIDUAL MEAN SQUARE. . . . . . . . . . .      1.000
```

USING THE ABOVE SPECIFICATIONS THIS PROGRAM COULD PROCESS 962 CASES.

@ADD.P NLRDAT.A3

BASED ON INPUT FORMAT SUPPLIED 1 RECORDS READ PER CASE.

NUMBER OF CASES READ. 65

VARIABLE NO.	NAME	MEAN	STANDARD DEVIATION	MINIMUM	MAXIMUM
1	PERF	180.907242	3.718250	160.750000	186.250000
2	HOLD	.012998	.061372	.000000	.726670
3	CASEWT	.724568	.511209	.003290	1.540790
4	TIMEWT	155.281641	151.562746	1.000000	594.000000
5	I1	.171645	.380006	.000000	1.000000
6	I2	.287964	.456338	.000000	1.000000
7	I3	.096512	.297591	.000000	1.000000
8	I4	.220145	.417569	.000000	1.000000

			P1	P2	P3	P4	P5	P6
PARAMETER MAXIMA.			.2126765+038	.2126765+038	.2126765+038	.2126765+038	.2126765+038	.2126765+038
PARAMETER MINIMA.			-.2126765+038	-.2126765+038	-.2126765+038	-.2126765+038	-.2126765+038	-.2126765+038

ITERATION NUMBER	INCREMENT HALVINGS	RESIDUAL SUM OF SQUARES	P1	P2	P3	P4	P5	P6
0	0	.120959+000	-10.000000	.060000	.000000	.000000	.000000	.000000
1	0	.316473-001	-9.145348	.059471	.144023	-.033910	-.613681	.115851
2	0	.169828-001	-12.636195	.081478	.350048	-.040851	-.877400	.290197
3	0	.143535-001	-15.521506	.098900	.623167	-.025906	-.957007	.519916
4	0	.145123-001	-16.653460	.105618	.852476	-.014195	-.964134	.690867

6	0	.147403-001	-16.824423	.106626	.960445	-.012852	-.962685	.743443
7	0	.147407-001	-16.824724	.106628	.960615	-.012851	-.962690	.743442
8	0	.147407-001	-16.824738	.106628	.960615	-.012851	-.962680	.743442
9	0	.147407-001	-16.824739	.106628	.960615	-.012851	-.962680	.743442
10	0	.147407-001	-16.824739	.106628	.960615	-.012851	-.962680	.743442
11	0	.147407-001	-16.824739	.106628	.960615	-.012851	-.962680	.743442
12	0	.147407-001	-16.824739	.106628	.960615	-.012851	-.962680	.743442
13	0	.147407-001	-16.824739	.106628	.960615	-.012851	-.962680	.743442
14	0	.147407-001	-16.824739	.106628	.960615	-.012851	-.962680	.743442
15	0	.147407-001	-16.824739	.106628	.960615	-.012851	-.962680	.743442

PAGE 3 PARAMETERS FROM DATA SET # 3 (5 PLATFORMS)

ASYMPTOTIC CORRELATION MATRIX OF THE PARAMETERS

		P1	P2	P3	P4	P5	P6
		1	2	3	4	5	6
P1	1	1.0000					
P2	2	-.9969	1.0000				
P3	3	-.1004	.0614	1.0000			
P4	4	.1815	-.2332	.3142	1.0000		
P5	5	-.1952	.1265	.4523	.5481	1.0000	
P6	6	-.0897	.0449	.2917	.3649	.5137	1.0000

RESIDUAL MEAN SQUARE .249842-003

DEGREES OF FREEDOM 59

THE SPECIFIED VALUE OF THE RESIDUAL MEAN SQUARE(1.000), NOT THE COMPUTED VALUE, IS USED IN COMPUTING STANDARD DEVIATIONS FOR PARAMETERS AND PREDICTED VALUES.

PARAMETER	ESTIMATE	ASYMPTOTIC STANDARD DEVIATION	TOLERANCE
P1	-16.824739	131.254795	.0009360017
P2	.106628	.759375	.0009484170
P3	.960615	20.390571	.7433967699
P4	-.012851	15.694566	.5188363751
P5	-.962680	11.597253	.2023801311
P6	.743442	17.843364	.6678030191

PAGE 4 PARAMETERS FROM DATA SET # 3 (5 PLATFORMS)

CASE NO.	LABEL	PREDICTED HOLD	STD DEV OF PRED VALUE	OBSERVED HOLD	RESIDUAL	CASEWT	PERF	TIMEWT	I1
1		.169675	17195.157471	.676050	.506375	.006388	166.750000	18.000000	.000000
2		.132341	17195.157471	.079360	-.052981	.057042	168.250000	131.000000	.000000
3		.101096	17195.157471	.160150	.059054	.015956	169.750000	29.000000	.000000
4		.075604	17195.157471	.062860	-.012744	.080128	171.250000	112.000000	.000000
5		.055332	17195.157471	.047770	-.007562	.110005	172.750000	115.000000	.000000
6		.039616	17195.157471	.097340	.057724	.060452	174.250000	46.000000	.000000
7		.027740	17195.157471	.035640	.007900	.139041	175.750000	75.000000	.000000
8		.018991	17195.157471	.013860	-.005131	.477707	177.250000	178.000000	.000000
9		.012709	17195.157471	.000000	-.012709	.502084	178.750000	126.000000	.000000
10		.008312	17195.157471	.000000	-.008312	.266900	180.250000	44.000000	.000000
11		.005311	17195.157471	.000000	-.005311	.558373	181.750000	59.000000	.000000
12		.003316	17195.157471	.000000	-.003316	1.240653	183.250000	82.000000	.000000
13		.001204	17195.157471	.000000	-.001204	1.496934	186.250000	36.000000	.000000
14		.027678	17195.157471	.033560	.005882	.091036	166.750000	49.000000	1.000000
15		.018947	17195.157471	.014050	-.004897	.373903	168.250000	139.000000	1.000000
16		.012678	17195.157471	.022240	.009562	.587208	169.750000	147.000000	1.000000
17		.008290	17195.157471	.000000	-.008290	1.222432	171.250000	201.000000	1.000000
18		.005297	17195.157471	.017750	.012453	1.328609	172.750000	140.000000	1.000000
19		.003306	17195.157471	.000000	-.003306	2.063651	174.250000	136.000000	1.000000
20		.002016	17195.157471	.000000	-.002016	1.391992	175.750000	56.000000	1.000000
21		.001200	17195.157471	.000000	-.001200	4.964031	177.250000	119.000000	1.000000
22		.000698	17195.157471	.000000	-.000698	20.653470	178.750000	208.000000	1.000000
23		.000396	17195.157471	.000000	-.000396	11.366676	180.250000	90.000000	1.000000
24		.000219	17195.157471	.000000	-.000219	20.507651	181.750000	90.000000	1.000000
25		.000119	17195.157471	.000000	-.000119	21.059102	183.250000	50.000000	1.000000
26		.000063	17195.157471	.000000	-.000063	3.988195	184.750000	5.000000	1.000000
27		.056783	17195.157471	.260570	.203787	.051345	172.750000	55.000000	.000000
28		.040727	17195.157471	.114840	.074113	.103664	174.250000	81.000000	.000000
29		.028569	17195.157471	.000000	-.028569	.315280	175.750000	175.000000	.000000
30		.019595	17195.157471	.018020	-.001575	.809439	177.250000	311.000000	.000000
31		.013137	17195.157471	.000000	-.013137	2.290855	178.750000	594.000000	.000000
32		.008608	17195.157471	.000000	-.008608	.427720	180.250000	73.000000	.000000
33		.005511	17195.157471	.000000	-.005511	.583184	181.750000	42.000000	.000000
34		.003447	17195.157471	.000000	-.003447	2.139895	183.250000	147.000000	.000000
35		.002106	17195.157471	.000000	-.002106	.261765	184.750000	11.000000	.000000
36		.001256	17195.157471	.000000	-.001256	.039852	186.250000	1.000000	.000000
37		.741183	17195.157471	.556390	-.184793	.038836	160.750000	149.000000	.000000
38		.686891	17195.157471	.587160	-.099731	.024178	162.250000	104.000000	.000000
39		.628209	17195.157471	.718580	.090371	.017126	163.750000	80.000000	.000000
40		.566383	17195.157471	.468890	-.097493	.008958	165.250000	44.000000	.000000
41		.502884	17195.157471	.531500	.028616	.013800	166.750000	69.000000	.000000
42		.439313	17195.157471	.308820	-.130493	.012179	168.250000	60.000000	.000000
43		.377272	17195.157471	.726670	.349398	.014685	169.750000	69.000000	.000000
44		.318251	17195.157471	.608830	.290579	.034337	171.250000	149.000000	.000000
45		.263518	17195.157471	.602480	.338962	.004380	172.750000	17.000000	.000000
46		.214041	17195.157471	.208460	-.005581	.046069	174.250000	155.000000	.000000
47		.170442	17195.157471	.102600	-.067842	.020864	175.750000	59.000000	.000000
48		.132991	17195.157471	.089530	-.043461	.127055	177.250000	293.000000	.000000
49		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

52	.039876	17195.157471	.000000	-.039876	.011754	183.250000	9.000000	.000000
53	.044670	17195.157471	.000000	-.044670	.051553	166.750000	44.000000	.000000
54	.031525	17195.157471	.015490	-.016035	.112998	168.250000	69.000000	.000000
55	.021755	17195.157471	.011480	-.010275	.566206	169.750000	241.000000	.000000
56	.014676	17195.157471	.014410	-.000266	.511722	171.250000	148.000000	.000000
57	.009677	17195.157471	.026530	.016853	.589590	172.750000	113.000000	.000000
58	.006234	17195.157471	.021220	.014986	1.363919	174.250000	169.000000	.000000
59	.003924	17195.157471	.012290	.008366	1.036181	175.750000	81.000000	.000000
60	.002413	17195.157471	.002750	.000337	4.030356	177.250000	194.000000	.000000
61	.001449	17195.157471	.000000	-.001449	4.977289	178.750000	144.000000	.000000
62	.000849	17195.157471	.000000	-.000849	7.952974	180.250000	135.000000	.000000
63	.000486	17195.157471	.000000	-.000486	21.394359	181.750000	208.000000	.000000
64	.000272	17195.157471	.000000	-.000272	11.958459	183.250000	65.000000	.000000
65	.000148	17195.157471	.000000	-.000148	.674254	184.750000	2.000000	.000000

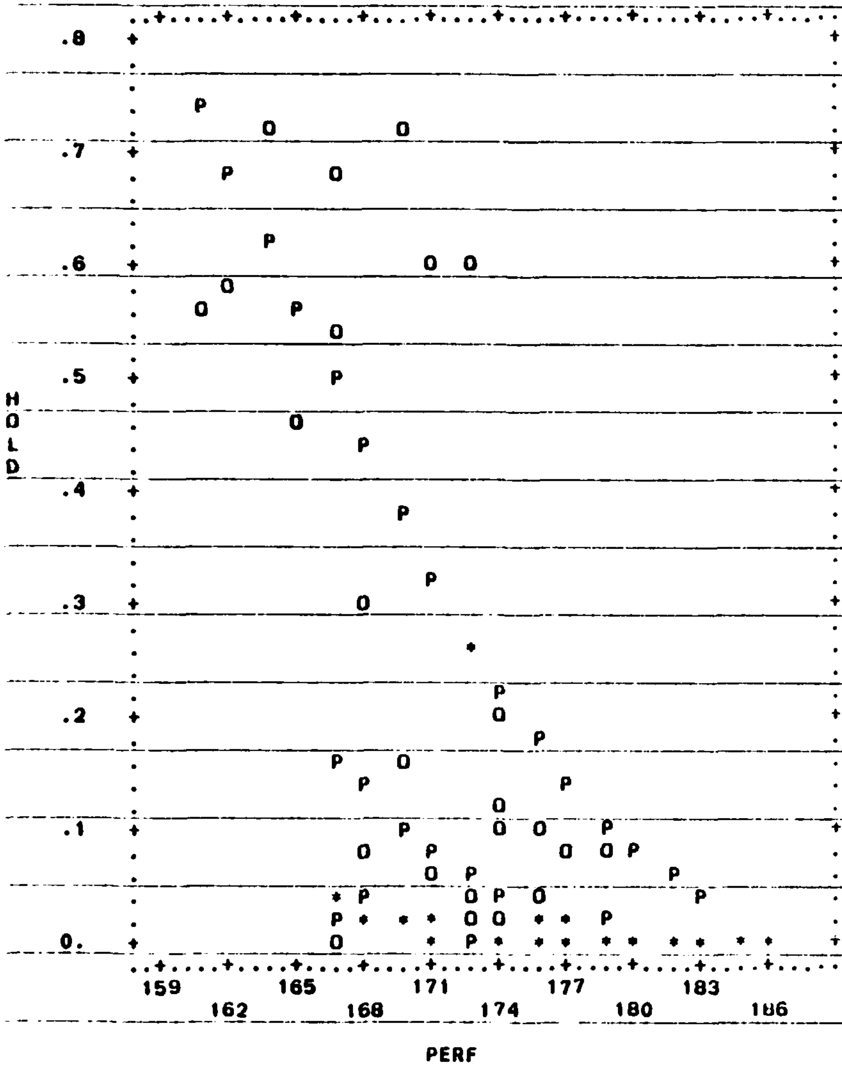
CASE	I2	I3	I4
1	.000000	.000000	.000000
2	.000000	.000000	.000000
3	.000000	.000000	.000000
4	.000000	.000000	.000000
5	.000000	.000000	.000000
6	.000000	.000000	.000000
7	.000000	.000000	.000000
8	.000000	.000000	.000000
9	.000000	.000000	.000000
10	.000000	.000000	.000000
11	.000000	.000000	.000000
12	.000000	.000000	.000000
13	.000000	.000000	.000000
14	.000000	.000000	.000000
15	.000000	.000000	.000000
16	.000000	.000000	.000000
17	.000000	.000000	.000000
18	.000000	.000000	.000000
19	.000000	.000000	.000000
20	.000000	.000000	.000000
21	.000000	.000000	.000000
22	.000000	.000000	.000000
23	.000000	.000000	.000000
24	.000000	.000000	.000000
25	.000000	.000000	.000000
26	.000000	.000000	.000000
27	1.000000	.000000	.000000
28	1.000000	.000000	.000000
29	1.000000	.000000	.000000
30	1.000000	.000000	.000000
31	1.000000	.000000	.000000
32	1.000000	.000000	.000000
33	1.000000	.000000	.000000
34	1.000000	.000000	.000000
35	1.000000	.000000	.000000
36	1.000000	.000000	.000000
37	.000000	1.000000	.000000
38	.000000	1.000000	.000000
39	.000000	1.000000	.000000

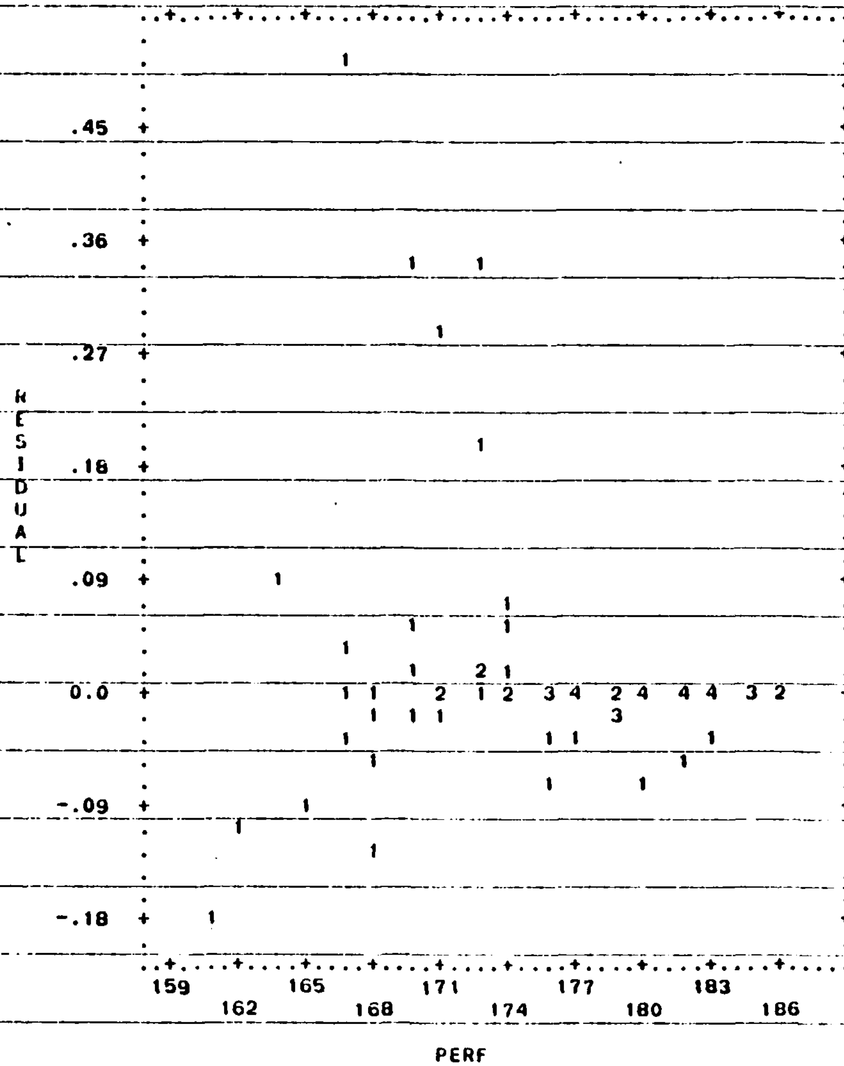
41	.000000	1.000000	.000000
42	.000000	1.000000	.000000
43	.000000	1.000000	.000000
44	.000000	1.000000	.000000
45	.000000	1.000000	.000000
46	.000000	1.000000	.000000
47	.000000	1.000000	.000000
48	.000000	1.000000	.000000
49	.000000	1.000000	.000000
50	.000000	1.000000	.000000
51	.000000	1.000000	.000000
52	.000000	1.000000	.000000
53	.000000	.000000	1.000000
54	.000000	.000000	1.000000
55	.000000	.000000	1.000000
56	.000000	.000000	1.000000
57	.000000	.000000	1.000000
58	.000000	.000000	1.000000
59	.000000	.000000	1.000000
60	.000000	.000000	1.000000
61	.000000	.000000	1.000000
62	.000000	.000000	1.000000
63	.000000	.000000	1.000000
64	.000000	.000000	1.000000
65	.000000	.000000	1.000000

SERIAL CORRELATION .296

 PARAMETERS FROM DATA SET # 3 (5 PLATFORMS)

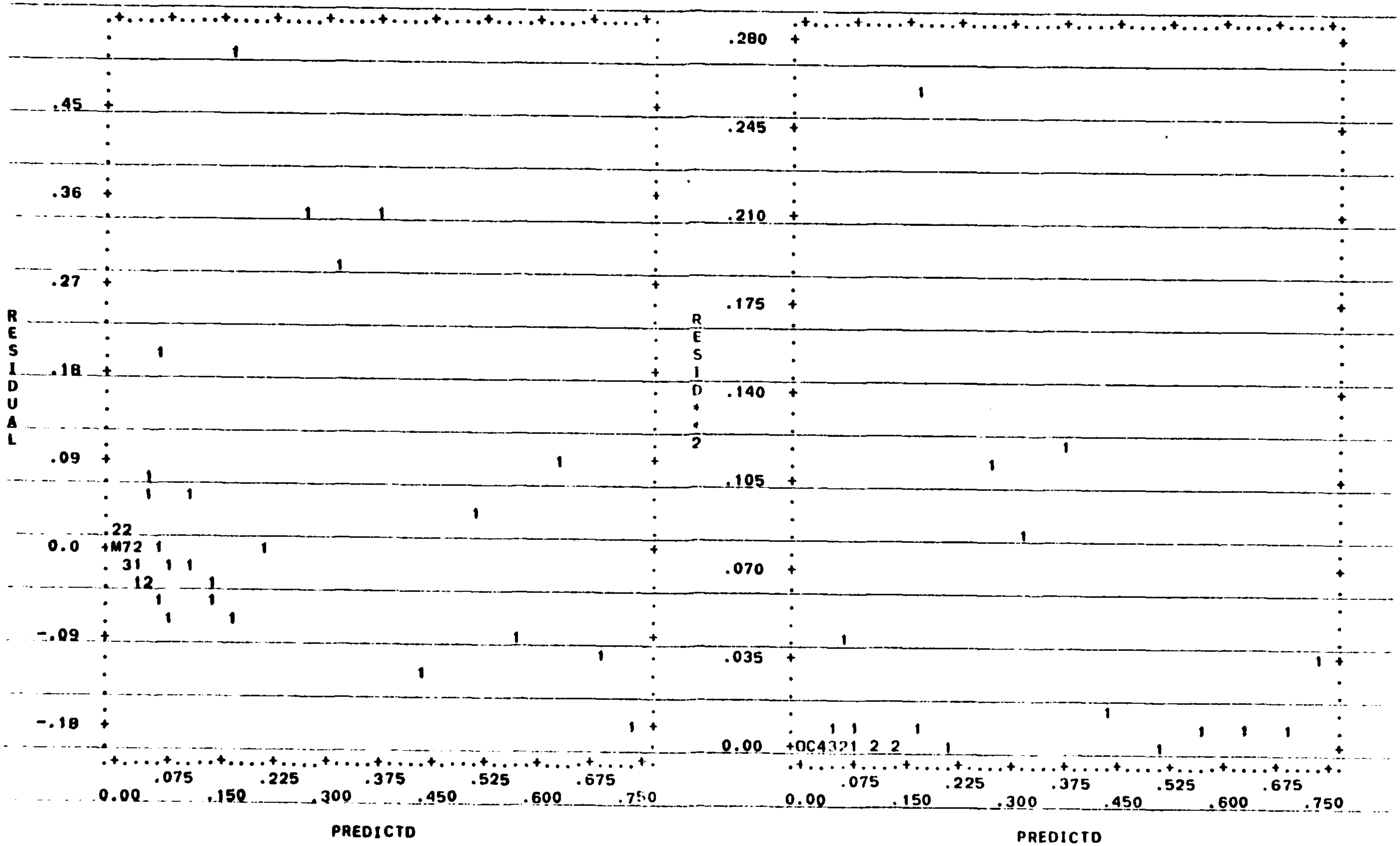
PLOTS OF VARIABLE(1) VERSUS PREDICTED AND OBSERVED VARIABLE(2) AND VERSUS RESIDUALS.





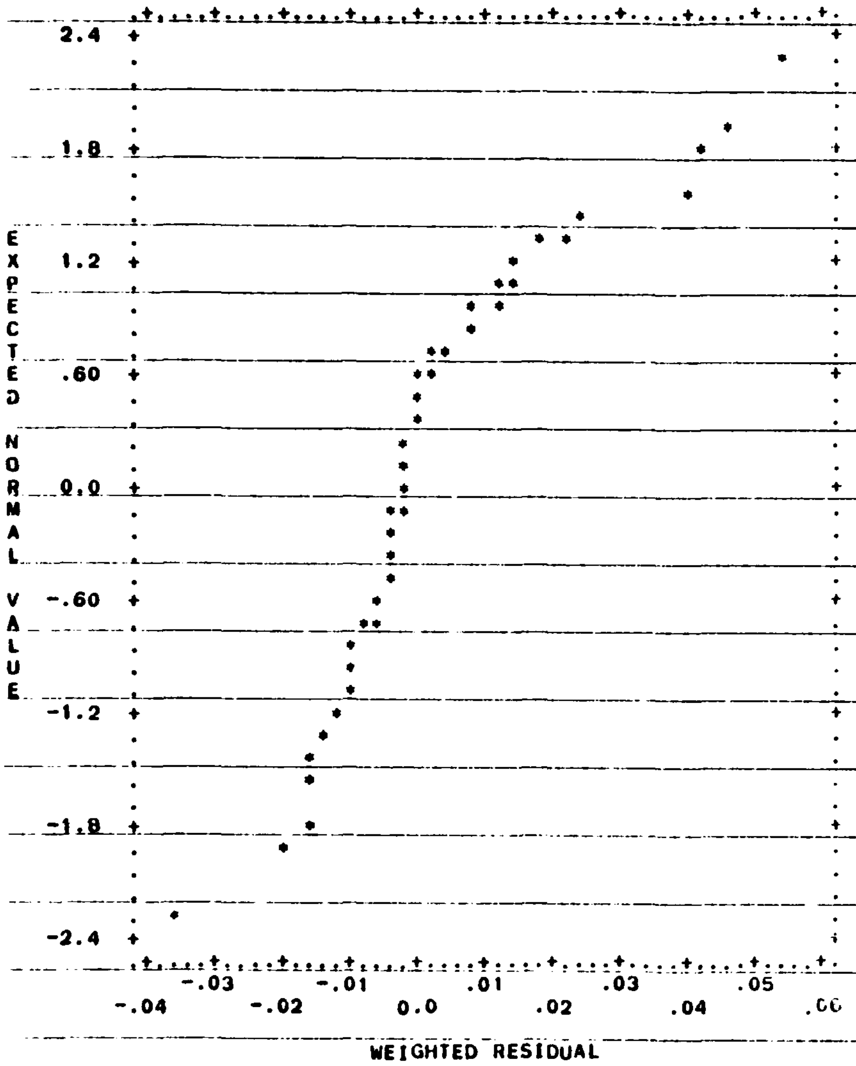
PAGE 6 PARAMETERS FROM DATA SET # 3 (5 PLATFORMS)

PLOTS OF PREDICTED VARIABLE HOLD VERSUS RESIDUALS AND VERSUS RESIDUALS SQUARED



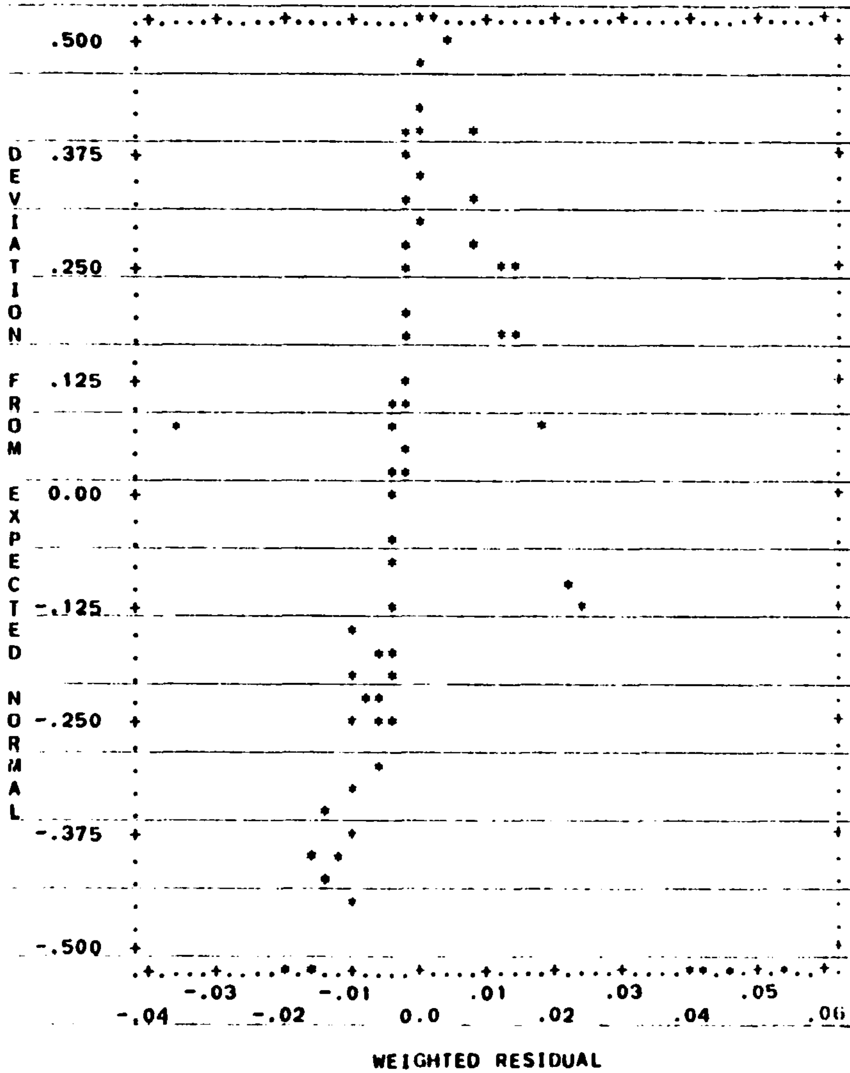
PAGE 7 PARAMETERS FROM DATA SET # 3 (5 PLATFORMS)

NORMAL PROBABILITY PLOT OF WEIGHTED RESIDUALS



PAGE 8 PARAMETERS FROM DATA SET # 3 (5 PLATFORMS)

DETRENDED NORMAL PROBABILITY PLOT OF WEIGHTED RESIDUALS



CPU TIME USED 10.454 SECONDS

```
PAGE    9

BMDP3R - NONLINEAR REGRESSION
10/07/82           AT 17:22:33

NO MORE CONTROL LANGUAGE.

PROGRAM TERMINATED

@TEST TNE/0/T3

@JUMP 3
INTERVENING STATEMENTS SKIPPED

@BRKPT PRINT$
```

APPENDIX C

NONLINEAR REGRESSION ANALYSIS COMPUTER PROGRAM PACKAGE

```
@ELT,L NLR.MAP/P3R77
EITOI7 RLIB70 09/21-10:55:41-(4,)
000001       004 @PACK,P PASS*NLR.
000002       004 @MAP   ,PASS*NLR.P3R77
000003       000 IN PASS*NLR.P3RFUN/CUMGAUSS
000004       003 IN PASS*NLR.MDNORD
000005       000 IN N*BMDP77.3RREL
000006       000 IN MEMORY
000007       000 END

END ELT.
```

```
@ELT,L NLR.MAP/PAR77
ELT0T7 RLIB70 09/21-10:55:53-(3,)
000001       003 @PACK,P PASS*NLR.
000002       003 @MAP   ,PASS*NLR.PAR77
000003       000 IN PASS*NLR.FUN/CUMGAUSS
000004       002 IN PASS*NLR.MONORD
000005       000 IN N*BMDP77.ARREL
000006       000 IN MEMORY
000007       000 END

END ELT.
```

```
@ELT,L NLR.MAP/P3R81
ELT0T7 RLIB70 09/21-10:56:48-(0,)
000 @PACK,P BMDP-SOURCE*BMDP3R.
000 @COPY,R PASS*NLR.P3RFUN/CUMGAUSS,P3RFUN
000 @COPY,R PASS*NLR.MDNORD,MDNORD
000 @MAP,E    ,PASS*NLR.P3R81
000 . BMDP81 UNIVAC SEGMENTED MAP OF BMDP3R
000 . BASED ON IBM OVERLAY STRUCTURE WITH DYNAMIC MEMORY
000 . ALLOCATION ADDED
000 .
000 LIB BMDP-SOURCE*BMDP3R.
000 LIB BMDP-SOURCE*BMDPLIB81.
000 NOT  TPF$.
000 .
000 SEG $MAIN$
000    IN  MAIN/PROGRAM
000    IN  S$START
000    ENT S$START
000    IN  F2FRT
000 SEG 1A*
000 IN       IBSIZE,SETUPS,GETCOR,PRTHED,P3RNWS,TIMEV,ENDSUB
000 IN       P3RSET
000 SEG 1B*,1A
000 IN       GETHNG,GETINP,GETME,GETSTR,GETNAM,RDTRAN
000 SEG 2A*
000 IN           PLINFO
000 SEG 3A*
000 IN               PLINF5
000 SEG 3B*,3A
000 IN               PLINF1,SFOPEN,SFTOFC,SFTINQ
000 SEG 3C*,3B
000 IN               SFIRPT
000 SEG 3D*,3C
000 IN               PLINF2
000 SEG 3E*,3D
000 IN               PLINF3
000 SEG 3F*,3E
000 IN               PLINF4
000 SEG 3G*,3F
000 IN               FORCMP,NEXTFM
000 SEG 3H*,3G
000 IN               FORSIM
000 SEG 3I*,3H
000 IN               FORANA
000 SEG 3J*,3I
000 IN               VARPRT,BLDFMT
000 SEG 2B*,2A
000 IN           UNCOLA
000 SEG 3K*
000 IN               INITER
000 SEG 3L*,3K
000 IN               FUNC3R
000 SEG 1C*,1B
000 IN       CREDEV,REDEV
000 SEG 2C*
000 IN           XREADS,TRANS,TRANSF,MISVAL
000 SEG 3M*
```

```
000 IN                 FORMRC,INTCHS
000 SEG 3N*,3M
000 IN                 FREERC
000 SEG 2D*,2C
000 IN             PRTNOC
000 SEG 1D*,1C
000 IN         TPF$.P3RFUN,TRANT
000 IN TPF$.MDNORD
000 SEG 2E*
000 IN             LSTSQ,RITEIT,P3RPSI,DORDER,P3RSTP
000 SEG 2F*,2E
000 IN             RITEND,PRTRID,SFTDOT,SFTOUT,SFTEND,SFDOUT
000 IN             SFREPO
000 IN             SERCOR,SFFOUT
000 SEG 1E*,1D
000 IN         CLEARB,RECORD
000 SEG 1F*,1E
000 IN         PLOTR,PLTSIN,PLTMFL,PLTSFL,PLTPRT,SCALE,PLTNPR
000 SEG 1G*,()
000 IN         RDTERR
000 SEG 2G*
000 IN             RDTER1
000 SEG 2H*,2G
000 IN             RDTER2
000 SEG 2I*,2H
000 IN             RDTER3
000 SEG 1H*,1G
000 IN         GETERR
000 SEG 1I*,1H
000 IN         DUMPA
000 SEG 1J*,1I
000 IN         SHADOW
000 SEG 1K*,1J
000 IN         RETYPE'
000 SEG 1L*,1K
000 IN         GETARG
000 SEG 1M*,1L
000 IN         RANDOM,RANDG
000 .
000 . ADD THE FOLLOWING AS *LAST* SEGMENT IF PROGRAM IS TO
000 . BE SEGMENTED
000 SEG MEM,()
000     IN MEMORY
000 . *NOTHING* SHOULD FOLLOW THE DIRECTIVE IN MEMORY  !!!!!!
000 END  . MAP OF BMDP3R

END ELT.

@BRKPT PRINT$
```

```
@ELT,L NLR.P3RFUN/CUMGAUSS
ELT017 RLIB70 09/21-10:55:06-(33,)
003       SUBROUTINE P3RFUN (
003      *                F,               @ OUTPUT
003      *                DF,              @ OUTPUT
003      *                P,               @ INPUT
003      *                X,               @ INPUT
003      *                N,               @ INPUT
003      *                KASE,            @ INPUT
003      *                NVAR,            @ INPUT
003      *                NPAR,            @ INPUT
003      *                IPASS,           @ INPUT
003      *                XLOSS,           @ INPUT
003      *                INDP             @ INPUT
003      *                      )
003 C**  NAME: PASS*NLR.P3RFUN/CUMGAUSS
003 C**
003 C**  USAGE: CALL P3RFUN ( F, DF, P, X, N, KASE, NVAR, NPAR, IPASS,
003 C**                       XLOSS, INDP )
003 C**
003 C**  PURPOSE: OBTAIN THE VALUE OF THE CUMULATIVE GAUSSIAN FUNCTION FROM
006 C**           THE INDEPENDENT VARIABLE X(1) AND THE REGRESSION
006 C**           EQUATION PARAMETERS P(1), P(2), ... P(N).  THIS FUNCTION
006 C**           IS FOR USE WITH THE P3R PROGRAM DESCRIBED IN THE
032 C**           UCLA BMDP 1977 USERS'S MANUAL PG 464.  OR THE 1981
032 C**           USER'S MANUAL PG 290. A NONLINEAR REGRESSION OF THE
032 C**           CUMULATIVE GAUSSIAN FUNCTION IS MADE USINT THE RAW
032 C**           STATISTIC P(1) + P(2)*X(1), ... +P(N)*X(M).
003 C**
032 C**  LIMITATIONS: THE INDEPENDENT VARIABLE (PERFORMANCE INDEX) MUST BE
032 C**               IN THE FIRST POSITION I.E. X(1) AND THE DEPENDENT
032 C**               (FRACTIONAL HOLDING TIME) MUST BE IN THE SECOND
006 C**               POSITION X(2).  X(3) AND X(4) SHOULD HAVE INITIAL
006 C**               ESTIMATES OF CASE WEIGHT AND AVAILABILITY TIME
032 C**               RESPECTIVELY. X(5)... X(NVAR) ARE DUMMY VARIABLES
032 C**               TO ALLOW FOR DIFFERENT Y-INTERCEPTS IF MORE THAN
033 C**               ONE SOUND PROJECTOR IS USED IN THE REGRESSION AND
032 C**               SHOULD BE SET TO 0 OR 1 TO CONTROL THE INTRODUCTION
032 C**               OF ADDITIONAL DATA SETS FOR A COMPUTER RUN
032 C**               ESTABLISHING THE PARAMETERS ESTIMATES.
003 C**
008 C**  WARNINGS: NO. OF VARIABLES MUST BE TWO GREATER THAN THE
008 C**            NO. OF PARAMETERS. A MESSAGE PRINTS OUT IF THE CONDITION
006 C**            IS NOT MET.
003 C**
017 C**  SUBPROGRAMS REQUIRED: MDNORD - OBTAINED FROM PASS*NLR.MDNORD
003 C**
003 C**  ARGUMENTS: .
003 C**
003 C**     INPUT: P   - REGRESSION PARAMETERS
003 C**            X   - REGRESSION VARIABLES
003 C**            N   - ID FOR REGRESSION FUNCTION
015 C**                  N = 1,  USE INPUT CASEWT X(3)
015 C**                  N = 2,  RECALCULATE X(3)
032 C**                  N = 3,  SAM AS N = 2, + WRITES DEBUG ON LU 20
003 C**            KASE - CASE INDEX
003 C**            NVAR - NUMBER OF FUNCTION VRBLS
```

```
003 C**               NPAR - NUMBER OF FUNCTION PARAMETERS
003 C**               IPASS - NUMBER OF DATA PASSES
003 C**               XLOSS - UTILITY VRBL
015 C**               INDP  - INDEX OF DEP VRBL(NOT USED)
003 C**
003 C**     INPUT/OUTPUT: NONE
003 C**
003 C**     OUTPUT: F - FUNCTION VALUE
003 C**             DF - DERIVATIVES OF FUNCTION W/R PARAMATERS
003 C**
032 C**  NOTES: IF EVALUATION OF THE WEIGHTING FUNCTION WOULD
032 C**         CAUSE DIVISION BY ZERO THEN THE ZERO FACTOR
032 C**         IS RESET TO 10**-38 AND THE FACTORS OF THE
032 C**         WEIGHTING FUNCTION ARE WRITTEN ON LU 21.  THE
032 C**         CONDITION WORD IS ALSO SET TO 1 SO THAT IT MAY
032 C**         MAY BE SENSED IN THE RUNSTREAM AND A BRANCH
032 C**         PROVIDED TO DUMP FILE 21.
003 C**
003 C**  PROGRAMMER/ORGANIZATION: HOFMOCKEL-JL, CSC
003 C**
005 C**  ALGORITHM:  THE RAW STATISTIC P(1) + P(2)*X(1)+ ... + P(N)*X(M) IS
005 C**              FORMED AS THE ARGUMENT TO SUBROUTINE MDNOR WHICH YIELDS
005 C**              THE AREA UNDER THE GAUSSIAN CURVE.  THE FIRST DERIVATIVES
003 C**              OF THE CUMULATIVE GAUSSIAN FUNCTION WITH RESPECT TO
005 C**              PARAMETERS P(1), P(2),..., P(N) ARE ALSO EVALUATED.
003 C**
003 C**  APPLICABILITY: ASCII FORTRAN
003 C**
003 C**  KEYWORDS: BMDP77, NONLINEAR, REGRESSION, STATISTICS, GAUSSIAN
003 C**
003 C**  RECORD OF MODIFICATIONS: INITIAL PROGRAM 4-7-82
003 C**
003 C**  WAIVERS: NONE
003 C
003        START EDIT PAGE
003 C
014        DOUBLE PRECISION A                   @ AREA UNDER GAUSSIAN
003        DOUBLE PRECISION DF ( NPAR )         @ DERIVATIVES W/R PARAMETERS
003        DOUBLE PRECISION F                   @ VALUE OF FUNCTION
010        DOUBLE PRECISION FACTOR              @ (1-F)*F LIMITED, DIV FLT PROT
007        INTEGER I                            @ LOOP INDEX
007        INTEGER IEND                         @ LIMIT ON LOOP INDEX
015        INTEGER INDP                         @ DEP VRBL INDEX(UNUSED)
006        INTEGER IP                           @ PARAM INDEX
016        INTEGER IPASS                        @ NUM DATA PASSES(UNUSED)
006        INTEGER IV                           @ VRBL INDEX
016        INTEGER KASE                         @ CASE SEQ NUM(UNUSED)
029        DOUBLE PRECISION LMBTEE              @ TIME AVAIL / 4
003        INTEGER N                            @ FUNCTION ID
021        INTEGER NCALL / 0 /                  @ COUNT OF SUB CALLS
003        INTEGER NPAR                         @ NUMBER PARAMS IN FUNCTION
003        INTEGER NVAR                         @ TOTAL NO. VRBLS
003        DOUBLE PRECISION P ( NPAR )          @ REGRESSION PARAMETERS
006        DOUBLE PRECISION STPINV              @ SQRT(TWOPI) INVERTED
006       * / 0.39894228040143267800 /
003        DOUBLE PRECISION X ( NVAR )          @ INDEPENDENT VRBL
003        DOUBLE PRECISION XLOSS               @ UTILITY VRBL(UNUSED)
```

```
003        DOUBLE PRECISION Z                    * NORMALIZED STATISTIC
003 C
021        NCALL = NCALL + 1
009        IF ( NVAR-NPAR .NE. 2 ) THEN          * ERROR IN INPUTS
009          WRITE ( 6, 10 ) NVAR, NPAR
009 10       FORMAT ( ' VRBLS/PARAMS ERROR:',
006     *    ' NVAR= ', I2, ' NPAR= ', I2 )
009          STOP ' ERROR STOP P3RFUN'
010        ENDIF
005        Z =  P(1)+P(2)*X(1)                   * FORM STAT
021        IF ( NPAR .GT. 2 ) THEN               * ADD XTRA VRBLS EFFECT
021          IV = 4
021          IP = 2
021          IEND = NPAR -2
021          DO 15 I = 1, IEND
021            IP = IP + 1
021            IV = IV + 1
021            Z = Z + P(IP)*X(IV)
021 15       CONTINUE
021        ENDIF
009          DF ( 1 ) = -STPINV *                * DERIVATIVE W/R P(1)
024     *      DEXP ( -0.5D0*Z*Z)
006          DF ( 2 ) = X ( 1 ) * DF ( 1 )       * DERIVATIVE W/R P ( 2 )
015        IF ( NPAR .GT. 2 ) THEN               * ADD XTRA VRBLS EFFECT
006          IV = 4
006          IP = 2
006          IEND = NPAR -2
006          DO 20 I = 1, IEND
006            IP = IP + 1
006            IV = IV + 1
006            DF ( IP ) = X ( IV ) * DF ( 1 )
006 20       CONTINUE
006        ENDIF
015        CALL MDNORD ( Z, A )                  * AREA UNDER GAUSSIAN
015        F = 1.0 - A
021        IF ( N .GT. 1 ) THEN                  * RESET CA EWT
015          FACTOR = F - F*F
031            IF ( FACTOR .LE. 0.0D0 ) THEN * SHOULD NOT BE 0
031              WRITE ( 21, * ) NCALL, KASE,
031     *          Z, A, FACTOR                  * SAV DATA IN FILE
031              CALL FSETC ( 1 )                * SET CONDITION WORD
031              FACTOR = 1.0D-38                * PREVENT DIVFLT
031            ENDIF
028          LMBTEE = 0.25D0 * X ( 4 )
015          X ( 3 ) =
028     *    ( LMBTEE * LMBTEE ) /
028     *    ( ( DEXP( -LMBTEE )
028     *    + LMBTEE-1.0D0 )*FACTOR )
010        ENDIF
027          IF ( N .EQ. 3 ) THEN                * DEBUG DATA FILE
027            WRITE ( 20, * ) NCALL, KASE,
027     *        Z, A, X(3)
027          ENDIF
003        RETURN
003        END

END ELT.
```

```
@ELT,L NLR.FUN/CUMGAUSS
ELT0T7 RLIB70 09/21-10:55:21-(1,)
000        SUBROUTINE FUN (
000     *                  F,                 @ OUTPUT
000     *                  P,                 @ INPUT
000     *                  X,                 @ INPUT
000     *                  N,                 @ INPUT
000     *                  KASE,              @ INPUT
000     *                  NVAR,              @ INPUT
000     *                  NPAR,              @ INPUT
000     *                  IPASS,             @ INPUT
000     *                  XLOSS              @ INPUT
000     *                        )
001 C** NAME: PASS*NLR.FUN/CUMGAUSS
000 C**
000 C** USAGE: CALL FUN ( F, P, X, N, KASE, NVAR, NPAR, IPASS,
000 C**                  XLOSS )
000 C**
000 C** PURPOSE: OBTAIN THE VALUE OF THE CUMULATIVE GAUSSIAN FUNCTION FROM
000 C**          THE INDEPENDENT VARIABLE X(1) AND THE REGRESSION
000 C**          EQUATION PARAMETERS P(1), P(2), ... P(N).  THIS FUNCTION
000 C**          IS FOR USE WITH THE PAR PROGRAM DESCRIBED IN THE
000 C**          UCLA BMDP 1977 USERS'S MANUAL PG 464.  OR THE 1981
000 C**          USER'S MANUAL PG 290. A NONLINEAR REGRESSION OF THE
000 C**          CUMULATIVE GAUSSIAN FUNCTION IS MADE USING THE RAW
000 C**          STATISTIC P(1) + P(2)*X(1), ... +P(N)*X(M).
000 C**
000 C** LIMITATIONS: THE INDEPENDENT VARIABLE (PERFORMANCE INDEX) MUST BE
000 C**              IN THE FIRST POSITION I.E. X(1) AND THE DEPENDENT
000 C**              (FRACTIONAL HOLDING TIME) MUST BE IN THE SECOND
000 C**              POSITION X(2).  X(3) AND X(4) SHOULD HAVE INITIAL
000 C**              ESTIMATES OF CASE WEIGHT AND AVAILABILITY TIME
000 C**              RESPECTIVELY. X(5)... X(NVAR) ARE DUMMY VARIABLES
000 C**              TO ALLOW FOR DIFFERENT Y-INTERCEPTS IF MORE THAN
000 C**              ONE SOUND PROJECTOR IS USED IN THE REGRESSION AND
000 C**              SHOULD BE SET TO 0 OR 1 TO CONTROL THE INTRODUCTION
000 C**              OF ADDITIONAL DATA SETS FOR A COMPUTER RUN
000 C**              ESTABLISHING THE PARAMETERS ESTIMATES.
000 C**
000 C** WARNINGS: NO. OF VARIABLES MUST BE TWO GREATER THAN THE
000 C**           NO. OF PARAMETERS. A MESSAGE PRINTS OUT IF THE CONDITION
000 C**           IS NOT MET.
000 C**
000 C** SUBPROGRAMS REQUIRED: MDNORD - OBTAINED FROM PASS*NLR.MDNORD
000 C**
000 C** ARGUMENTS:
000 C**
000 C**    INPUT: P    - REGRESSION PARAMETERS
000 C**           X    - REGRESSION VARIABLES
000 C**           N    - ID FOR REGRESSION FUNCTION
000 C**                  N = 1,  USE INPUT CASEWT X(3)
000 C**                  N = 2,  RECALCULATE X(3)
000 C**                  N = 3,  SAM AS N = 2, + WRITES DEBUG ON LU 20
000 C**           KASE - CASE INDEX
000 C**           NVAR - NUMBER OF FUNCTION VRBLS
000 C**           NPAR - NUMBER OF FUNCTION PARAMETERS
000 C**           IPASS - NUMBER OF DATA PASSES
```

```
000 C**          XLOSS - UTILITY VRBL
000 C**
000 C**     INPUT/OUTPUT: NONE
000 C**
000 C**     OUTPUT: F - FUNCTION VALUE
000 C**
000 C**  NOTES: IF EVALUATION OF THE WEIGHTING FUNCTION WOULD
000 C**        CAUSE DIVISION BY ZERO THEN THE ZERO FACTOR
000 C**        IS RESET TO 10**-38 AND THE FACTORS OF THE
000 C**        WEIGHTING FUNCTION ARE WRITTEN ON LU 21.  THE
000 C**        CONDITION WORD IS ALSO SET TO 1 SO THAT IT MAY
000 C**        MAY BE SENSED IN THE RUNSTREAM AND A BRANCH
000 C**        PROVIDED TO DUMP FILE 21.
000 C**
000 C**  PROGRAMMER/ORGANIZATION: HOFMOCKEL-JL, CSC
000 C**
000 C**  ALGORITHM:  THE RAW STATISTIC P(1) + P(2)*X(1)+ ... + P(N)*X(M) IS
000 C**              FORMED AS THE ARGUMENT TO SUBROUTINE MDNOR WHICH YIELDS
000 C**              THE AREA UNDER THE GAUSSIAN CURVE.
000 C**
000 C**  APPLICABILITY: ASCII FORTRAN
000 C**
000 C**  KEYWORDS: BMDP77, NONLINEAR, REGRESSION, STATISTICS, GAUSSIAN
000 C**
000 C**  RECORD OF MODIFICATIONS: INITIAL PROGRAM 4-7-82
000 C**
000 C**  WAIVERS: NONE
000 C
000        START EDIT PAGE
000 C
000        DOUBLE PRECISION A                      @ AREA UNDER GAUSSIAN
000        DOUBLE PRECISION F                      @ VALUE OF FUNCTION
000        DOUBLE PRECISION FACTOR                 @ (1-F)*F LIMITED, DIV FLT PROT
000        INTEGER I                               @ LOOP INDEX
000        INTEGER IEND                            @ LIMIT ON LOOP INDEX
000        INTEGER IP                              @ PARAM INDEX
000        INTEGER IPASS                           @ NUM DATA PASSES(UNUSED) .
000        INTEGER IV                              @ VRBL INDEX
000        INTEGER KASE                            @ CASE SEQ NUM(UNUSED)
000        DOUBLE PRECISION LMBTEE                 @ TIME AVAIL / 4
000        INTEGER N                               @ FUNCTION ID
000        INTEGER NCALL / 0 /                     @ COUNT OF SUB CALLS
000        INTEGER NPAR                            @ NUMBER PARAMS IN FUNCTION
000        INTEGER NVAR                            @ TOTAL NO. VRBLS
000        DOUBLE PRECISION P ( NPAR )             @ REGRESSION PARAMETERS
000        DOUBLE PRECISION STPINV                 @ SQRT(TWOPI) INVERTED
000       *  / 0.3989422804014326780D0 /
000        DOUBLE PRECISION X ( NVAR )             @ INDEPENDENT VRBL
000        DOUBLE PRECISION XLOSS                  @ UTILITY VRBL(UNUSED)
000        DOUBLE PRECISION Z                      @ NORMALIZED STATISTIC
000 C
000        NCALL = NCALL + 1
000        IF ( NVAR-NPAR .NE. 2 ) THEN            @ ERROR IN INPUTS
000          WRITE ( 6, 10 ) NVAR, NPAR
000 10       FORMAT ( ' VRBLS/PARAMS ERROR:',
000       *  ' NVAR= ', I2, ' NPAR= ', I2 )
001          STOP ' ERROR STOP FUN'
```

```
000         ENDIF
000           Z =  P(1)+P(2)*X(1)                 @ FORM STAT
000         IF ( NPAR .GT. 2 ) THEN               @ ADD XTRA VRBLS EFFECT
000           IV = 4
000           IP = 2
000           IEND = NPAR -2
000           DO 15 I = 1, IEND
000             IP = IP + 1
000             IV = IV + 1
000             Z = Z + P(IP)*X(IV)
000 15        CONTINUE
000         ENDIF
000         CALL MDNORD ( Z, A )                  @ AREA UNDER GAUSSIAN
000         F = 1.0 - A
000         IF ( N .GT. 1 ) THEN                  @ RESET CASEWT
000           FACTOR = F - F*F
000             IF ( FACTOR .LE. 0.0D0 ) THEN @ SHOULD NOT BE 0
000               WRITE ( 21, * ) NCALL, KASE,
000      *          Z, A, FACTOR                  @ SAV DATA IN FILE
000               CALL FSETC ( 1 )                @ SET CONDITION WORD
000               FACTOR = 1.0D-38                @ PREVENT DIVFLT
000             ENDIF
000           LMBTEE = 0.25D0 * X ( 4 )
000           X ( 3 ) =
000      *    ( LMBTEE * LMBTEE ) /
000      *    ( ( DEXP( -LMBTEE )
000      *    + LMBTEE-1.0D0 )*FACTOR )
000         ENDIF
000           IF ( N .EQ. 3 ) THEN                @ DEBUG DATA FILE
000             WRITE ( 20, * ) NCALL, KASE,
000      *        Z, A, X(3)
000           ENDIF
000         RETURN
000         END

END ELT.
```

```
@ELT,L NLR.MDNORD/26214-5
ELT017 RLIB70 06/11-12:45:59-(13,)
009          SUBROUTINE MDNORD (
009          *                       X,              * INPUT
009          *                       A               * OUTPUT
009          *                        )
009 C**     NAME: PASS*NLR.MDNORD
009 C**
010 C**     USAGE: CALL MDNORD ( X, A )
009 C**
009 C**     PURPOSE: EVALUATE THE AREA UNDER THE GAUSSIAN DISTRIBUTION
009 C**              BY CONTINUED FRACTION USING ART. 26.2.14 OR 26.2.15,
009 C**              HANDBOOK OF MATHEMATICAL FUNCTIONS, AMS 55.
009 C**
010 C**     LIMITATIONS: INPUT ARGUMENTS X AND A MUST BE DOUBLE PRECISION
009 C**                  MDNORD MUST BE CALLED FROM ASCII COMPILED PROGRAM.
009 C**
009 C**     WARNINGS: NONE
009 C**
009 C**     SUBPROGRAMS REQUIRED: NONE
009 C**
009 C**     ARGUMENTS: .
009 C**
010 C**        INPUT: X                           * NO. STD. DEV. FR. MEAN OF 0
009 C**
009 C**        INPUT/OUTPUT: NONE
009 C**
009 C**        OUTPUT: A                          * AREA UNDER THE GAUSSIAN
009 C**
009 C**     NOTES: NONE
009 C**
009 C**     PROGRAMMER/ORGANIZATION: HOFMOCKEL-JL/CSC
009 C**
009 C**     ALGORITHM: IF ( ABS(X) .LE. 3 ) THEN USING ART 26.2.15
009 C**                EVALUATE THE CONTINUED FRACTION IN THE FORM:
009 C**                Q(X)=0.5-Z(X)*(X/1- X**2/3+ 2*X**2/5- 3*X**2/7+ ...)
009 C**                OTHERWISE IF ( ABS(Z) .GT. 3 ) THEN USING ART 26.2.14
010 C**                EVALUATE THE CONTIUED FRACTION IN THE FORM:
010 C**                Q(X)=0.5-Z(X)*(1/X+ 1/X+ 2/X+ 3/X+ 4/X+ ... )
010 C**                WHERE Z(X)=EXP(-0.5*X**2)/SQRT(2*PI)
009 C**
009 C**     APPLICABILITY: ASCII FORTRAN
009 C**
009 C**     KEYWORDS: CUMULATIVE GAUSSIAN, AREA UNDER GAUSSIAN, NORMAL CURVE
009 C**
009 C**     RECORD OF MODIFICATIONS: INITIAL PROGRAM 6-10-82
009 C**
009 C**     WAIVERS: NONE
009 C
009          START EDIT PAGE
009 C
009          DOUBLE PRECISION A               * AREA UNDER THE GAUSSIAN
009          DOUBLE PRECISION ANBN ( 2 )      * A B VECTOR ART 3.10
009          DOUBLE PRECISION COEF ( 2 )      * COEFFICIENTS ART 3.10
009          DOUBLE PRECISION DIFN            * DIFFERENCE F(1)-F(2)
009          DOUBLE PRECISION FN ( 2 )        * FRACT VAL, 1-CURRENT, 2-PREVIOUS
009          INTEGER I                        * ROW INDEX
```

```
009        INTEGER J                              @ COL INDEX
009        INTEGER K                              @ NTH TERM INDEX
010        DOUBLE PRECISION MTRX ( 2, 2 )         @ A, B MATRIX
010        DOUBLE PRECISION SGN                   @ ALGEBRAIC SIGN FLIP FLOP
009        DOUBLE PRECISION STPINV                @ SQRT(TWOPI) INVERTED
009     *         / 0.398942280401432678D0 /
010        DOUBLE PRECISION SUMX2                 @ ACCUMULATES X**2 SUM
010        DOUBLE PRECISION X                     @ # OF SD FR 0(ARG INPUT)
009        DOUBLE PRECISION XA                    @ ABSOLUTE VALUE OF X (ARG INPUT)
009        DOUBLE PRECISION XSQ                   @ X**2
009        DOUBLE PRECISION Z                     @ GAUSS ORD (FOR X S.D. FR MEAN)
009        IF ( X .EQ. 0.0D0 ) THEN
010          A = 0.5D0                            @ SPECIAL CASE X=0
009        ELSE
009          XA = DABS ( X )                      @ USE POS ARG
009          XSQ = X * X                          @ X**2
009          FN ( 1 ) = 0.0D0                     @ PRESETS FOR RECURSIVE CALC
009          FN ( 2 ) = 0.0D0
010         IF ( XA .GT. 3.0D0 ) THEN             @ ART 26.2.14 INITIAL
009          COEF ( 1 ) = XA
009          COEF ( 2 ) = 1.0D0
010          MTRX ( 1, 1 ) = 1.0D0
010          MTRX ( 2, 1 ) = XA
010         ELSE
010          COEF ( 1 ) = 1.0D0                   @ ART 26.2.15 INITIAL
010          COEF ( 2 ) = -XSQ
010          SUMX2 = XSQ
010          SGN = -1.0D0
010          MTRX ( 1, 1 ) = XA
012          MTRX ( 2, 1 ) = 1.0D0
010         ENDIF
010          MTRX ( 1, 2 ) = 0.0D0
010          MTRX ( 2, 2 ) = 1.0D0
010          DO 30 K = 1, 300                     @ LOOP THRU N TERMS
010            ANBN ( 1 ) = 0.0D0                 @ TO GET NTH FRACT
009            ANBN ( 2 ) = 0.0D0
010            IF ( XA .LE. 3.0D0 )
010     *        COEF ( 1 ) = COEF ( 1 )+2.0D0
010            DO 20 I = 1, 2                     @ ROW LOOP
009              DO 10 J = 1, 2                   @ COL LOOP
010                ANBN ( I ) = ANBN ( I ) +      @ MULT MATRICES
010     *          MTRX ( I, J )*COEF ( J )
009 10           CONTINUE
009 20         CONTINUE
010            FN ( 2 ) = FN ( 1 )                @ SAV PRIOR FRACT
010            FN ( 1 ) =                         @ NTH FRACTIONAL
009     *        ANBN ( 1 ) / ANBN ( 2 )
010            DIFN = DABS ( FN(2)-FN(1) )        @ CONVERG CRITERION
009            IF ( DIFN .LT. 1.0D-19 )
010     *          GO TO 40                       @ ENOUGH TERMS
010           IF ( XA .GT. 3.0D0 ) THEN
009            COEF ( 2 ) = COEF ( 2 )+1.0D0
010           ELSE
010            SUMX2 = SUMX2 + XSQ
010            SGN = -SGN
010            COEF ( 2 ) = DSIGN ( SUMX2, SGN )
010           ENDIF
```

```
009           MTRX ( 1, 2 ) = MTRX ( 1, 1 )
009           MTRX ( 2, 2 ) = MTRX ( 2, 1 )
010           MTRX ( 1, 1 ) = ANBN ( 1 )
009           MTRX ( 2, 1 ) = ANBN ( 2 )
009 30      CONTINUE                        * END N TERMS LOOP
009 40      CONTINUE                        * NTH TERM IN FN ( 1 )
010         Z = STPINV*DEXP ( -0.5D0*XSQ )
010         A = FN ( 1 ) * Z                * USE TAIL AREA, X<0
010         IF ( XA .LE. 3.0D0 )
010      *    A = -A + 0.5D0
010         IF ( X .GT. 0.0D0 )
010      *    A = -A + 1.0D0
009       ENDIF
009       RETURN
009       END

END ELT.
```

```
@ELT,L NLR.MAIN/TSTMDNORD
ELT0T7 RLIB70 10/18-13:56:55-(12,)
000001       008      DOUBLE PRECISION A
000002       008      DOUBLE PRECISION Z
000003       009      WRITE ( 6 , 10 )
000004       009 10   FORMAT ( ' TEST PROGRAM FOR MDNORD',
000005       009     *  ' (AREA UNDER GAUSSIAN)',/,
000006       009     *  ' AFTER EACH SOLICIT CHARACTER ( > ) ',/,
000007       009     *  ' ENTER THE NUMBER OF STANDARD ',/,
000008       009     *  ' DEVIATIONS FROM ZERO MEAN (+ OR -)',/,
000009       009     *  ' THE PROGRAM WILL ECHO THE NO. S.D. ',
000010       009     *  'FOLLOWED BY THE AREA',/,
000011       009     *  ' ENTER @EOF TO STOP' )
000012       009 20   CONTINUE
000013       009      READ ( 5, *, END=30 )  Z
000014       009      CALL MDNORD ( Z, A )
000015       010      WRITE ( 6, 15 ) Z, A
000016       012 15   FORMAT ( F10.6,2X, F20.18 )
000017       009      GO TO 20
000018       009 30   CONTINUE
000019       009      STOP ' NORMAL TSTMDNORD STOP '
000020       009      END

END ELT.

@XQT NLR.TSTMDNORD
TEST PROGRAM FOR MDNORD (AREA UNDER GAUSSIAN)
AFTER EACH SOLICIT CHARACTER ( > )
ENTER THE NUMBER OF STANDARD
DEVIATIONS FROM ZERO MEAN (+ OR -)
THE PROGRAM WILL ECHO THE NO. S.D. FOLLOWED BY THE AREA
ENTER @EOF TO STOP
 -9.000000   .000000000000000000
 -8.000000   .000000000000000622
 -7.000000   .000000000001279813
 -6.000000   .000000000985667930
 -5.000000   .000000286651575102
 -4.000000   .000031671241833111
 -3.000000   .001349898031630095
 -2.000000   .022750131948179208
 -1.500000   .066807201268858066
 -1.000000   .158655253931457051
  -.500000   .308537538725986895
   .000000   .500000000000000000
   .500000   .691462461274013100
  1.000000   .841314746068542945
  1.500000   .933192798731141929
  2.000000   .977249868051820788
  3.000000   .998650101968369902
  4.000000   .999968328758166884
  5.000000   .999999713348424892
  6.000000   .999999999014332067
  7.000000   .999999999998720185
  8.000000   .999999999999999376
  9.000000  1.000000000000000000
```

```
STOP      NORMAL TSTMONORD STOP

@BRKPT PRINT$
```

APPENDIX D

INPUT DATA BASE
COMPUTER PROGRAM PACKAGE

```
@ELT,L NLR.MAIN/FILEPROC
ELT017 RLIB70 09/16-11:24:14-(9,)
       008 C**  NAME: PASS*NLR.MAIN/FILEPROC
       008 C**
       008 C**  USAGE: @XQT PASS*NLR.FILEPROC
       008 C**
       008 C**  PURPOSE: REFORMAT INPUT DATA FILES SET UP FOR THE LINEAR
       008 C**           REGRESSION ANALYSIS PROGRAMS TO A FORMAT
       008 C**           SUITABLE FOR THE NONLINEAR REGRESSION
       008 C**           ANALYSIS PROGRAMS.
       008 C**
       008 C**  LIMITATIONS: INPUT FILES MUST BE AVAILABLE IN A FORM
       008 C**               WHICH PERMITS ADDING TO THE RUNSTREAM,
       008 C**               E.G., INDIVIDUAL ELEMENTS OF FILES OR
       008 C**               INDIVIDUAL FILES.
       008 C**
       008 C**  WARNINGS: NONE
       008 C**
       008 C**  SUBPROGRAMS REQUIRED: MONOR  ( IMSL-B LIBRARY )
       008 C**
       008 C**  ARGUMENTS: NONE
       008 C**
       008 C**     INPUT: FILES ADDED TO RUNSTREAM
       008 C**
       008 C**     INPUT/OUTPUT: NONE
       008 C**
       008 C**     OUTPUT: OUTPUT FILE WRITEEN ON LU 8
       008 C**
       008 C**  NOTES: NONE
       008 C**
       008 C**  PROGRAMMER/ORGANIZATION: HOFMOCKEL-JL/CSC
       008 C**
       008 C**  ALGORITHM: READ DATA FROM RUNSTREAM, REFORMAT FOR
       008 C**             INPUT TO THE NONLINEAR REGRESSION
       008 C**             PROGRAMS, WRITE OUTPUT FILE
       008 C**
       008 C**  APPLICABILITY: ASCII FORTRAN
       008 C**
       008 C**  KEYWORDS: NONLINEAR REGRESSION, HOLDING TIME,
       008 C**           PERFORMANCE INDEX.
       008 C**
       008 C**  RECORD OF MODIFICATIONS: INITIAL PROGRAM 8-10-82
       008 C**
       008 C**  WAIVERS: NONE
       008       START EDIT PAGE
       008
       008       REAL A                          @ AREA UNDER GAUSSIAN
       005       INTEGER I                       @ INDEX VRBL
       005       INTEGER IY ( 5 )                @ 2ND O/P BUFFER
       005       INTEGER J                       @ INDEX VRBL
       005       INTEGER K                       @ INDEX VRBL
       005       REAL LAMBDA / 0.25 /            @ WEIGHTING PARAMETER
       005       INTEGER NREC                    @ COUNT OF O/P FILE RECS
       006       REAL X ( 9 )                    @ INPUT DATA BUFFER
       006       REAL Y ( 4 )                    @ 1ST O/P DATA BUFFER
       006       REAL Z
       005       WRITE ( 6, 10 )
```

```
008 10    FORMAT ( ' ADD INPUT DATA',
008      *    ' TO RUNSTREAM' )
005       NREC = 0
005       DO 40 K = 1, 200
008         READ ( 5, *, END = 50 )
008      *      ( X(J), J=1, 9 )
005         IF ( X(4) .GT. 0.0 ) THEN
005           NREC = NREC + 1
006           CALL MDNOR ( X(2), A )        @ AREA UNDER GAUSSIAN
006           Y ( 1 ) = X ( 1 ) + 0.75      @ SET UP O/P BUFFER
005           Y ( 2 ) = 1.0 - A
008           Z = -20.0 + 0.125*X ( 1 )     @ SET UP FOR INITIAL WTS
006           CALL MDNOR ( Z, A )
008           Y ( 3 ) = ( LAMBDA*X(4) )**2./
008      *    ( ( EXP( -LAMBDA*X(4) ) +
008      *     LAMBDA*X(4) - 1.0 ) *
006      *     ( 1.0 - A ) * A )
005           Y ( 4 ) = X ( 4 )
005           DO 20 J = 5, 9
008             IY ( J-4 ) = INT ( X(J) )   @ SET DUMMY VRBLS
005 20        CONTINUE
005           WRITE ( 8, 30 )               @ WRITE A REC IN O/P FILE
008      *    ( Y(I), I = 1, 4 ),
008      *    ( IY(J), J = 1, 5 )
008 30        FORMAT ( F6.2, F9.5, F12.5,
009      *      F6.1, 5I2 )
005         ENDIF
005 40    CONTINUE
005 50    CONTINUE
005       WRITE ( 6, 60 ) NREC
008 60    FORMAT ( ' WROTE ', I3,
008      *  ' FORMATTED DATA RECORDS ',
008      *   'ON LU 8' )
006       STOP ' NORMAL STOP'
005       END

END ELT.

@

@XQT NLR.FILEPROC
ADD INPUT DATA TO RUNSTREAM

@ADD,P NLRDAT.AIDAT/LINEAR
WROTE  99 FORMATTED DATA RECORDS ON LU 8

STOP     NORMAL STOP
```

```
@MED,Q 8.,NLRDAT.AIDAT/NONLINEAR
MED 29B 09/16/82 11:25 AIDAT/NONLINEAR(0):A
EDIT
0*hh
END EDIT 99 LINES OUTPUT

@PRT NLRDAT.AIDAT/LINEAR
FURPUR 28R2 S74R1A 09/16/82 11:25:55
PASS*NLRDAT(1).AIDAT/LINEAR(0)
     1      169.0  1.01783   2.00694  13.00000 0 0 0 0 0
     2      170.5 99.99999    .00000  10.00000 0 0 0 0 0
     3      172.0  1.77188   3.28583  86.00000 0 0 0 0 0
     4      173.5  1.84860  11.25806 349.00000 0 0 0 0 0
     5      175.0  2.23549   6.57472 518.00000 0 0 0 0 0
     6      176.5  3.19695    .25000 360.00000 0 0 0 0 0
     7      178.0 99.99999    .00000 217.00000 0 0 0 0 0
     8      179.5 99.99999    .00000  44.00000 0 0 0 0 0
     9      181.0 99.99999    .00000  19.00000 0 0 0 0 0
    10      182.5 99.99999    .00000  50.00000 0 0 0 0 0
    11      184.0 99.99999    .00000  47.00000 0 0 0 0 0
    12      185.5 99.99999    .00000  68.00000 0 0 0 0 0
    13      187.0 99.99999    .00000  44.00000 0 0 0 0 0
    14      188.5 99.99999    .00000  32.00000 0 0 0 0 0
    15      167.5 99.99999    .00000   1.00000 1 0 0 0 0
    16      169.0  1.94692   3.17000 123.00000 1 0 0 0 0
    17      170.5 99.99999    .00000  13.00000 1 0 0 0 0
    18      172.0 99.99999    .00000  76.00000 1 0 0 0 0
    19      173.5 99.99999    .00000 190.00000 1 0 0 0 0
    20      175.0  2.39078   3.39611 404.00000 1 0 0 0 0
    21      176.5 99.99999    .00000 346.00000 1 0 0 0 0
    22      178.0  2.41168   1.34972 170.00000 1 0 0 0 0
    23      179.5  1.98286   2.86667 121.00000 1 0 0 0 0
    24      181.0 99.99999    .00000  24.00000 1 0 0 0 0
    25      182.5 99.99999    .00000  26.00000 1 0 0 0 0
    26      184.0 99.99999    .00000  28.00000 1 0 0 0 0
    27      185.5 99.99999    .00000  39.00000 1 0 0 0 0
    28      187.0 99.99999    .00000  54.00000 1 0 0 0 0
    29      188.5 99.99999    .00000   2.00000 1 0 0 0 0
    30      167.5 99.99999    .00000  30.00000 0 1 0 0 0
    31      169.0  2.41226   1.38722 175.00000 0 1 0 0 0
    32      170.5 99.99999    .00000 144.00000 0 1 0 0 0
    33      172.0 99.99999    .00000 241.00000 0 1 0 0 0
    34      173.5 99.99999    .00000 426.00000 0 1 0 0 0
    35      175.0 99.99999    .00000 122.00000 0 1 0 0 0
    36      176.5 99.99999    .00000 120.00000 0 1 0 0 0
    37      178.0 99.99999    .00000 105.00000 0 1 0 0 0
    38      179.5 99.99999    .00000  70.00000 0 1 0 0 0
    39      181.0 99.99999    .00000  26.00000 0 1 0 0 0
    40      182.5 99.99999    .00000  76.00000 0 1 0 0 0
    41      184.0 99.99999    .00000 159.00000 0 1 0 0 0
    42      185.5 99.99999    .00000 100.00000 0 1 0 0 0
    43      187.0 99.99999    .00000  53.00000 0 1 0 0 0
    44      188.5 99.99999    .00000   1.00000 0 1 0 0 0
    45      166.0  1.17071   8.46000  70.00000 0 0 1 0 0
    46      167.5 99.99999    .00000  68.00000 0 0 1 0 0
    47      169.0 99.99999    .00000  85.00000 0 0 1 0 0
```

48	170.5	99.99999	.00000	155.00000	0	0	1	0	0
49	172.0	99.99999	.00000	95.00000	0	0	1	0	0
50	173.5	99.99999	.00000	134.00000	0	0	1	0	0
51	175.0	99.99999	.00000	162.00000	0	0	1	0	0
52	176.5	99.99999	.00000	133.00000	0	0	1	0	0
53	178.0	99.99999	.00000	204.00000	0	0	1	0	0
54	179.5	99.99999	.00000	169.00000	0	0	1	0	0
55	181.0	99.99999	.00000	93.00000	0	0	1	0	0
56	182.5	99.99999	.00000	196.00000	0	0	1	0	0
57	184.0	99.99999	.00000	129.00000	0	0	1	0	0
58	185.5	99.99999	.00000	88.00000	0	0	1	0	0
59	187.0	99.99999	.00000	65.00000	0	0	1	0	0
60	188.5	99.99999	.00000	2.00000	0	0	1	0	0
61	161.5	-1.24710	7.15056	8.00000	0	0	0	1	0
62	163.0	-.36381	19.26000	30.00000	0	0	0	1	0
63	164.5	-.36056	7.68944	12.00000	0	0	0	1	0
64	166.0	.71835	11.10472	47.00000	0	0	0	1	0
65	167.5	-.63487	10.32139	14.00000	0	0	0	1	0
66	169.0	2.19303	.56611	40.00000	0	0	0	1	0
67	170.5	1.47419	1.54472	22.00000	0	0	0	1	0
68	172.0	1.71151	6.56750	151.00000	0	0	0	1	0
69	173.5	1.16984	30.25833	250.00000	0	0	0	1	0
70	175.0	1.52028	33.97222	529.00000	0	0	0	1	0
71	176.5	2.35102	2.90194	310.00000	0	0	0	1	0
72	178.0	1.93792	1.81583	69.00000	0	0	0	1	0
73	179.5	1.30300	3.17750	33.00000	0	0	0	1	0
74	181.0	1.58672	2.02639	36.00000	0	0	0	1	0
75	182.5	99.99999	.00000	42.00000	0	0	0	1	0
76	184.0	99.99999	.00000	115.00000	0	0	0	1	0
77	185.5	99.99999	.00000	93.00000	0	0	0	1	0
78	187.0	99.99999	.00000	38.00000	0	0	0	1	0
79	188.5	99.99999	.00000	23.00000	0	0	0	1	0
80	160.0	1.14637	5.91361	47.00000	0	0	0	0	1
81	161.5	1.03929	7.91472	53.00000	0	0	0	0	1
82	163.0	1.54866	2.97583	49.00000	0	0	0	0	1
83	164.5	1.86987	3.10583	101.00000	0	0	0	0	1
84	166.0	1.31501	10.36778	110.00000	0	0	0	0	1
85	167.5	2.10279	2.20000	124.00000	0	0	0	0	1
86	169.0	2.36376	1.80000	199.00000	0	0	0	0	1
87	170.5	99.99999	.00000	80.00000	0	0	0	0	1
88	172.0	99.99999	.00000	108.00000	0	0	0	0	1
89	173.5	99.99999	.00000	288.00000	0	0	0	0	1
90	175.0	99.99999	.00000	118.00000	0	0	0	0	1
91	176.5	99.99999	.00000	63.00000	0	0	0	0	1
92	178.0	99.99999	.00000	95.00000	0	0	0	0	1
93	179.5	99.99999	.00000	64.00000	0	0	0	0	1
94	181.0	99.99999	.00000	40.00000	0	0	0	0	1
95	182.5	2.33433	.56778	58.00000	0	0	0	0	1
96	184.0	99.99999	.00000	42.00000	0	0	0	0	1
97	185.5	99.99999	.00000	98.00000	0	0	0	0	1
98	187.0	99.99999	.00000	73.00000	0	0	0	0	1
99	188.5	99.99999	.00000	6.00000	0	0	0	0	1

```
@PRT NLRDAT.AIDAT/NONLINEAR
PASS*NLRDAT(1).AIDAT/NONLINEAR(0)
  1      169.75    .15438     40.72541   13.0 0 0 0 0 0
```

2	171.25	.00000	46.09006	10.0	0	0	0	0	0
3	172.75	.03821	361.68320	86.0	0	0	0	0	0
4	174.25	.03226	2021.55571	349.0	0	0	0	0	0
5	175.75	.01269	4428.13062	518.0	0	0	0	0	0
6	177.25	.00069	4740.98297	360.0	0	0	0	0	0
7	178.75	.00000	4577.10846	217.0	0	0	0	0	0
8	180.25	.00000	1648.51399	44.0	0	0	0	0	0
9	181.75	.00000	1391.57599	19.0	0	0	0	0	0
10	183.25	.00000	5541.43645	50.0	0	0	0	0	0
11	184.75	.00000	9526.93555	47.0	0	0	0	0	0
12	186.25	.00000	25190.51904	68.0	0	0	0	0	0
13	187.75	.00000	32795.66016	44.0	0	0	0	0	0
14	189.25	.00000	49785.01270	32.0	0	0	0	0	0
15	168.25	.00000	15.08179	1.0	1	0	0	0	0
16	169.75	.02577	280.48195	123.0	1	0	0	0	0
17	171.25	.00000	53.84196	13.0	1	0	0	0	0
18	172.75	.00000	321.69179	76.0	1	0	0	0	0
19	174.25	.00000	1111.34325	190.0	1	0	0	0	0
20	175.75	.00841	3461.20053	404.0	1	0	0	0	0
21	177.25	.00000	4558.68402	346.0	1	0	0	0	0
22	178.75	.00794	3604.46732	170.0	1	0	0	0	0
23	180.25	.02369	4262.19067	121.0	1	0	0	0	0
24	181.75	.00000	1668.28036	24.0	1	0	0	0	0
25	183.25	.00000	3132.20056	26.0	1	0	0	0	0
26	184.75	.00000	6057.10510	28.0	1	0	0	0	0
27	186.25	.00000	15151.56677	39.0	1	0	0	0	0
28	187.75	.00000	39517.47754	54.0	1	0	0	0	0
29	189.25	.00000	12779.17822	2.0	1	0	0	0	0
30	168.25	.00000	60.13806	30.0	0	1	0	0	0
31	169.75	.00793	395.11330	175.0	0	1	0	0	0
32	171.25	.00000	432.01025	144.0	0	1	0	0	0
33	172.75	.00000	982.72281	241.0	0	1	0	0	0
34	174.25	.00000	2462.41193	426.0	0	1	0	0	0
35	175.75	.00000	4069.94554	122.0	0	1	0	0	0
36	177.25	.00000	1616.65704	120.0	0	1	0	0	0
37	178.75	.00000	2260.00061	105.0	0	1	0	0	0
38	180.25	.00000	2528.71649	70.0	0	1	0	0	0
39	181.75	.00000	1780.31606	26.0	0	1	0	0	0
40	183.25	.00000	8179.72925	76.0	0	1	0	0	0
41	184.75	.00000	30247.45459	159.0	0	1	0	0	0
42	186.25	.00000	36318.51074	100.0	0	1	0	0	0
43	187.75	.00000	38844.30420	53.0	0	1	0	0	0
44	189.25	.00000	11817.16187	1.0	0	1	0	0	0
45	166.75	.12086	105.89880	70.0	0	0	1	0	0
46	168.25	.00000	125.53218	68.0	0	0	1	0	0
47	169.75	.00000	196.78613	85.0	0	0	1	0	0
48	171.25	.00000	464.07006	155.0	0	0	1	0	0
49	172.75	.00000	397.69590	95.0	0	0	1	0	0
50	174.25	.00000	790.89750	134.0	0	0	1	0	0
51	175.75	.00000	1408.95450	162.0	0	0	1	0	0
52	177.25	.00000	1785.77596	133.0	0	0	1	0	0
53	178.75	.00000	4308.05933	204.0	0	0	1	0	0
54	180.25	.00000	5895.72833	169.0	0	0	1	0	0
55	181.75	.00000	5632.06531	93.0	0	0	1	0	0
56	183.25	.00000	20401.17383	196.0	0	0	1	0	0
57	184.75	.00000	24688.55640	129.0	0	0	1	0	0
58	186.25	.00000	32142.91969	88.0	0	0	1	0	0

59	187.75	.00000	46931.95215	65.0	0	0	1	0	0
60	189.25	.00000	12779.17822	2.0	0	0	1	0	0
61	162.25	.89382	14.41155	8.0	0	0	0	1	0
62	163.75	.64200	37.84693	30.0	0	0	0	1	0
63	165.25	.64079	21.46169	12.0	0	0	0	1	0
64	166.75	.23627	73.27669	47.0	0	0	0	1	0
65	168.25	.73724	33.64797	14.0	0	0	0	1	0
66	169.75	.01415	98.05211	40.0	0	0	0	1	0
67	171.25	.07022	78.35663	22.0	0	0	0	1	0
68	172.75	.04349	621.98779	151.0	0	0	0	1	0
69	174.25	.12103	1454.78517	250.0	0	0	0	1	0
70	175.75	.06422	4521.43262	529.0	0	0	0	1	0
71	177.25	.00936	4089.92514	310.0	0	0	0	1	0
72	178.75	.02632	1516.47816	69.0	0	0	0	1	0
73	180.25	.09629	1278.97552	33.0	0	0	0	1	0
74	181.75	.05629	2347.14612	36.0	0	0	0	1	0
75	183.25	.00000	4733.23401	42.0	0	0	0	1	0
76	184.75	.00000	22095.25342	115.0	0	0	0	1	0
77	186.25	.00000	33882.47705	93.0	0	0	0	1	0
78	187.75	.00000	28777.70825	38.0	0	0	0	1	0
79	189.25	.00000	37878.14258	23.0	0	0	0	1	0
80	160.75	.12582	51.37206	47.0	0	0	0	0	1
81	162.25	.14933	58.62333	53.0	0	0	0	0	1
82	163.75	.06073	58.34154	49.0	0	0	0	0	1
83	165.25	.03075	128.51125	101.0	0	0	0	0	1
84	166.75	.09425	162.82399	110.0	0	0	0	0	1
85	168.25	.01774	222.62777	124.0	0	0	0	0	1
86	169.75	.00905	448.03630	199.0	0	0	0	0	1
87	171.25	.00000	245.61986	80.0	0	0	0	0	1
88	172.75	.00000	449.73788	108.0	0	0	0	0	1
89	174.25	.00000	1672.32465	288.0	0	0	0	0	1
90	175.75	.00000	1036.05589	118.0	0	0	0	0	1
91	177.25	.00000	876.07741	63.0	0	0	0	0	1
92	178.75	.00000	2053.32242	95.0	0	0	0	0	1
93	180.25	.00000	2325.18060	64.0	0	0	0	0	1
94	181.75	.00000	2575.77005	40.0	0	0	0	0	1
95	183.25	.00979	6351.94098	58.0	0	0	0	0	1
96	184.75	.00000	8608.74841	42.0	0	0	0	0	1
97	186.25	.00000	35622.43213	98.0	0	0	0	0	1
98	187.75	.00000	52332.12500	73.0	0	0	0	0	1
99	189.25	.00000	16943.51636	6.0	0	0	0	0	1

```
@XQT NLR.FILEPROC
ADD INPUT DATA TO RUNSTREAM

@ADD,P NLRDAT.A2DAT/LINEAR
WROTE  96 FORMATTED DATA RECORDS ON LU 8

STOP     NORMAL STOP
```

```
@MED,Q 8.,NLRDAT.A2DAT/NONLINEAR
MED 29B 09/16/82 11:26 A2DAT/NONLINEAR(0):A
EDIT
0*hh
END EDIT 96 LINES OUTPUT

@PRT NLRDAT.A2DAT/LINEAR
FURPUR 28R2 S74R1A 09/16/82 11:27:13
PASS*NLRDAT(1).A2DAT/LINEAR(0)
     1     163.0  -.08300   7.46306  14.00000 0 0 0 0 0
     2     164.5   .33406   4.06083  11.00000 0 0 0 0 0
     3     166.0  -.26644   6.65556  11.00000 0 0 0 0 0
     4     167.5  -.09469  23.65972  44.00000 0 0 0 0 0
     5     169.0   .25423  34.37083  86.00000 0 0 0 0 0
     6     170.5   .13735  30.73111  69.00000 0 0 0 0 0
     7     172.0   .29860  14.92222  39.00000 0 0 0 0 0
     8     173.5  1.29245  15.10750 154.00000 0 0 0 0 0
     9     175.0  2.50671   1.77306 291.00000 0 0 0 0 0
    10     176.5  1.99636   3.53389 154.00000 0 0 0 0 0
    11     178.0  3.27942    .19972 384.00000 0 0 0 0 0
    12     179.5  2.89039    .70028 364.00000 0 0 0 0 0
    13     181.0 99.99999    .00000  32.00000 0 0 0 0 0
    14     182.5 99.99999    .00000  23.00000 0 0 0 0 0
    15     184.0 99.99999    .00000  43.00000 0 0 0 0 0
    16     185.5 99.99999    .00000  24.00000 0 0 0 0 0
    17     187.0 99.99999    .00000  44.00000 0 0 0 0 0
    18     188.5 99.99999    .00000  15.00000 0 0 0 0 0
    19     160.0  1.71164    .65222  15.00000 1 0 0 0 0
    20     161.5   .59747  24.20861  88.00000 1 0 0 0 0
    21     163.0   .80076  13.12139  62.00000 1 0 0 0 0
    22     164.5  1.55338   3.00833  50.00000 1 0 0 0 0
    23     166.0   .87060   6.33556  33.00000 1 0 0 0 0
    24     167.5  1.39959  15.98056  74.00000 1 0 0 0 0
    25     169.0  1.34919  10.28194 116.00000 1 0 0 0 0
    26     170.5 99.99999    .00000  70.00000 1 0 0 0 0
    27     172.0  1.88349   2.35556  79.00000 1 0 0 0 0
    28     173.5 99.99999    .00000  75.00000 1 0 0 0 0
    29     175.0 99.99999    .00000 150.00000 1 0 0 0 0
    30     176.5 99.99999    .00000 144.00000 1 0 0 0 0
    31     178.0 99.99999    .00000 316.00000 1 0 0 0 0
    32     179.5 99.99999    .00000 102.00000 1 0 0 0 0
    33     181.0 99.99999    .00000  24.00000 1 0 0 0 0
    34     182.5 99.99999    .00000  21.00000 1 0 0 0 0
    35     184.0 99.99999    .00000  22.00000 1 0 0 0 0
    36     185.5 99.99999    .00000  27.00000 1 0 0 0 0
    37     187.0 99.99999    .00000  14.00000 1 0 0 0 0
    38     188.5 99.99999    .00000   4.00000 1 0 0 0 0
    39     160.0  1.67640   5.33861 114.00000 0 1 0 0 0
    40     161.5  1.46970   9.91500 140.00000 0 1 0 0 0
    41     163.0  1.34282  11.83583 132.00000 0 1 0 0 0
    42     164.5  1.52887   5.68333  90.00000 0 1 0 0 0
    43     166.0 99.99999    .00000  15.00000 0 1 0 0 0
    44     167.5 99.99999    .00000  10.00000 0 1 0 0 0
    45     169.0 99.99999    .00000  25.00000 0 1 0 0 0
    46     170.5 99.99999    .00000  83.00000 0 1 0 0 0
    47     172.0 99.99999    .00000  57.00000 0 1 0 0 0
```

```
48        173.5 99.99999     .00000  48.00000 0 1 0 0 0
49        175.0 99.99999     .00000 110.00000 0 1 0 0 0
50        176.5 99.99999     .00000  94.00000 0 1 0 0 0
51        178.0 99.99999     .00000 127.00000 0 1 0 0 0
52        179.5 99.99999     .00000  73.00000 0 1 0 0 0
53        181.0 99.99999     .00000  72.00000 0 1 0 0 0
54        182.5 99.99999     .00000  45.00000 0 1 0 0 0
55        184.0 99.99999     .00000  42.00000 0 1 0 0 0
56        185.5 99.99999     .00000  50.00000 0 1 0 0 0
57        187.0 99.99999     .00000  44.00000 0 1 0 0 0
58        188.5 99.99999     .00000   9.00000 0 1 0 0 0
59        160.0 -1.18476    3.52778   4.00000 0 0 1 0 0
60        161.5 -1.11354    6.07083   7.00000 0 0 1 0 0
61        163.0  -.76471    7.00000   9.00000 0 0 1 0 0
62        164.5 -1.30344    9.94167  11.00000 0 0 1 0 0
63        166.0  -.39083   11.73667  18.00000 0 0 1 0 0
64        167.5  -.67063   42.68000  57.00000 0 0 1 0 0
65        169.0   .09518   62.38167 135.00000 0 0 1 0 0
66        170.5   .38775   64.58389 185.00000 0 0 1 0 0
67        172.0   .60740   66.86083 246.00000 0 0 1 0 0
68        173.5   .69521   51.12694 210.00000 0 0 1 0 0
69        175.0  1.01993   42.62500 277.00000 0 0 1 0 0
70        176.5  1.23879   20.03444 186.00000 0 0 1 0 0
71        178.0  1.79179    4.49972 123.00000 0 0 1 0 0
72        179.5  1.42986    4.12444  54.00000 0 0 1 0 0
73        181.0 99.99999     .00000  30.00000 0 0 1 0 0
74        182.5 99.99999     .00000  69.00000 0 0 1 0 0
75        184.0 99.99999     .00000  45.00000 0 0 1 0 0
76        185.5 99.99999     .00000  53.00000 0 0 1 0 0
77        187.0 99.99999     .00000  49.00000 0 0 1 0 0
78        188.5 99.99999     .00000  10.00000 0 0 1 0 0
79        163.0  2.31171     .87333  84.00000 0 0 0 1 0
80        164.5  1.88444    2.97528 100.00000 0 0 0 1 0
81        166.0  1.34102    9.44556 105.00000 0 0 0 1 0
82        167.5  2.11059    3.16750 182.00000 0 0 0 1 0
83        169.0 99.99999     .00000 234.00000 0 0 0 1 0
84        170.5  2.27043    1.61111 139.00000 0 0 0 1 0
85        172.0 99.99999     .00000  52.00000 0 0 0 1 0
86        173.5 99.99999     .00000  78.00000 0 0 0 1 0
87        175.0 99.99999     .00000 276.00000 0 0 0 1 0
88        176.5 99.99999     .00000  99.00000 0 0 0 1 0
89        178.0 99.99999     .00000 139.00000 0 0 0 1 0
90        179.5 99.99999     .00000  42.00000 0 0 0 1 0
91        181.0 99.99999     .00000  38.00000 0 0 0 1 0
92        182.5 99.99999     .00000  48.00000 0 0 0 1 0
93        184.0 99.99999     .00000  43.00000 0 0 0 1 0
94        185.5 99.99999     .00000 104.00000 0 0 0 1 0
95        187.0 99.99999     .00000  36.00000 0 0 0 1 0
96        188.5 99.99999     .00000   4.00000 0 0 0 1 0

@PRT NLRDAT.A2DAT/NONLINEAR
PASS*NLRDAT(1).A2DAT/NONLINEAR(0)
  1       163.75    .53307    21.17581   14.0 0 0 0 0 0
  2       165.25    .36917    20.37866   11.0 0 0 0 0 0
  3       166.75    .60505    23.78725   11.0 0 0 0 0 0
  4       168.25    .53772    84.09339   44.0 0 0 0 0 0
```

5	169.75	.39966	198.98700	86.0	0	0	0	0	0
6	171.25	.44538	213.63968	69.0	0	0	0	0	0
7	172.75	.38262	174.26235	39.0	0	0	0	0	0
8	174.25	.09810	905.32421	154.0	0	0	0	0	0
9	175.75	.00609	2502.81128	291.0	0	0	0	0	0
10	177.25	.02295	2059.03427	154.0	0	0	0	0	0
11	178.75	.00052	8033.96967	384.0	0	0	0	0	0
12	180.25	.00192	12535.69055	364.0	0	0	0	0	0
13	181.75	.00000	2119.39987	32.0	0	0	0	0	0
14	183.25	.00000	2836.97437	23.0	0	0	0	0	0
15	184.75	.00000	8792.20166	43.0	0	0	0	0	0
16	186.25	.00000	10036.36646	24.0	0	0	0	0	0
17	187.75	.00000	32795.66016	44.0	0	0	0	0	0
18	189.25	.00000	27610.17065	15.0	0	0	0	0	0
19	160.75	.04348	20.28110	15.0	1	0	0	0	0
20	162.25	.27510	94.27596	88.0	1	0	0	0	0
21	163.75	.21164	72.46926	62.0	1	0	0	0	0
22	165.25	.06017	66.41286	50.0	1	0	0	0	0
23	166.75	.19199	53.56155	33.0	1	0	0	0	0
24	168.25	.08082	135.91977	74.0	1	0	0	0	0
25	169.75	.08864	265.05721	116.0	1	0	0	0	0
26	171.25	.00000	216.54554	70.0	1	0	0	0	0
27	172.75	.02982	333.68617	79.0	1	0	0	0	0
28	174.25	.00000	453.64709	75.0	1	0	0	0	0
29	175.75	.00000	1307.23505	150.0	1	0	0	0	0
30	177.25	.00000	1928.90280	144.0	1	0	0	0	0
31	178.75	.00000	6626.[illegible]9712	316.0	1	0	0	0	0
32	180.25	.00000	3615.94873	102.0	1	0	0	0	0
33	181.75	.00000	1668.28036	24.0	1	0	0	0	0
34	183.25	.00000	2641.78033	21.0	1	0	0	0	0
35	184.75	.00000	4982.01361	22.0	1	0	0	0	0
36	186.25	.00000	11048.68359	27.0	1	0	0	0	0
37	187.75	.00000	13122.40454	14.0	1	0	0	0	0
38	189.25	.00000	14802.39514	4.0	1	0	0	0	0
39	160.75	.04683	118.14545	114.0	0	1	0	0	0
40	162.25	.07082	147.37780	140.0	0	1	0	0	0
41	163.75	.08967	148.84571	132.0	0	1	0	0	0
42	165.25	.06315	115.09507	90.0	0	1	0	0	0
43	166.75	.00000	28.92880	15.0	0	1	0	0	0
44	168.25	.00000	27.45538	10.0	0	1	0	0	0
45	169.75	.00000	65.63609	25.0	0	1	0	0	0
46	171.25	.00000	271.80547	89.0	0	1	0	0	0
47	172.75	.00000	245.82108	57.0	0	1	0	0	0
48	174.25	.00000	299.83582	48.0	0	1	0	0	0
49	175.75	.00000	968.28572	110.0	0	1	0	0	0
50	177.25	.00000	1278.57614	94.0	0	1	0	0	0
51	178.75	.00000	2714.89893	127.0	0	1	0	0	0
52	180.25	.00000	2630.53827	73.0	0	1	0	0	0
53	181.75	.00000	4418.22546	72.0	0	1	0	0	0
54	183.25	.00000	5035.99005	45.0	0	1	0	0	0
55	184.75	.00000	8608.74841	42.0	0	1	0	0	0
56	186.25	.00000	18948.78247	50.0	0	1	0	0	0
57	187.75	.00000	32795.66016	44.0	0	1	0	0	0
58	189.25	.00000	20339.26733	9.0	0	1	0	0	0
59	160.75	.88194	10.87313	4.0	0	0	1	0	0
60	162.25	.86726	13.56080	7.0	0	0	1	0	0
61	163.75	.77778	16.33640	9.0	0	0	1	0	0

```
62    165.25  .90379     20.37866  11.0 0 0 1 0 0
63    166.75  .65204     32.90634  18.0 0 0 1 0 0
64    168.25  .74877    106.51016  57.0 0 0 1 0 0
65    169.75  .46209    306.92899 135.0 0 0 1 0 0
66    171.25  .34910    551.52091 185.0 0 0 1 0 0
67    172.75  .27179   1002.76726 246.0 0 0 1 0 0
68    174.25  .24346   1225.81612 210.0 0 0 1 0 0
69    175.75  .15388   2384.08047 277.0 0 0 1 0 0
70    177.25  .10771   2475.52832 186.0 0 0 1 0 0
71    178.75  .03658   2632.17398 123.0 0 0 1 0 0
72    180.25  .07638   1986.39433  54.0 0 0 1 0 0
73    181.75  .00000   2005.96802  30.0 0 0 1 0 0
74    183.25  .00000   7468.42578  69.0 0 0 1 0 0
75    184.75  .00000   9159.39746  45.0 0 0 1 0 0
76    186.25  .00000  19987.33374  53.0 0 0 1 0 0
77    187.75  .00000  36153.57178  49.0 0 0 1 0 0
78    189.25  .00000  21512.34277  10.0 0 0 1 0 0
79    163.75  .01040     96.44218  84.0 0 0 0 1 0
80    165.25  .02975    127.29136 100.0 0 0 0 1 0
81    166.75  .08996    155.70269 105.0 0 0 0 1 0
82    168.25  .01740    323.32552 182.0 0 0 0 1 0
83    169.75  .00000    525.22518 234.0 0 0 0 1 0
84    171.25  .01159    417.43892 139.0 0 0 0 1 0
85    172.75  .00000    225.89710  52.0 0 0 0 1 0
86    174.25  .00000    470.77288  78.0 0 0 0 1 0
87    175.75  .00000   2375.59982 276.0 0 0 0 1 0
88    177.25  .00000   1343.56963  99.0 0 0 0 1 0
89    178.75  .00000   2963.10587 139.0 0 0 0 1 0
90    180.25  .00000   1581.10870  42.0 0 0 0 1 0
91    181.75  .00000   2461.36630  38.0 0 0 0 1 0
92    183.25  .00000   5339.17065  48.0 0 0 0 1 0
93    184.75  .00000   8792.20166  43.0 0 0 0 1 0
94    186.25  .00000  37710.81738 104.0 0 0 0 1 0
95    187.75  .00000  27442.27246  36.0 0 0 0 1 0
96    189.25  .00000  14802.39514   4.0 0 0 0 1 0

@XQT NLR.FILEPROC
ADD INPUT DATA TO RUNSTREAM

@ADD,P NLRDAT.A3DAT/LINEAR
WROTE  84 FORMATTED DATA RECORDS ON LU 8

STOP     NORMAL STOP
```

```
@MED,Q 8.,NLRDAT.A3DAT/NONLINEAR
MED 29B 09/16/82 11:28 A3DAT/NONLINEAR(0):A
EDIT
0+hh
END EDIT 84 LINES OUTPUT

@PRT NLRDAT.A3DAT/LINEAR
FURPUR 28R2 S74R1A 09/16/82 11:28:28
PASS+NLRDAT(1).A3DAT/LINEAR(0)
     1        167.5  1.17371   1.44306  12.00000 0 0 0 0 0
     2        169.0   .31864   3.00000   8.00000 0 0 0 0 0
     3        170.5   .56097  38.22556 133.00000 0 0 0 0 0
     4        172.0   .76394  38.03917 171.00000 0 0 0 0 0
     5        173.5  1.78003  14.22583 379.00000 0 0 0 0 0
     6        175.0  2.59703   3.31944 706.00000 0 0 0 0 0
     7        176.5 99.99999    .00000  86.00000 0 0 0 0 0
     8        178.0 99.99999    .00000  70.00000 0 0 0 0 0
     9        179.5 99.99999    .00000  43.00000 0 0 0 0 0
    10        181.0 99.99999    .00000  80.00000 0 0 0 0 0
    11        182.5 99.99999    .00000  61.00000 0 0 0 0 0
    12        184.0 99.99999    .00000   4.00000 0 0 0 0 0
    13        166.0  1.11623  12.68750  96.00000 1 0 0 0 0
    14        167.5  1.04179  32.42833 218.00000 1 0 0 0 0
    15        169.0  1.35179   4.14639  47.00000 1 0 0 0 0
    16        170.5  1.23219  11.00278 101.00000 1 0 0 0 0
    17        172.0  1.52999  14.55528 231.00000 1 0 0 0 0
    18        173.5 99.99999    .00000 216.00000 1 0 0 0 0
    19        175.0 99.99999    .00000 401.00000 1 0 0 0 0
    20        176.5 99.99999    .00000  47.00000 1 0 0 0 0
    21        178.0 99.99999    .00000  10.00000 1 0 0 0 0
    22        179.5 99.99999    .00000  46.00000 1 0 0 0 0
    23        181.0 99.99999    .00000  83.00000 1 0 0 0 0
    24        182.5 99.99999    .00000  26.00000 1 0 0 0 0
    25        164.5 99.99999    .00000  20.00000 0 1 0 0 0
    26        166.0  2.24289   3.59861 289.00000 0 1 0 0 0
    27        167.5 99.99999    .00000 251.00000 0 1 0 0 0
    28        169.0  2.18482   2.38444 165.00000 0 1 0 0 0
    29        170.5 99.99999    .00000  50.00000 0 1 0 0 0
    30        172.0  1.97977   2.48194 104.00000 0 1 0 0 0
    31        173.5 99.99999    .00000 114.00000 0 1 0 0 0
    32        175.0 99.99999    .00000  85.00000 0 1 0 0 0
    33        176.5 99.99999    .00000 119.00000 0 1 0 0 0
    34        178.0 99.99999    .00000  78.00000 0 1 0 0 0
    35        179.5 99.99999    .00000  64.00000 0 1 0 0 0
    36        181.0 99.99999    .00000 154.00000 0 1 0 0 0
    37        182.5 99.99999    .00000  63.00000 0 1 0 0 0
    38        184.0 99.99999    .00000  36.00000 0 1 0 0 0
    39        185.5 99.99999    .00000   4.00000 0 1 0 0 0
    40        187.0 99.99999    .00000   1.00000 0 1 0 0 0
    41        167.5  -.55795  18.50056  26.00000 0 0 1 0 0
    42        169.0  1.32035   5.13472  55.00000 0 0 1 0 0
    43        170.5 99.99999    .00000  97.00000 0 0 1 0 0
    44        172.0 99.99999    .00000 179.00000 0 0 1 0 0
    45        173.5  1.99969   3.55167 156.00000 0 0 1 0 0
    46        175.0 99.99999    .00000 118.00000 0 0 1 0 0
    47        176.5 99.99999    .00000 191.00000 0 0 1 0 0
```

```
48      178.0 99.99999    .00000 215.00000 0 0 1 0 0
49      179.5  2.17090   2.32028 155.00000 0 0 1 0 0
50      181.0 99.99999    .00000 288.00000 0 0 1 0 0
51      182.5 99.99999    .00000 129.00000 0 0 1 0 0
52      184.0 99.99999    .00000  45.00000 0 0 1 0 0
53      185.5 99.99999    .00000   4.00000 0 0 1 0 0
54      160.0  -.18029  70.87055 124.00000 0 0 0 1 0
55      161.5  -.09388  48.36583  90.00000 0 0 0 1 0
56      163.0  -.57552  56.68500  79.00000 0 0 0 1 0
57      164.5   .01059  34.70417  70.00000 0 0 0 1 0
58      166.0  -.31266  37.36389  60.00000 0 0 0 1 0
59      167.5  -.30037  38.93722  63.00000 0 0 0 1 0
60      169.0  -.93237  28.85500  35.00000 0 0 0 1 0
61      170.5  -.17685  51.31667  90.00000 0 0 0 1 0
62      172.0   .53919  85.51417 290.00000 0 0 0 1 0
63      173.5  1.00861  37.26639 238.00000 0 0 0 1 0
64      175.0  1.34104  11.51417 128.00000 0 0 0 1 0
65      176.5  1.30194   6.46333  67.00000 0 0 0 1 0
66      178.0  1.46014   3.75056  52.00000 0 0 0 1 0
67      179.5  2.49628    .41417  66.00000 0 0 0 1 0
68      181.0   .96373  14.41278  86.00000 0 0 0 1 0
69      182.5  1.68653   5.50167 120.00000 0 0 0 1 0
70      166.0  1.56795  13.26722 227.00000 0 0 0 0 1
71      167.5  2.34333   2.80000 293.00000 0 0 0 0 1
72      169.0  2.20514   2.33278 170.00000 0 0 0 0 1
73      170.5 99.99999    .00000  93.00000 0 0 0 0 1
74      172.0 99.99999    .00000 191.00000 0 0 0 0 1
75      173.5 99.99999    .00000  63.00000 0 0 0 0 1
76      175.0 99.99999    .00000 241.00000 0 0 0 0 1
77      176.5  2.27631   1.52944 134.00000 0 0 0 0 1
78      178.0 99.99999    .00000  89.00000 0 0 0 0 1
79      179.5 99.99999    .00000  70.00000 0 0 0 0 1
80      181.0 99.99999    .00000  77.00000 0 0 0 0 1
81      182.5 99.99999    .00000 105.00000 0 0 0 0 1
82      184.0 99.99999    .00000  18.00000 0 0 0 0 1
83      185.5 99.99999    .00000   1.00000 0 0 0 0 1
84      187.0 99.99999    .00000   1.00000 0 0 0 0 1

@PRT NLRDAT.A3DAT/NONLINEAR
PASS•NLRDAT(1).A3DAT/NONLINEAR(0)
 1     168.25   .12026     30.51483  12.0 0 0 0 0 0
 2     169.75   .37500     31.09120   8.0 0 0 0 0 0
 3     171.25   .28741    399.95458 133.0 0 0 0 0 0
 4     172.75   .22245    702.13568 171.0 0 0 0 0 0
 5     174.25   .03754   2193.31549 379.0 0 0 0 0 0
 6     175.75   .00470   6022.77051 706.0 0 0 0 0 0
 7     177.25   .00000   1174.61743  86.0 0 0 0 0 0
 8     178.75   .00000   1537.10480  70.0 0 0 0 0 0
 9     180.25   .00000   1614.80228  43.0 0 0 0 0 0
10     181.75   .00000   4880.43097  80.0 0 0 0 0 0
11     183.25   .00000   6656.24133  61.0 0 0 0 0 0
12     184.75   .00000   2016.41896   4.0 0 0 0 0 0
13     166.75   .13216    142.88726  96.0 1 0 0 0 0
14     168.25   .14875    385.84816 218.0 1 0 0 0 0
15     169.75   .08822    113.33619  47.0 1 0 0 0 0
16     171.25   .10894    306.73838 101.0 1 0 0 0 0
```

17	172.75	.06301	942.63464	231.0	1	0	0	0	0
18	174.25	.00000	1260.15973	216.0	1	0	0	0	0
19	175.75	.00000	3435.75558	401.0	1	0	0	0	0
20	177.25	.00000	669.02191	47.0	1	0	0	0	0
21	178.75	.00000	327.16101	10.0	1	0	0	0	0
22	180.25	.00000	1715.98686	46.0	1	0	0	0	0
23	181.75	.00000	5053.83295	83.0	1	0	0	0	0
24	183.25	.00000	3132.20056	26.0	1	0	0	0	0
25	165.25	.00000	30.49855	20.0	0	1	0	0	0
26	166.75	.01245	418.01292	289.0	0	1	0	0	0
27	168.25	.00000	443.16730	251.0	0	1	0	0	0
28	169.75	.01445	373.06429	165.0	0	1	0	0	0
29	171.25	.00000	158.51820	50.0	0	1	0	0	0
30	172.75	.02386	433.72252	104.0	0	1	0	0	0
31	174.25	.00000	676.50494	114.0	0	1	0	0	0
32	175.75	.00000	756.61832	85.0	0	1	0	0	0
33	177.25	.00000	1603.64960	119.0	0	1	0	0	0
34	178.75	.00000	1702.19308	78.0	0	1	0	0	0
35	180.25	.00000	2325.18060	64.0	0	1	0	0	0
36	181.75	.00000	9163.09045	154.0	0	1	0	0	0
37	183.25	.00000	8891.46521	83.0	0	1	0	0	0
38	184.75	.00000	7510.59961	36.0	0	1	0	0	0
39	186.25	.00000	3790.99966	4.0	0	1	0	0	0
40	187.75	.00000	5881.76160	1.0	0	1	0	0	0
41	168.25	.71156	53.37311	26.0	0	0	1	0	0
42	169.75	.09336	130.85696	55.0	0	0	1	0	0
43	171.25	.00000	295.09213	97.0	0	0	1	0	0
44	172.75	.00000	734.19819	179.0	0	0	1	0	0
45	174.25	.02277	916.76825	156.0	0	0	1	0	0
46	175.75	.00000	1036.05589	118.0	0	0	1	0	0
47	177.25	.00000	2540.61304	191.0	0	0	1	0	0
48	178.75	.00000	4535.71545	215.0	0	0	1	0	0
49	180.25	.01497	5419.19080	155.0	0	0	1	0	0
50	181.75	.00000	10926.15942	288.0	0	0	1	0	0
51	183.25	.00000	13574.18140	129.0	0	0	1	0	0
52	184.75	.00000	9159.39746	45.0	0	0	1	0	0
53	186.25	.00000	3790.99966	4.0	0	0	1	0	0
54	160.75	.57154	128.13333	124.0	0	0	0	1	0
55	162.25	.53740	96.31667	90.0	0	0	0	1	0
56	163.75	.71753	90.98952	79.0	0	0	0	1	0
57	165.25	.49578	90.72402	70.0	0	0	0	1	0
58	166.75	.62273	91.69662	60.0	0	0	0	1	0
59	168.25	.61805	116.88164	63.0	0	0	0	1	0
60	169.75	.82443	87.17805	35.0	0	0	0	1	0
61	171.25	.57019	274.71582	90.0	0	0	0	1	0
62	172.75	.29488	1179.16684	290.0	0	0	0	1	0
63	174.25	.15658	1386.09186	238.0	0	0	0	1	0
64	175.75	.08995	1120.78491	128.0	0	0	0	1	0
65	177.25	.09647	927.94547	67.0	0	0	0	1	0
66	178.75	.07213	1166.31728	52.0	0	0	0	1	0
67	180.25	.00628	2393.00812	66.0	0	0	0	1	0
68	181.75	.16759	5227.26892	86.0	0	0	0	1	0
69	183.25	.04585	12657.52356	120.0	0	0	0	1	0
70	166.75	.05845	329.59888	227.0	0	0	0	0	1
71	168.25	.00956	516.12466	293.0	0	0	0	0	1
72	169.75	.01372	384.08860	170.0	0	0	0	0	1
73	171.25	.00000	283.44773	93.0	0	0	0	0	1

74	172.75	.00000	782.29477	191.0	0	0	0	0	1
75	174.25	.00000	385.19713	63.0	0	0	0	0	1
76	175.75	.00000	2078.78589	241.0	0	0	0	0	1
77	177.25	.01141	1798.78658	134.0	0	0	0	0	1
78	178.75	.00000	1929.35625	89.0	0	0	0	0	1
79	180.25	.00000	2528.71649	70.0	0	0	0	0	1
80	181.75	.00000	4707.06702	77.0	0	0	0	0	1
81	183.25	.00000	11130.16150	105.0	0	0	0	0	1
82	184.75	.00000	4278.25824	18.0	0	0	0	0	1
83	186.25	.00000	3026.46002	1.0	0	0	0	0	1
84	187.75	.00000	5881.76160	1.0	0	0	0	0	1

@BRKPT PRINT$

```
@ELT,L NLR.MAIN/FILPROCS
ELT017 RLIB70 09/20-16:47:19-(11,)
      008 C**  NAME: PASS*NLR.MAIN/FILPROCS
      008 C**
      008 C**  USAGE: @XQT PASS*NLR.FILPROCS
      008 C**
      008 C**  PURPOSE: REFORMAT THE FILES EXTRACTED FROM PRIMITIVE DATA BASE
      008 C**           FOR INPUT TO THE NONLINEAR REGRESSION ANALYSIS
      008 C**           PROGRAMS.
      008 C**
      008 C**  LIMITATIONS: INPUT DATA MUST BE IN INDIVIDUAL FILES OR
      008 C**               ELEMENTS OF FILES SO THAT THEY MAY BE
      008 C**               ADDED TO THE RUNSTREAM WHEN REQUESTED.
      008 C**
      008 C**  WARNINGS: NONE
      008 C**
      008 C**  SUBPROGRAMS REQUIRED: MDNOR ( IMSL-8 LIBRARY )
      008 C**
      008 C**  ARGUMENTS: NONE
      008 C**
      008 C**     INPUT:
      008 C**
      008 C**             VIA RUNSTREAM
      008 C**
      008 C**     OUTPUT:
      008 C**           FILE WRITTEN ON LU 8.
      008 C**
      008 C**  NOTES: NONE
      008 C**
      008 C**  PROGRAMMER/ORGANIZATION: HOFMOCKEL-JL/CSC
      008 C**
      008 C**  ALGORITHM: READ ENTIRE FILES FROM THE RUNSTREAM AND
      008 C**             PROCESS THE DATA TO REFORMAT IT FOR THE
      008 C**           , NONLINEAR REGRESSION PROGRAMS
      008 C**
      008 C**  APPLICABILITY: ASCII FORTRAN
      008 C**
      008 C**  KEYWORDS: NONLINEAR REGRESSION, PRIMITIVE DATA, HOLDING TIME
      008 C**
      008 C**  RECORD OF MODIFICATIONS: INITIAL PROGRAM 8-15-82
      008 C**
      008 C**  WAIVERS: NONE
      008        START EDIT PAGE
      008
      008        REAL A                             @ AREA UNDER GAUSSIAN
      008        CHARACTER*80 HEDR                  @ FILE HEADER
      007        INTEGER I                          @ INDEX VRBL
      007        INTEGER IY ( 5 )                   @ 2ND O/P BUFFER
      007        INTEGER J                          @ INDEX VRBL
      007        INTEGER K                          @ INDEX VRBL
      008        INTEGER L                          @ INDEX VRBL
      007        REAL LAMBDA / 0.25 /               @ WEIGHTING PARAMETER
      007        INTEGER NREC                       @ COUNT OF O/P FILE RECS
      008        INTEGER NTGT                       @ COUNT OF SUBS
      007        REAL X ( 9 )                       @ INPUT DATA BUFFER
      007        REAL Y ( 4 )                       @ 1ST O/P DATA BUFFER
      007        REAL Z
```

```
008       NTGT = 0                                 @ INITIAL TGT COUNT
008       NREC = 0
008 5     CONTINUE
007       WRITE ( 6, 10 )
008 10    FORMAT ( ' ADD INPUT DATA TO ',
008      *   'RUNSTREAM OR @EOF TO STOP' )
008       READ ( 5, 15, END = 70 ) HEDR
008 15    FORMAT ( A80 )
008       NTGT = NTGT + 1                          @ INCR TGT COUNT
007       DO 40 K = 1, 200
008         READ ( 5, *, END = 50 ) I, J,
009      *     ( X(L), L=1, 6 )
010         IF ( X(5) .GT. 0.0 ) THEN
007           NREC = NREC + 1
008           Y ( 1 ) = X ( 3 ) + 0.75             @ SET UP O/P BUFFER
010           Y ( 2 ) = X ( 6 ) / X ( 5 )          @ FRACT HOLD TIME
010           Y ( 4 ) = X ( 5 ) / 3600.0           @ CHG TIME TO HRS
008           Z = -20.0 + 0.125*Y ( 1 )            @ SET FOR INITIAL WTS
007           CALL MDNOR ( Z, A )
010           Y ( 3 ) = ( LAMBDA*Y(4) )**2./@ INITIAL WT EST
010      *     ( ( EXP( -LAMBDA*Y(4) ) +
010      *      LAMBDA*Y(4) - 1.0 ) *
007      *     ( 1.0 - A ) + A )
008           DO 20 J = 1, 5                       @ SET UP DUMMY VRBL
008             IY ( J ) = 0
007 20        CONTINUE
008         IF ( NTGT .GT. 1 )
008      *  IY ( NTGT-1 ) = 1
007           WRITE ( 8, 30 )                      @ WRITE A REC IN O/P FILE
008      *     ( Y(I), I = 1, 4 ),
008      *     ( IY(J), J = 1, 5 )
008 30        FORMAT ( F6.2, F9.5, F12.5,
011      *       F6.1, 5I2 )
007         ENDIF
007 40    CONTINUE
007 50    CONTINUE
008       WRITE ( 6, 60 ) HEDR
008 60    FORMAT ( ' COMPLETED DATA ENTRY',
008      *   ' FOR FILE: ', /, A80 )
008       GO TO 5                                  @ GO BACK FOR NEXT FILE
008 70    CONTINUE                                 @ END OF DATA INPUT
008       WRITE ( 6, 80 ) NREC
008 80    FORMAT ( ' WROTE ', I3,
008      *   ' FORMATTED DATA RECORDS',
008      *   ' ON LU 8 ' )
007       STOP ' NORMAL STOP'
007       END

END ELT.

@PRT,S NLRDAT.A1S12,.A1S16,.A1S17,.A1S18,.A1S19,.A1S14
FURPUR 28R2 S74R1A 09/20/82 16:48:05
PASS*NLRDAT(1).A1S12(0)
```

```
     1        ARRAY # 1, SOURCE 12
     2        1  7   1.2    1.2 169.0 170.5    46800.     7225.
     3        1  8   1.2    1.2 170.5 172.0    36000.        0.
     4        1  9   1.2    1.2 172.0 173.5   309600.    11829.
     5        1 10   1.2    1.2 173.5 175.0  1256400.    40529.
     6        1 11   1.2    1.2 175.0 176.5  1864800.    23659.
     7        1 12   1.2    1.2 176.5 178.0  1296000.      900.
     8        1 13   1.2    1.2 178.0 179.5   781200.        0.
     9        1 14   1.2    1.2 179.5 181.0   158400.        0.
    10        1 15   1.2    1.2 181.0 182.5    68400.        0.
    11        1 16   1.2    1.2 182.5 184.0   180000.        0.
    12        1 17   1.2    1.2 184.0 185.5   169200.        0.
    13        1 18   1.2    1.2 185.5 187.0   244800.        0.
    14        1 19   1.2    1.2 187.0 188.5   158400.        0.
    15        1 20   1.2    1.2 188.5 190.0   115200.        0.
    16      @EOF
PASS*NLRDAT(1).AIS16(0)
     1        ARRAY # 1, SOURCE 16
     2        1  6   1.2    1.2 167.5 169.0     3600.        0.
     3        1  7   1.2    1.2 169.0 170.5   442800.    11412.
     4        1  8   1.2    1.2 170.5 172.0    46800.        0.
     5        1  9   1.2    1.2 172.0 173.5   273600.        0.
     6        1 10   1.2    1.2 173.5 175.0   684000.        0.
     7        1 11   1.2    1.2 175.0 176.5  1454400.    12226.
     8        1 12   1.2    1.2 176.5 178.0  1245600.        0.
     9        1 13   1.2    1.2 178.0 179.5   612000.     4859.
    10        1 14   1.2    1.2 179.5 181.0   435600.    10320.
    11        1 15   1.2    1.2 181.0 182.5    86400.        0.
    12        1 16   1.2    1.2 182.5 184.0    93600.        0.
    13        1 17   1.2    1.2 184.0 185.5   100800.        0.
    14        1 18   1.2    1.2 185.5 187.0   140400.        0.
    15        1 19   1.2    1.2 187.0 188.5   194400.        0.
    16        1 20   1.2    1.2 188.5 190.0     7200.        0.
    17      @EOF
PASS*NLRDAT(1).AIS17(0)
     1        ARRAY # 1, SOURCE 17
     2        1  6   1.2    1.2 167.5 169.0   108000.        0.
     3        1  7   1.2    1.2 169.0 170.5   630000.     4994.
     4        1  8   1.2    1.2 170.5 172.0   518400.        0.
     5        1  9   1.2    1.2 172.0 173.5   867600.        0.
     6        1 10   1.2    1.2 173.5 175.0  1533600.        0.
     7        1 11   1.2    1.2 175.0 176.5   439200.        0.
     8        1 12   1.2    1.2 176.5 178.0   432000.        0.
     9        1 13   1.2    1.2 178.0 179.5   378000.        0.
    10        1 14   1.2    1.2 179.5 181.0   252000.        0.
    11        1 15   1.2    1.2 181.0 182.5    93600.        0.
    12        1 16   1.2    1.2 182.5 184.0   273600.        0.
    13        1 17   1.2    1.2 184.0 185.5   572400.        0.
    14        1 18   1.2    1.2 185.5 187.0   360000.        0.
    15        1 19   1.2    1.2 187.0 188.5   190800.        0.
    16        1 20   1.2    1.2 188.5 190.0     3600.        0.
    17      @EOF
PASS*NLRDAT(1).AIS18(0)
     1        ARRAY # 1, SOURCE 18
     2        1  5   1.2    1.2 166.0 167.5   252000.    30456.
     3        1  6   1.2    1.2 167.5 169.0   244800.        0.
     4        1  7   1.2    1.2 169.0 170.5   306000.        0.
```

```
    5       1   8   1.2    1.2 170.5 172.0  558000.       0.
    6       1   9   1.2    1.2 172.0 173.5  342000.       0.
    7       1  10   1.2    1.2 173.5 175.0  482400.       0.
    8       1  11   1.2    1.2 175.0 176.5  583200.       0.
    9       1  12   1.2    1.2 176.5 178.0  478800.       0.
   10       1  13   1.2    1.2 178.0 179.5  734400.       0.
   11       1  14   1.2    1.2 179.5 181.0  608400.       0.
   12       1  15   1.2    1.2 181.0 182.5  334800.       0.
   13       1  16   1.2    1.2 182.5 184.0  705600.       0.
   14       1  17   1.2    1.2 184.0 185.5  464400.       0.
   15       1  18   1.2    1.2 185.5 187.0  316800.       0.
   16       1  19   1.2    1.2 187.0 188.5  234000.       0.
   17       1  20   1.2    1.2 188.5 190.0    7200.       0.
   18      @EOF
PASS*NLRDAT(1).A1S19(0)
    1       ARRAY # 1, SOURCE 19
    2       1   2   1.2    1.2 161.5 163.0   28800.   25742.
    3       1   3   1.2    1.2 163.0 164.5  108000.   69336.
    4       1   4   1.2    1.2 164.5 166.0   43200.   27682.
    5       1   5   1.2    1.2 166.0 167.5  169200.   39977.
    6       1   6   1.2    1.2 167.5 169.0   50400.   37157.
    7       1   7   1.2    1.2 169.0 170.5  144000.    2038.
    8       1   8   1.2    1.2 170.5 172.0   79200.    5561.
    9       1   9   1.2    1.2 172.0 173.5  543600.   23643.
   10       1  10   1.2    1.2 173.5 175.0  900000.  108930.
   11       1  11   1.2    1.2 175.0 176.5 1904400.  122300.
   12       1  12   1.2    1.2 176.5 178.0 1116000.   10447.
   13       1  13   1.2    1.2 178.0 179.5  248400.    6537.
   14       1  14   1.2    1.2 179.5 181.0  118800.   11439.
   15       1  15   1.2    1.2 181.0 182.5  129600.    7295.
   16       1  16   1.2    1.2 182.5 184.0  151200.       0.
   17       1  17   1.2    1.2 184.0 185.5  414000.       0.
   18       1  18   1.2    1.2 185.5 187.0  334800.       0.
   19       1  19   1.2    1.2 187.0 188.5  136800.       0.
   20       1  20   1.2    1.2 188.5 190.0   82800.       0.
   21      @EOF
PASS*NLRDAT(1).A1S14(0)
    1       ARRAY # 1, SOURCE 14
    2       1   1   1.2    1.2 160.0 161.5  169200.   21289.
    3       1   2   1.2    1.2 161.5 163.0  190800.   28493.
    4       1   3   1.2    1.2 163.0 164.5  176400.   10713.
    5       1   4   1.2    1.2 164.5 166.0  363600.   11181.
    6       1   5   1.2    1.2 166.0 167.5  396000.   37324.
    7       1   6   1.2    1.2 167.5 169.0  446400.    7920.
    8       1   7   1.2    1.2 169.0 170.5  716400.    6480.
    9       1   8   1.2    1.2 170.5 172.0  288000.       0.
   10       1   9   1.2    1.2 172.0 173.5  388800.       0.
   11       1  10   1.2    1.2 173.5 175.0 1036800.       0.
   12       1  11   1.2    1.2 175.0 176.5  424800.       0.
   13       1  12   1.2    1.2 176.5 178.0  226800.       0.
   14       1  13   1.2    1.2 178.0 179.5  342000.       0.
   15       1  14   1.2    1.2 179.5 181.0  230400.       0.
   16       1  15   1.2    1.2 181.0 182.5  144000.       0.
   17       1  16   1.2    1.2 182.5 184.0  208800.    2044.
   18       1  17   1.2    1.2 184.0 185.5  151200.       0.
   19       1  18   1.2    1.2 185.5 187.0  352900.       0.
   20       1  19   1.2    1.2 187.0 188.5  262300.       0.
```

```
21        1  20   1.2   1.2 188.5 190.0   21600.       0.
22       @EOF

@XQT NLR.FILPROCS
ADD INPUT DATA TO RUNSTREAM OR @EOF TO STOP

@ADD,P NLRDAT.A1S12
COMPLETED DATA ENTRY FOR FILE:
ARRAY # 1, SOURCE 12
ADD INPUT DATA TO RUNSTREAM OR @EOF TO STOP

@ADD,P NLRDAT.A1S16
COMPLETED DATA ENTRY FOR FILE:
ARRAY # 1, SOURCE 16
ADD INPUT DATA TO RUNSTREAM OR @EOF TO STOP

@ADD,P NLRDAT.A1S17
COMPLETED DATA ENTRY FOR FILE:
ARRAY # 1, SOURCE 17
ADD INPUT DATA TO RUNSTREAM OR @EOF TO STOP

@ADD,P NLRDAT.A1S18
COMPLETED DATA ENTRY FOR FILE:
ARRAY # 1, SOURCE 18
ADD INPUT DATA TO RUNSTREAM OR @EOF TO STOP

@ADD,P NLRDAT.A1S19
COMPLETED DATA ENTRY FOR FILE:
ARRAY # 1, SOURCE 19
ADD INPUT DATA TO RUNSTREAM OR @EOF TO STOP

@ADD,P NLRDAT.A1S14
COMPLETED DATA ENTRY FOR FILE:
ARRAY # 1, SOURCE 14
ADD INPUT DATA TO RUNSTREAM OR @EOF TO STOP
WROTE  99 FORMATTED DATA RECORDS ON LU 8

STOP     NORMAL STOP
```

```
@MED,Q 8.,NLRDAT.A1/P-NONLINEAR
MED 298 09/20/82 16:49 A1/P-NONLINEAR(0):A
EDIT
0*hh
END EDIT 99 LINES OUTPUT

@PRT NLRDAT.A1/P-NONLINEAR
FURPUR 28R2 S74R1A 09/20/82 16:49:42
PASS*NLRDAT(1).A1/P-NONLINEAR(0)
      1      169.75   .15438    46.59456  13.0 0 0 0 0 0
      2      171.25   .00000    53.78251  10.0 0 0 0 0 0
      3      172.75   .03821   430.18713  86.0 0 0 0 0 0
      4      174.25   .03226  2449.37216 349.0 0 0 0 0 0
      5      175.75   .01269  5462.61011 518.0 0 0 0 0 0
      6      177.25   .00069  5952.01373 360.0 0 0 0 0 0
      7      178.75   .00000  5845.84241 217.0 0 0 0 0 0
      8      180.25   .00000  2141.38232  44.0 0 0 0 0 0
      9      181.75   .00000  1838.13139  19.0 0 0 0 0 0
     10      183.25   .00000  7442.42352  50.0 0 0 0 0 0
     11      184.75   .00000 13008.83081  47.0 0 0 0 0 0
     12      186.25   .00000 34972.62109  68.0 0 0 0 0 0
     13      187.75   .00000 46294.00146  44.0 0 0 0 0 0
     14      189.25   .00000 71450.38086  32.0 0 0 0 0 0
     15      168.25   .00000    16.90794   1.0 1 0 0 0 0
     16      169.75   .02577   320.90368 123.0 1 0 0 0 0
     17      171.25   .00000    62.82821  13.0 1 0 0 0 0
     18      172.75   .00000   382.62122  76.0 1 0 0 0 0
     19      174.25   .00000  1346.53386 190.0 1 0 0 0 0
     20      175.75   .00841  4269.79022 404.0 1 0 0 0 0
     21      177.25   .00000  5723.14844 346.0 1 0 0 0 0
     22      178.75   .00794  4603.59375 170.0 1 0 0 0 0
     23      180.25   .02369  5536.48914 121.0 1 0 0 0 0
     24      181.75   .00000  2203.62994  24.0 1 0 0 0 0
     25      183.25   .00000  4206.66248  26.0 1 0 0 0 0
     26      184.75   .00000  8270.84998  28.0 1 0 0 0 0
     27      186.25   .00000 21035.29517  39.0 1 0 0 0 0
     28      187.75   .00000 55782.44580  54.0 1 0 0 0 0
     29      189.25   .00000 18340.40210   2.0 1 0 0 0 0
     30      168.25   .00000    67.41976  30.0 0 1 0 0 0
     31      169.75   .00793   452.05515 175.0 0 1 0 0 0
     32      171.25   .00000   504.11292 144.0 0 1 0 0 0
     33      172.75   .00000  1168.85356 241.0 0 1 0 0 0
     34      174.25   .00000  2983.52557 426.0 0 1 0 0 0
     35      175.75   .00000  1319.90129 122.0 0 1 0 0 0
     36      177.25   .00000  2029.61388 120.0 0 1 0 0 0
     37      178.75   .00000  2086.45279 105.0 0 1 0 0 0
     38      180.25   .00000  3284.74545  70.0 0 1 0 0 0
     39      181.75   .00000  2351.61783  26.0 0 1 0 0 0
     40      183.25   .00000 10985.68225  76.0 0 1 0 0 0
     41      184.75   .00000 41302.26514 159.0 0 1 0 0 0
     42      186.25   .00000 50421.88721 100.0 0 1 0 0 0
     43      187.75   .00000 54832.20166  53.0 0 1 0 0 0
     44      189.25   .00000 16959.73706   1.0 0 1 0 0 0
     45      166.75   .12086   116.26365  70.0 0 0 1 0 0
     46      168.25   .00000   140.73200  68.0 0 0 1 0 0
     47      169.75   .00000   225.14602  85.0 0 0 1 0 0
```

48	171.25	.00000	541.52353	155.0	0	0	1	0	0
49	172.75	.00000	473.02074	95.0	0	0	1	0	0
50	174.25	.00000	958.27303	134.0	0	0	1	0	0
51	175.75	.00000	1738.10794	162.0	0	0	1	0	0
52	177.25	.00000	2241.93228	133.0	0	0	1	0	0
53	178.75	.00000	5502.21527	204.0	0	0	1	0	0
54	180.25	.00000	7658.41748	169.0	0	0	1	0	0
55	181.75	.00000	7439.38983	93.0	0	0	1	0	0
56	183.25	.00000	27399.53906	196.0	0	0	1	0	0
57	184.75	.00000	33711.70557	129.0	0	0	1	0	0
58	186.25	.00000	44624.81055	88.0	0	0	1	0	0
59	187.75	.00000	66248.63867	65.0	0	0	1	0	0
60	189.25	.00000	18340.40210	2.0	0	0	1	0	0
61	162.25	.89382	14.81972	8.0	0	0	0	1	0
62	163.75	.64200	39.79090	30.0	0	0	0	1	0
63	165.25	.64079	23.06260	12.0	0	0	0	1	0
64	166.75	.23627	80.44865	47.0	0	0	0	1	0
65	168.25	.73724	37.72217	14.0	0	0	0	1	0
66	169.75	.01415	112.18292	40.0	0	0	0	1	0
67	171.25	.07021	91.43438	22.0	0	0	0	1	0
68	172.75	.04349	739.79420	151.0	0	0	0	1	0
69	174.25	.12103	1762.65750	250.0	0	0	0	1	0
70	175.75	.06422	5577.70886	529.0	0	0	0	1	0
71	177.25	.00936	5134.65045	310.0	0	0	0	1	0
72	178.75	.02632	1936.83250	69.0	0	0	0	1	0
73	180.25	.09629	1661.36024	33.0	0	0	0	1	0
74	181.75	.05629	3100.34305	36.0	0	0	0	1	0
75	183.25	.00000	6356.91028	42.0	0	0	0	1	0
76	184.75	.00000	30170.60522	115.0	0	0	0	1	0
77	186.25	.00000	47039.88184	93.0	0	0	0	1	0
78	187.75	.00000	40622.30273	38.0	0	0	0	1	0
79	189.25	.00000	54361.89697	23.0	0	0	0	1	0
80	160.75	.12582	51.66026	47.0	0	0	0	0	1
81	162.25	.14933	60.28368	53.0	0	0	0	0	1
82	163.75	.06073	61.33819	49.0	0	0	0	0	1
83	165.25	.03075	138.09742	101.0	0	0	0	0	1
84	166.75	.09425	178.76039	110.0	0	0	0	0	1
85	168.25	.01774	249.58422	124.0	0	0	0	0	1
86	169.75	.00905	512.60516	199.0	0	0	0	0	1
87	171.25	.00000	286.61391	80.0	0	0	0	0	1
88	172.75	.00000	534.91962	108.0	0	0	0	0	1
89	174.25	.00000	2026.23425	288.0	0	0	0	0	1
90	175.75	.00000	1278.09448	118.0	0	0	0	0	1
91	177.25	.00000	1099.86153	63.0	0	0	0	0	1
92	178.75	.00000	2622.48526	95.0	0	0	0	0	1
93	180.25	.00000	3020.35696	64.0	0	0	0	0	1
94	181.75	.00000	3402.33224	40.0	0	0	0	0	1
95	183.25	.00979	8530.89429	58.0	0	0	0	0	1
96	184.75	.00000	11755.06555	42.0	0	0	0	0	1
97	186.25	.00000	49455.50391	98.0	0	0	0	0	1
98	187.75	.00000	73871.46484	73.0	0	0	0	0	1
99	189.25	.00000	24316.97119	6.0	0	0	0	0	1

```
@PRT NLRDAT.A2S12,.A2S16,.A2S17,.A2S19,.A2S14
PASS*NLRDAT(1).A2S12(0)
   1       ARRAY # 2, SOURCE 12
```

```
       2       1   3 270.3 270.3 163.0 164.5   50400.   26867.
       3       1   4 270.3 270.3 164.5 166.0   39600.   14619.
       4       1   5 270.3 270.3 166.0 167.5   39600.   23960.
       5       1   6 270.3 270.3 167.5 169.0  158400.   85175.
       6       1   7 270.3 270.3 169.0 170.5  309600.  123735.
       7       1   8 270.3 270.3 170.5 172.0  248400.  110632.
       8       1   9 270.3 270.3 172.0 173.5  149400.   53770.
       9       1  10 270.3 270.3 173.5 175.0  554400.   54387.
      10       1  11 270.3 270.3 175.0 176.5 1047600.    6383.
      11       1  12 270.3 270.3 176.5 178.0  554400.   12722.
      12       1  13 270.3 270.3 178.0 179.5 1382400.     719.
      13       1  14 270.3 270.3 179.5 181.0 1310400.    2521.
      14       1  15 270.3 270.3 181.0 182.5  115200.       0.
      15       1  16 270.3 270.3 182.5 184.0   82800.       0.
      16       1  17 270.3 270.3 184.0 185.5  154800.       0.
      17       1  18 270.3 270.3 185.5 187.0   86400.       0.
      18       1  19 270.3 270.3 187.0 188.5  158400.       0.
      19       1  20 270.3 270.3 188.5 190.0   54000.       0.
      20      @EOF
PASS*NLRDAT(1).A2S16(0)
       1       ARRAY # 2, SOURCE 16
       2       1   1 270.3 270.3 160.0 161.5   54000.    2348.
       3       1   2 270.3 270.3 161.5 163.0  316800.   87151.
       4       1   3 270.3 270.3 163.0 164.5  223200.   47237.
       5       1   4 270.3 270.3 164.5 166.0  180000.   10830.
       6       1   5 270.3 270.3 166.0 167.5  118800.   22808.
       7       1   6 270.3 270.3 167.5 169.0  266400.   21530.
       8       1   7 270.3 270.3 169.0 170.5  417600.   37015.
       9       1   8 270.3 270.3 170.5 172.0  252000.       0.
      10       1   9 270.3 270.3 172.0 173.5  284400.    8480.
      11       1  10 270.3 270.3 173.5 175.0  270000.       0.
      12       1  11 270.3 270.3 175.0 176.5  540000.       0.
      13       1  12 270.3 270.3 176.5 178.0  518400.       0.
      14       1  13 270.3 270.8 178.0 179.5 1137600.       0.
      15       1  14 270.3 270.3 179.5 181.0  367200.       0.
      16       1  15 270.3 270.3 181.0 182.5   86400.       0.
      17       1  16 270.3 270.3 182.5 184.0   75600.       0.
      18       1  17 270.3 270.3 184.0 185.5   79200.       0.
      19       1  18 270.3 270.3 185.5 187.0   97200.       0.
      20       1  19 270.3 270.3 187.0 188.5   50400.       0.
      21       1  20 270.3 270.3 188.5 190.0   14400.       0.
      22      @EOF
PASS*NLRDAT(1).A2S17(0)
       1       ARRAY # 2, SOURCE 17
       2       1   1 270.3 270.3 160.0 161.5  410400.   19219.
       3       1   2 270.3 270.3 161.5 163.0  504000.   35694.
       4       1   3 270.3 270.3 163.0 164.5  475200.   42609.
       5       1   4 270.3 270.3 164.5 166.0  324000.   20460.
       6       1   5 270.3 270.3 166.0 167.5   54000.       0.
       7       1   6 270.3 270.3 167.5 169.0   36000.       0.
       8       1   7 270.3 270.3 169.0 170.5   90000.       0.
       9       1   8 270.3 270.3 170.5 172.0  320400.       0.
      10       1   9 270.3 270.3 172.0 173.5  205200.       0.
      11       1  10 270.3 270.3 173.5 175.0  172800.       0.
      12       1  11 270.3 270.3 175.0 176.5  396000.       0.
      13       1  12 270.3 270.3 176.5 178.0  338400.       0.
      14       1  13 270.3 270.3 178.0 179.5  457200.       0.
```

```
      1  14 270.3 270.3 179.5 181.0  262800.        0.
      1  15 270.3 270.3 181.0 182.5  259200.        0.
      1  16 270.3 270.3 182.5 184.0  162000.        0.
      1  17 270.3 270.3 184.0 185.5  151200.        0.
      1  18 270.3 270.3 185.5 187.0  180000.        0.
      1  19 270.3 270.3 187.0 188.5  158400.        0.
      1  20 270.3 270.3 188.5 190.0   32400.        0.
     @EOF
PASS*NLRDAT(1).A2S19(0)
      ARRAY # 2, SOURCE 19
      1   1 270.3 270.3 160.0 161.5   14400.    12700.
      1   2 270.3 270.3 161.5 163.0   25200.    21855.
      1   3 270.3 270.3 163.0 164.5   32400.    25200.
      1   4 270.3 270.3 164.5 166.0   39600.    35790.
      1   5 270.3 270.3 166.0 167.5   64800.    42252.
      1   6 270.3 270.3 167.5 169.0  205200.   153648.
      1   7 270.3 270.3 169.0 170.5  486000.   224574.
      1   8 270.3 270.3 170.5 172.0  666000.   232502.
      1   9 270.3 270.3 172.0 173.5  885600.   240699.
      1  10 270.3 270.3 173.5 175.0  756000.   184057.
      1  11 270.3 270.3 175.0 176.5  997200.   153450.
      1  12 270.3 270.3 176.5 178.0  C69600.    72124.
      1  13 270.3 270.3 178.0 179.5  442800.    16199.
      1  14 270.3 270.3 179.5 181.0  194400.    14848.
      1  15 270.3 270.3 181.0 182.5  108000.        0.
      1  16 270.3 270.3 182.5 184.0  248400.        0.
      1  17 270.3 270.3 184.0 185.5  162000.        0.
      1  18 270.3 270.3 185.5 187.0  190800.        0.
      1  19 270.3 270.3 187.0 188.5  176400.        0.
      1  20 270.3 270.3 188.5 190.0   36000.        0.
     @EOF
PASS*NLRDAT(1).A2S14(0)
      ARRAY # 2, SOURCE 14
      1   3 270.3 270.8 163.0 164.5  302400.     3144.
      1   4 270.3 270.3 164.5 166.0  360000.    10711.
      1   5 270.3 270.3 166.0 167.5  378000.    34004.
      1   6 270.3 270.3 167.5 169.0  655200.    11403.
      1   7 270.3 270.3 169.0 170.5  842400.        0.
      1   8 270.3 270.3 170.5 172.0  500400.     5800.
      1   9 270.3 270.3 172.0 173.5  187200.        0.
      1  10 270.3 270.3 173.5 175.0  280800.        0.
      1  11 270.3 270.3 175.0 176.5  993600.        0.
      1  12 270.3 270.3 176.5 178.0  356400.        0.
      1  13 270.3 270.3 178.0 179.5  500400.        0.
      1  14 270.3 270.3 179.5 181.0  151200.        0.
      1  15 270.3 270.3 181.0 182.5  136800.        0.
      1  16 270.3 270.3 182.5 184.0  172800.        0.
      1  17 270.3 270.3 184.0 185.5  154800.        0.
      1  18 270.3 270.3 185.5 187.0  374400.        0.
      1  19 270.3 270.3 187.0 188.5  129600.        0.
      1  20 270.3 270.3 188.5 190.0   14400.        0.
     @EOF

@XQT NLR.FILPROCS
ADD INPUT DATA TO RUNSTREAM OR @EOF TO STOP
```

```
@ADD,P NLRDAT.A2S12
COMPLETED DATA ENTRY FOR FILE:
ARRAY # 2, SOURCE 12
ADD INPUT DATA TO RUNSTREAM OR @EOF TO STOP


@ADD,P NLRDAT.A2S16
COMPLETED DATA ENTRY FOR FILE:
ARRAY # 2, SOURCE 16
ADD INPUT DATA TO RUNSTREAM OR @EOF TO STOP


@ADD,P NLRDAT.A2S17
COMPLETED DATA ENTRY FOR FILE:
ARRAY # 2, SOURCE 17
ADD INPUT DATA TO RUNSTREAM OR @EOF TO STOP


@ADD,P NLRDAT.A2S19
COMPLETED DATA ENTRY FOR FILE:
ARRAY # 2, SOURCE 19
ADD INPUT DATA TO RUNSTREAM OR @EOF TO STOP


@ADD,P NLRDAT.A2S14
COMPLETED DATA ENTRY FOR FILE:
ARRAY # 2, SOURCE 14
ADD INPUT DATA TO RUNSTREAM OR @EOF TO STOP
WROTE  96 FORMATTED DATA RECORDS ON LU 8

STOP      NORMAL STOP
```

```
@MED,Q 8.,NLRDAT.A2/P-NONLINEAR
MED 298 09/20/82 16:52 A2/P-NONLINEAR(0):A
EDIT
0*hh
END EDIT 96 LINES OUTPUT

@PRT NLRDAT.A2/P-NONLINEAR
FURPUR 28R2 S74R1A 09/20/82 16:52:19
PASS*NLRDAT(1).A2/P-NONLINEAR(0)
      1     163.75   .53308     22.26349  14.0 0 0 0 0 0
      2     165.25   .36917     21.89878  11.0 0 0 0 0 0
      3     166.75   .60505     26.11543  11.0 0 0 0 0 0
      4     168.25   .53772     94.27567  44.0 0 0 0 0 0
      5     169.75   .39966    227.66407  86.0 0 0 0 0 0
      6     171.25   .44538    249.29623  69.0 0 0 0 0 0
      7     172.75   .38262    207.26818  39.0 0 0 0 0 0
      8     174.25   .09810   1096.91557 154.0 0 0 0 0 0
      9     175.75   .00609   3087.50653 291.0 0 0 0 0 0
     10     177.25   .02295   2584.99139 154.0 0 0 0 0 0
     11     178.75   .00052  10260.91504 384.0 0 0 0 0 0
     12     180.25   .00192  16283.57813 364.0 0 0 0 0 0
     13     181.75   .00000   2799.51334  32.0 0 0 0 0 0
     14     183.25   .00000   3810.16266  23.0 0 0 0 0 0
     15     184.75   .00000  12005.56689  43.0 0 0 0 0 0
     16     186.25   .00000  13933.73596  24.0 0 0 0 0 0
     17     187.75   .00000  46294.00146  44.0 0 0 0 0 0
     18     189.25   .00000  39625.52393  15.0 0 0 0 0 0
     19     160.75   .04348     20.39489  15.0 1 0 0 0 0
     20     162.25   .27510     96.94607  88.0 1 0 0 0 0
     21     163.75   .21164     76.19157  62.0 1 0 0 0 0
     22     165.25   .06017     71.36686  50.0 1 0 0 0 0
     23     166.75   .19199     58.80389  33.0 1 0 0 0 0
     24     168.25   .08082    152.37734  74.0 1 0 0 0 0
     25     169.75   .08864    303.25599 116.0 1 0 0 0 0
     26     171.25   .00000    252.68707  70.0 1 0 0 0 0
     27     172.75   .02982    396.88737  79.0 1 0 0 0 0
     28     174.25   .00000    549.65121  75.0 1 0 0 0 0
     29     175.75   .00000   1612.62527 150.0 1 0 0 0 0
     30     177.25   .00000   2421.61932 144.0 1 0 0 0 0
     31     178.75   .00000   8463.04810 316.0 1 0 0 0 0
     32     180.25   .00000   4697.03546 102.0 1 0 0 0 0
     33     181.75   .00000   2203.62994  24.0 1 0 0 0 0
     34     183.25   .00000   3548.02051  21.0 1 0 0 0 0
     35     184.75   .00000   6802.83514  22.0 1 0 0 0 0
     36     186.25   .00000  15339.16077  27.0 1 0 0 0 0
     37     187.75   .00000  18523.[illegible]4507  14.0 1 0 0 0 0
     38     189.25   .00000  21244.07959   4.0 1 0 0 0 0
     39     160.75   .04683    118.80828 114.0 0 1 0 0 0
     40     162.25   .07082    151.55187 140.0 0 1 0 0 0
     41     163.75   .08967    156.49102 132.0 0 1 0 0 0
     42     165.25   .06315    123.68047  90.0 0 1 0 0 0
     43     166.75   .00000     31.76021  15.0 0 1 0 0 0
     44     168.25   .00000     30.77976  10.0 0 1 0 0 0
     45     169.75   .00000     75.09526  25.0 0 1 0 0 0
     46     171.25   .00000    317.16990  89.0 0 1 0 0 0
     47     172.75   .00000    292.38036  57.0 0 1 0 0 0
```

48	174.25	.00000	363.28928	48.0	0	1	0	0	0
49	175.75	.00000	1194.49217	110.0	0	1	0	0	0
50	177.25	.00000	1605.17401	94.0	0	1	0	0	0
51	178.75	.00000	3467.44492	127.0	0	1	0	0	0
52	180.25	.00000	3417.00964	73.0	0	1	0	0	0
53	181.75	.00000	5836.02985	72.0	0	1	0	0	0
54	183.25	.00000	6763.52295	45.0	0	1	0	0	0
55	184.75	.00000	11755.06555	42.0	0	1	0	0	0
56	186.25	.00000	26307.06348	50.0	0	1	0	0	0
57	187.75	.00000	46294.00146	44.0	0	1	0	0	0
58	189.25	.00000	29190.47998	9.0	0	1	0	0	0
59	160.75	.88194	10.93413	4.0	0	0	1	0	0
60	162.25	.86726	13.94487	7.0	0	0	1	0	0
61	163.75	.77778	17.17550	9.0	0	0	1	0	0
62	165.25	.90379	21.89878	11.0	0	0	1	0	0
63	166.75	.65204	36.12705	18.0	0	0	1	0	0
64	168.25	.74877	119.40674	57.0	0	0	1	0	0
65	169.75	.46209	351.16213	135.0	0	0	1	0	0
66	171.25	.34910	643.56995	185.0	0	0	1	0	0
67	172.75	.27179	1192.69450	246.0	0	0	1	0	0
68	174.25	.24346	1485.23230	210.0	0	0	1	0	0
69	175.75	.15388	2941.03839	277.0	0	0	1	0	0
70	177.25	.10771	3107.87415	186.0	0	0	1	0	0
71	178.75	.03658	3361.78937	123.0	0	0	1	0	0
72	180.25	.07638	2580.28122	54.0	0	0	1	0	0
73	181.75	.00000	2649.68127	30.0	0	0	1	0	0
74	183.25	.00000	10030.37500	69.0	0	0	1	0	0
75	184.75	.00000	12506.96509	45.0	0	0	1	0	0
76	186.25	.00000	27748.91016	53.0	0	0	1	0	0
77	187.75	.00000	51033.99268	49.0	0	0	1	0	0
78	189.25	.00000	30874.05249	10.0	0	0	1	0	0
79	163.75	.01040	101.39583	84.0	0	0	0	1	0
80	165.25	.02975	136.78652	100.0	0	0	0	1	0
81	166.75	.08996	170.94209	105.0	0	0	0	1	0
82	168.25	.01740	362.47476	182.0	0	0	0	1	0
83	169.75	.00000	600.91814	234.0	0	0	0	1	0
84	171.25	.01159	487.10963	139.0	0	0	0	1	0
85	172.75	.00000	268.68272	52.0	0	0	0	1	0
86	174.25	.00000	570.40129	78.0	0	0	0	1	0
87	175.75	.00000	2930.57648	276.0	0	0	0	1	0
88	177.25	.00000	1686.76936	99.0	0	0	0	1	0
89	178.75	.00000	3784.45264	139.0	0	0	0	1	0
90	180.25	.00000	2053.82437	42.0	0	0	0	1	0
91	181.75	.00000	3251.21646	38.0	0	0	0	1	0
92	183.25	.00000	7170.70587	48.0	0	0	0	1	0
93	184.75	.00000	12005.56689	43.0	0	0	0	1	0
94	186.25	.00000	52354.86084	104.0	0	0	0	1	0
95	187.75	.00000	38737.21631	36.0	0	0	0	1	0
96	189.25	.00000	21244.07959	4.0	0	0	0	1	0

```
@PRT NLRDAT.A3S12,.A3S16,.A3S17,.A3S18,.A3S19,.A3S14
PASS*NLRDAT(1).A3S12(0)
     1        ARRAY # 3, SOURCE 12
     2        1    6 317.3 317.3 167.5 169.0    43200.     5195.
     3        1    7 317.3 317.3 169.0 170.5    28800.    10800.
     4        1    8 317.3 317.3 170.5 172.0   478800.   137612.
```

```
    5         1   9 317.3 317.3 172.0 173.5  615600.  136941.
    6         1  10 317.3 317.3 173.5 175.0 1364400.   51213.
    7         1  11 317.3 317.3 175.0 176.5 2541600.   11950.
    8         1  12 317.3 317.3 176.5 178.0  309600.       0.
    9         1  13 317.3 317.3 178.0 179.5  252000.       0.
   10         1  14 317.3 317.3 179.5 181.0  154800.       0.
   11         1  15 317.3 317.3 181.0 182.5  288000.       0.
   12         1  16 317.3 317.3 182.5 184.0  219600.       0.
   13         1  17 317.3 317.3 184.0 185.5   14400.       0.
   14        @EOF
PASS*NLRDAT(1).A3S16(0)
    1         ARRAY # 3, SOURCE 16
    2         1   5 317.3 317.3 166.0 167.5  345600.   45675.
    3         1   6 317.3 317.3 167.5 169.0  784800.  116742.
    4         1   7 317.3 317.3 169.0 170.5  169200.   14927.
    5         1   8 317.3 317.3 170.5 172.0  363600.   39610.
    6         1   9 317.3 317.3 172.0 173.5  831600.   52399.
    7         1  10 317.3 317.3 173.5 175.0  777600.       0.
    8         1  11 317.3 317.3 175.0 176.5 1443600.       0.
    9         1  12 317.3 317.3 176.5 178.0  169200.       0.
   10         1  13 317.3 317.3 178.0 179.5   36000.       0.
   11         1  14 317.3 317.3 179.5 181.0  165600.       0.
   12         1  15 317.3 317.3 181.0 182.5  298800.       0.
   13         1  16 317.3 317.3 182.5 184.0   93600.       0.
   14        @EOF
PASS*NLRDAT(1).A3S17(0)
    1         ARRAY # 3, SOURCE 17
    2         1   4 317.3 317.3 164.5 166.0   72000.       0.
    3         1   5 317.3 317.3 166.0 167.5 1040400.   12955.
    4         1   6 317.3 317.3 167.5 169.0  903600.       0.
    5         1   7 317.3 317.3 169.0 170.5  594000.    8584.
    6         1   8 317.3 317.3 170.5 172.0  180000.       0.
    7         1   9 317.3 317.3 172.0 173.5  374400.    8935.
    8         1  10 317.3 317.3 173.5 175.0  410400.       0.
    9         1  11 317.3 317.3 175.0 176.5  306000.       0.
   10         1  12 317.3 317.3 176.5 178.0  428400.       0.
   11         1  13 317.3 317.3 178.0 179.5  280800.       0.
   12         1  14 317.3 317.3 179.5 181.0  230400.       0.
   13         1  15 317.3 317.3 181.0 182.5  554400.       0.
   14         1  16 317.3 317.3 182.5 184.0  298800.       0.
   15         1  17 317.3 317.3 184.0 185.5  129600.       0.
   16         1  18 317.3 317.3 185.5 187.0   14400.       0.
   17         1  19 317.3 317.3 187.0 188.5    3600.       0.
   18        @EOF
PASS*NLRDAT(1).A3S18(0)
    1         ARRAY # 3, SOURCE 18
    2         1   6 317.3 317.3 167.5 169.0   93600.   66602.
    3         1   7 317.3 317.3 169.0 170.5  198000.   18485.
    4         1   8 317.3 317.3 170.5 172.0  349200.       0.
    5         1   9 317.3 317.3 172.0 173.5  644400.       0.
    6         1  10 317.3 317.3 173.5 175.0  561600.   12786.
    7         1  11 317.3 317.3 175.0 176.5  424800.       0.
    8         1  12 317.3 317.3 176.5 178.0  687600.       0.
    9         1  13 317.3 317.3 178.0 179.5  774000.       0.
   10         1  14 317.3 317.3 179.5 181.0  556000.    8353.
   11         1  15 317.3 317.3 181.0 182.5 1036900.       0.
   12         1  16 317.3 317.3 182.5 184.0  464400.       0.
```

```
  13      1  17 317.3 317.3 184.0 185.5  162000.       0.
  14      1  18 317.3 317.3 185.5 187.0   14400.       0.
  15       @EOF
PASS*NLRDAT(1).A3S19(0)
   1       ARRAY # 3, SOURCE 19
   2      1   1 317.3 317.3 160.0 161.5  446400.  255134.
   3      1   2 317.3 317.3 161.5 163.0  324000.  174117
   4      1   3 317.3 317.3 163.0 164.5  284400.  204066.
   5      1   4 317.3 317.3 164.5 166.0  252000.  124935.
   6      1   5 317.3 317.3 166.0 167.5  216000.  134510.
   7      1   6 317.3 317.3 167.5 169.0  226800.  140174.
   8      1   7 317.3 317.3 169.0 170.5  126000.  103878.
   9      1   8 317.3 317.3 170.5 172.0  324000.  184740.
  10      1   9 317.3 317.3 172.0 173.5 1044000.  307851.
  11      1  10 317.3 317.3 173.5 175.0  856800.  134159.
  12      1  11 317.3 317.3 175.0 176.5  460800.   41451.
  13      1  12 317.3 317.3 176.5 178.0  241200.   23268.
  14      1  13 317.3 317.3 178.0 179.5  187200.   13502.
  15      1  14 317.3 317.3 179.5 181.0  237600.    1491.
  16      1  15 317.3 317.3 181.0 182.5  309600.   51886.
  17      1  16 317.3 317.3 182.5 184.0  432000.   19806.
  18       @EOF
PASS*NLRDAT(1).A3S14(0)
   1       ARRAY # 3, SOURCE 14
   2      1   5 317.3 317.3 166.0 167.5  817200.   47762.
   3      1   6 317.3 317.3 167.5 169.0 1054800.   10080.
   4      1   7 317.3 317.3 169.0 170.5  612000.    8398.
   5      1   8 317.3 317.3 170.5 172.0  334800.       0.
   6      1   9 317.3 317.3 172.0 173.5  687600.       0.
   7      1  10 317.3 317.3 173.5 175.0  226800.       0.
   8      1  11 317.3 317.3 175.0 176.5  867600.       0.
   9      1  12 317.3 317.3 176.5 178.0  482400.    5506.
  10      1  13 317.3 317.3 178.0 179.5  320400.       0.
  11      1  14 317.3 317.3 179.5 181.0  252000.       0.
  12      1  15 317.3 317.3 181.0 182.5  277200.       0.
  13      1  16 317.3 317.3 182.5 184.0  378000.       0.
  14      1  17 317.3 317.3 184.0 185.5   64800.       0.
  15      1  18 317.3 317.3 185.5 187.0    3600.       0.
  16      1  19 317.3 317.3 187.0 188.5    3600.       0.
  17       @EOF

@XQT NLR.FILPROCS
ADD INPUT DATA TO RUNSTREAM OR @EOF TO STOP


@ADD,P NLRDAT.A3S12
COMPLETED DATA ENTRY FOR FILE:
ARRAY # 3, SOURCE 12
ADD INPUT DATA TO RUNSTREAM OR @EOF TO STOP


@ADD,P NLRDAT.A3S16
COMPLETED DATA ENTRY FOR FILE:
ARRAY # 3, SOURCE 16
```

```
ADD INPUT DATA TO RUNSTREAM OR @EOF TO STOP

@ADD,P NLRDAT.A3S17
COMPLETED DATA ENTRY FOR FILE:
ARRAY # 3, SOURCE 17
ADD INPUT DATA TO RUNSTREAM OR @EOF TO STOP

@ADD,P NLRDAT.A3S18
COMPLETED DATA ENTRY FOR F'LE:
ARRAY # 3, SOURCE 18
ADD INPUT DATA TO RUNSTREAM OR @EOF TO STOP

@ADD,P NLRDAT.A3S19
COMPLETED DATA ENTRY FOR FILE:
ARRAY # 3, SOURCE 19
ADD INPUT DATA TO RUNSTREAM OR @EOF TO STOP

@ADD,P NLRDAT.A3S14
COMPLETED DATA ENTRY FOR FILE:
ARRAY # 3, SOURCE 14
ADD INPUT DATA TO RUNSTREAM OR @EOF TO STOP
WROTE  84 FORMATTED DATA RECORDS ON LU 8

STOP     NORMAL STOP
```

```
@MED,Q 8.,NLRDAT.A3/P-NONLINEAR
MED 298 09/20/82 16:54 A3/P-NONLINEAR(0):A
EDIT
0+hh
END EDIT 84 LINES OUTPUT


@PRT NLRDAT.A3/P-NONLINEAR
FURPUR 28R2 S74R1A 09/20/82 16:54:36
PASS+NLRDAT(1).A3/P-NONLINEAR(0)
      1    168.25   .12025    34.20966  12.0 0 0 0 0 0
      2    169.75   .37500    35.57192   8.0 0 0 0 0 0
      3    171.25   .28741   466.70715 133.0 0 0 0 0 0
      4    172.75   .22245   835.12238 171.0 0 0 0 0 0
      5    174.25   .03754  2657.48102 379.0 0 0 0 0 0
      6    175.75   .00470  7429.78235 706.0 0 0 0 0 0
      7    177.25   .00000  1474.66023  86.0 0 0 0 0 0
      8    178.75   .00000  1963.17668  70.0 0 0 0 0 0
      9    180.25   .00000  2097.59155  43.0 0 0 0 0 0
     10    181.75   .00000  6446.55670  80.0 0 0 0 0 0
     11    183.25   .00000  8939.58081  61.0 0 0 0 0 0
     12    184.75   .00000  2753.37775   4.0 0 0 0 0 0
     13    166.75   .13216   156.87236  96.0 1 0 0 0 0
     14    168.25   .14875   432.56783 218.0 1 0 0 0 0
     15    169.75   .08822   129.66966  47.0 1 0 0 0 0
     16    171.25   .10894   357.93312 101.0 1 0 0 0 0
     17    172.75   .06301  1121.17258 231.0 1 0 0 0 0
     18    174.25   .00000  1526.84398 216.0 1 0 0 0 0
     19    175.75   .00000  4238.40094 401.0 1 0 0 0 0
     20    177.25   .00000   839.91602  47.0 1 0 0 0 0
     21    178.75   .00000   417.84715  10.0 1 0 0 0 0
     22    180.25   .00000  2229.02805  46.0 1 0 0 0 0
     23    181.75   .00000  6675.60327  83.0 1 0 0 0 0
     24    183.25   .00000  4206.66248  26.0 1 0 0 0 0
     25    165.25   .00000    32.77356  20.0 0 1 0 0 0
     26    166.75   .01245   458.92596 289.0 0 1 0 0 0
     27    168.25   .00000   496.82734 251.0 0 1 0 0 0
     28    169.75   .01445   426.82854 165.0 0 1 0 0 0
     29    171.25   .00000   184.97495  50.0 0 1 0 0 0
     30    172.75   .02386   515.87091 104.0 0 1 0 0 0
     31    174.25   .00000   819.67188 114.0 0 1 0 0 0
     32    175.75   .00000   933.37601  85.0 0 1 0 0 0
     33    177.25   .00000  2013.28383 119.0 0 1 0 0 0
     34    178.75   .00000  2174.02594  78.0 0 1 0 0 0
     35    180.25   .00000  3020.35696  64.0 0 1 0 0 0
     36    181.75   .00000 12103.51758 154.0 0 1 0 0 0
     37    183.25   .00000 11041.57031  83.0 0 1 0 0 0
     38    184.75   .00000 10255.56628  36.0 0 1 0 0 0
     39    186.25   .00000  5263.13867   4.0 0 1 0 0 0
     40    187.75   .00000  8302.63135   1.0 0 1 0 0 0
     41    168.25   .71156    59.83569  26.0 0 0 1 0 0
     42    169.75   .09336   149.71544  55.0 0 0 1 0 0
     43    171.25   .00000   344.34311  97.0 0 0 1 0 0
     44    172.75   .00000   873.25761 179.0 0 0 1 0 0
     45    174.25   .02277  1110.78146 156.0 0 0 1 0 0
     46    175.75   .00000  1278.09448 118.0 0 0 1 0 0
     47    177.25   .00000  3189.58405 191.0 0 0 1 0 0
```

48	178.75	.00000	5792.97571	215.0	0	0	1	0	0
49	180.25	.01497	7039.40613	155.0	0	0	1	0	0
50	181.75	.00000	22357.74805	288.0	0	0	1	0	0
51	183.25	.00000	18230.63306	129.0	0	0	1	0	0
52	184.75	.00000	12506.96509	45.0	0	0	1	0	0
53	186.25	.00000	5263.13867	4.0	0	0	1	0	0
54	160.75	.57154	128.85219	124.0	0	0	0	1	0
55	162.25	.53740	99.04458	90.0	0	0	0	1	0
56	163.75	.71753	95.66310	79.0	0	0	0	1	0
57	165.25	.49577	97.49149	70.0	0	0	0	1	0
58	166.75	.62273	100.67144	60.0	0	0	0	1	0
59	168.25	.61805	131.03403	63.0	0	0	0	1	0
60	169.75	.82443	99.74174	35.0	0	0	0	1	0
61	171.25	.57019	320.56599	90.0	0	0	0	1	0
62	172.75	.29488	1402.50470	290.0	0	0	0	1	0
63	174.25	.15658	1679.42680	238.0	0	0	0	1	0
64	175.75	.08995	1382.61751	128.0	0	0	0	1	0
65	177.25	.09647	1164.97867	67.0	0	0	0	1	0
66	178.75	.07213	1489.61011	52.0	0	0	0	1	0
67	180.25	.00628	3108.46338	66.0	0	0	0	1	0
68	181.75	.16759	6904.69458	86.0	0	0	0	1	0
69	183.25	.04585	16999.52734	120.0	0	0	0	1	0
70	166.75	.05845	361.85839	227.0	0	0	0	0	1
71	168.25	.00956	578.61861	293.0	0	0	0	0	1
72	169.75	.01372	439.44163	170.0	0	0	0	0	1
73	171.25	.00000	330.75527	93.0	0	0	0	0	1
74	172.75	.00000	930.46383	191.0	0	0	0	0	1
75	174.25	.00000	466.71537	63.0	0	0	0	0	1
76	175.75	.00000	2564.42227	241.0	0	0	0	0	1
77	177.25	.01141	2258.26630	134.0	0	0	0	0	1
78	178.75	.00000	2464.15674	89.0	0	0	0	0	1
79	180.25	.00000	3284.74545	70.0	0	0	0	0	1
80	181.75	.00000	6217.56042	77.0	0	0	0	0	1
81	183.25	.00000	14948.22302	105.0	0	0	0	0	1
82	184.75	.00000	5841.87189	18.0	0	0	0	0	1
83	186.25	.00000	4201.70935	1.0	0	0	0	0	1
84	187.75	.00000	8302.63135	1.0	0	0	0	0	1

@BRKPT PRINT$

APPENDIX E

SIGNAL EXCESS POST PROCESSOR
COMPUTER PROGRAM PACKAGE

SXPROC

HOFMOCK

7213

23SEP82

FILENAME • PRT5 USERID • HOFMOCKEL-JL ACCOUNT • D1A72130230A CREATED AT: 14:57:51 23 SEP 82

1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012

```
@ELT,L NLR.MAP/SXPROC
ELT0T7 RLIB70 10/19-11:41:12-(2,)
000001        000 IN PASS*NLR.MAIN/SXPROC
000002        001 IN PASS*NLR.READIN,.FINLBL
000003        000 IN PASS*NLR.GETCOV,.PRTCOV
000004        002 NOT PASS*NLR.GETSXD/WB
000005        000 IN PASS*NLR.GETSXD,.PRTSXD
000006        000 END

END ELT.

@

@BRKPT PRINT$
```

```
@ELT,L NLR.MAIN/SXPROC
ELT017 RLIB70 09/15-17:09:58-(12,)
      009 C**  NAME: PASS*NLR.MAIN/SXPROC
      009 C**  USAGE: @XQT PASS*NLR.SXPROC
      009 C**
      009 C**  PURPOSE: PROCESS THE PRINT FILE FROM A BMDP P3R
      009 C**        (1981 VERS) NONLINEAR REGRESSION ANALYSIS RUN
      009 C**        TO REARRANGE THE HOLDING TIME DATA ON THE BASIS
      009 C**        OF SIGNAL EXCESS.  THE COVARIANCE MATRIX OF  THE
      009 C**        NONLINEAR REGRESSION PARAMETERS IS ALSO AVAILABLE
      009 C**        AS AN OUTPUT.
      009 C**
      010 C**  LIMITATIONS: THE PRINT FILE FROM A P3R RUN MUST BE SAVED
      009 C**               AS AN ELEMENT OF A FILE.  THE MED PROCESSOR
      009 C**               MAY BE USED TO CONVERT BREAKPOINTED PRINT
      009 C**               FILES TO ELEMENTS OF FILES.
      009 C**
      012 C**  WARNINGS: IF PRINTOUT FILE CONTAINS ASTERISKS (****.**)
      012 C**            BECAUSE FORMAT SPECS WERE EXCEEDED DURING P3R
      012 C**            EXECUTION THEY SHOULD BE CHANGED TO 9999.99 BY
      012 C**            MEANS OF THE TEXT EDITOR BEFORE ATTEMPTING TO
      012 C**            READ THE PRINTOUT FILE WITH THIS PROGRAM.
      009 C**
      009 C**  SUBPROGRAMS REQUIRED: GETSXD, PRTSXD, GETCOV, PRTCOV
      009 C**                        READIN, ELTIN
      009 C**
      009 C**  FILES:
      009 C**
      009 C**     INPUT: PRINT FILE.ELEMS FROM P3R RUNS,
      009 C**            READ ON LU 8.
      009 C**
      009 C**    OUTPUT: PRINT FILE OUTPUT ON LU 6
      009 C**
      009 C**  NOTES: NONE
      009 C**
      009 C**  PROGRAMMER/ORGANIZATION: HOFMOCKEL-JL/CSC
      009 C**
      009 C**  ALGORITHM: SEARCH THROUGH THE FILE ELEMENT FOR
      009 C**             LABELS ASSOCIATED WITH DESIRED DATA.
      009 C**             READ THE DATA, THEN PROCESS TO PRO-
      009 C**             PORTION THE HOLD TIME DATA INTO SIGNAL
      011 C**             EXCESS BINS 1.5 DB WIDE. ALSO PROCESS
      011 C**             TO CONVERT THE CORRELATION MATRIX TO
      011 C**             THE COVARIANCE MATRIX. PRINTOUT THE
      011 C**             DATA FOR EITHER THE SIGNAL EXCESS
      011 C**             CALCULATION, THE COVARIANCE, OR BOTH.
      009 C**
      009 C**  APPLICABILITY: ASCII FORTRAN
      009 C**
      009 C**  KEYWORDS: SIGNAL EXCESS, HOLD TIME, PROBABILITY OF
      009 C**            DETECTION, COVARIANCE MATRIX.
      009 C**
      009 C**  RECORD OF MODIFICATIONS: INITIAL PROGRAM 8 - 25 - 82
      009 C**
      009 C**  WAIVERS: NONE
      009       START EDIT PAGE
      009
```

```
009       REAL CORR ( 50 )               @ CORRELATION MATRIX(PARAMS)
008       LOGICAL COVAR                  @ FLAG COVARIANCE PRT
008       REAL COVR ( 50 )               @ COVARIANCE MATRIX(PARAMS)
008       CHARACTER*12 ELEM              @ FILE ELEMENT NAME
008       LOGICAL ELTCHK                 @ ELEMENT CHECK FUNC
008       CHARACTER*12 FILNAM            @ FILE NAME
008       INTEGER FSTAT                  @ FILE STATUS WD
008       INTEGER ICTR ( 10 )            @ COUNT ITEMS/SOURCE
008       INTEGER NCAS                   @ NUM OF CASES
008       INTEGER NPAR                   @ NUM OF PARAMS
008       INTEGER NSX                    @ NUM ITEMS IN SX
008       INTEGER NVAR                   @ NUM OF VRBLS
008       REAL P ( 10 )                  @ REGR EQN VRBLS
008       REAL PHOL ( 200 )              @ PREDICTED HOLD TIMES
008       REAL PSIG ( 10 )               @ STAN DEV OF PARAMS
008       CHARACTER*80 PTIT              @ PROBLEM TITLE
008       CHARACTER*80 RTIT              @ REGRESSION TITLE
008       LOGICAL SIGEX                  @ FLAG SIG EX PRT
008       REAL SLRD ( 10 )               @ SRC LVL - DET THR
008       LOGICAL STOP                   @ RUN STOP SIGNAL
009       REAL SX ( 4, 200 )             @ SIG EX DATA
008       INTEGER UNIT / 8 /             @ LOG UNIT FOR DATA IN
009       CHARACTER*12 VERS              @ ELEM VERS NAME
008       REAL X ( 10, 200 )             @ REGR EQN VRBLS
008 C
009       NAMELIST / INPUTS/ COVAR, ELEM,
009      * FILNAM, SIGEX, STOP, UNIT, VERS
008 C
008 C
008 C
008 10    CONTINUE
008       READ ( 5, INPUTS )             @ RUNSTREAM INPUTS
009       OPEN ( UNIT, IOSTAT=FSTAT,     @ ASSIGN DATA IN FILE
008      * FILE=FILNAM, STATUS='OLD' )
008       IF ( FSTAT .GE. 0 ) THEN       @ PROCESS IF STATUS OK
009         IF ( ELTCHK ( UNIT, ELEM,    @ CHK ELEM/VERS
009      *      VERS ) ) THEN
009           CALL ELTIN ( UNIT, ELEM,   @ SET UP FOR ELTIN
009      *               VERS )
009           CALL READIN ( UNIT, PTIT,  @ READ DATA FILE
009      *      RTIT, NVAR, NPAR, CORR,
009      *      NCAS, P, PSIG, X, PHOL )
008           IF ( COVAR ) THEN          @ PROC COVAR IF FLAG
008             CALL GETCOV ( NPAR, PSIG,  @ GET COVARIANCE MATRIX
008      *        CORR, COVR )
008             CALL PRTCOV ( PTIT, RTIT,
008      *        NPAR, COVR )
008           ENDIF
008           IF ( SIGEX ) THEN          @ PROC SIG EXCESS DATA
009             CALL GETSXD ( NPAR, NCAS, P,@ GET SIG EXCESS DATA
009      *        X, SLRD, ICTR, NSX, SX )
009             CALL PRTSXD ( PTIT, RTIT,  @ PRT SX DATA
009      *         NPAR, P, SLRD,
009      *          ICTR, NSX, SX )
009           ENDIF
008         ELSE
008           WRITE ( 6, 20 ) ELEM, VERS,  @ ELEM/VERS ERROR
```

```
008      *       FILNAM
008 20      FORMAT ( ' ', 'ERROR              ', A12,
008      *       ' NOT FOUND IN FILE ', A12 )
008          ENDIF
008        ELSE
008          WRITE ( 6, 30 ) FILNAM, FSTAT   @ FILE ASG ERROR
009 30       FORMAT ( ' ', 'ERROR: COULD NOT',
009      *   ' ASSIGN FILE ', A12,
008      *     ' FAC STATUS= ', O12 )
008        ENDIF
008        IF ( .NOT. STOP ) GO TO 10        @ READ ANOTHER LIST
008        CLOSE ( UNIT )
008        STOP ' NORMAL SXPROC STOP '
008        END

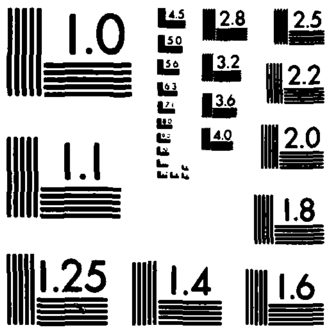
END ELT.
```

```
@ELT,L NLR.READIN
ELT0T7 RLIB70 09/15-17:10:09-(13,)
009       SUBROUTINE READIN
009       *    (
010       *       UNIT,                        @ INPUT
009       *       PTIT,                        @ OUTPUT
009       *       RTIT,                        @ OUTPUT
009       *       NVAR,                        @ OUTPUT
009       *       NPAR,                        @ OUTPUT
013       *       CORR,                        @ OUTPUT
009       *       NCAS,                        @ OUTPUT
009       *          P,                        @ OUTPUT
009       *       PSIG,                        @ OUTPUT
009       *          X,                        @ OUTPUT
009       *       PHOL                         @ OUTPUT
009       *          )
012 C**   NAME: PASS*NLR.READIN
009 C**
012 C**   USAGE: CALL READIN ( UNIT, PTIT, RTIT, NVAR, NPAR,
012 C**                        CORR, NCAS, P, PSIG, X, PHOL )
009 C**
012 C**   PURPOSE: READ SELECTED DATA FROM A P3R(BI VERS)
012 C**            PRINTOUT FILE.
009 C**
012 C**   LIMITATIONS: ONLY ONE P3R RUN PER PRINTOUT FILE
009 C**
012 C**   WARNINGS: IF PRINTOUT FILE CONTAINS ASTERISKS (****.**)
012 C**             BECAUSE FORMAT SPECS WERE EXCEEDED DURING P3R
012 C**             EXECUTION THEY SHOULD BE CHANGED TO 9999.99 BY
012 C**             MEANS OF THE TEXT EDITOR BEFORE ATTEMPTING TO
012 C**             READ THE PRINTOUT FILE WITH THIS PROGRAM.
009 C**
012 C**   SUBPROGRAMS REQUIRED: FINLBL
009 C**
012 C**   ARGUMENTS:
009 C**
012 C**      INPUT:
012 C**            UNIT                        @ LOGICAL UNIT FOR INPUT
012 C**
012 C**      OUTPUT:
012 C**            PTIT                        @ PROBLEM TITLE
012 C**            RTIT                        @ REGRESSION TITLE
012 C**            NVAR                        @ NUM REGR VRBLS
012 C**            CORR                        @ CORR MATRIX ( REGR PARAMS)
012 C**            NCAS                        @ NUM CASES(DATA PTS) IN REGR
012 C**               P                        @ REGR EQN PARAMS
012 C**            PSIG                        @ STAN DEVS OF PARAMS
012 C**               X                        @ REGR EQN VRBLS
012 C**            PHOL                        @ PREDICTED FRACT HOLD TIMES
003 C**
009 C**
012 C**   NOTES: NONE
009 C**
012 C**   PROGRAMMER/ORGANIZATION: HOFMOCKEL/CSC
009 C**
012 C**   ALGORITHM: INPUT - SEARCH FOR LABEL IN PRINTOUT FILE -
012 C**              READ ASSOCIATED DATA - OUTPUT
```

AD-A134 078 NONLINEAR REGRESSION ANALYSIS METHODOLOGY FOR THE ESTIMATION OF DETECTION..(U) COMPUTER SCIENCES CORP SAN DIEGO CALIF J L HOFMOCKEL SEP 82 NOSC-CR-153 5/5

UNCLASSIFIED N00123-79-D-0272 F/G 9/2 NL

END



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

```
009 C**
012 C**  APPLICABILITY: ASCII FORTRAN
009 C**
012 C**  KEYWORDS: REGRESSION PARAMETERS, CORRELATION MATRIX, CASE DATA
012 C**            HOLDING TIME, PERFORMANCE INDEX
009 C**
012 C**  RECORD OF MODIFICATIONS: INITIAL PROGRAM 8-27-82
009 C**
009 C**  WAIVERS: NONE
009        START EDIT PAGE
009
009        CHARACTER*132 ALIN                 @ BUFFER FOR ONE LINE
010        CHARACTER*20 CLBL                  @ LABEL FOR NUM CASES
010       * /'NUMBER OF CASES READ'/
010        CHARACTER*29 COLB                  @ LABEL FOR CORR MATRIX
010       */'ASYMPTOTIC CORRELATION MATRIX'/
009        REAL CORR ( 50 )                   @ CORRELATION MATRIX
010        REAL DUMY ( 10 )                   @ DUMMY ARRAY
010        CHARACTER*132 FINLBL               @ FUNCTION FINLBL(FIND LABEL)
010        INTEGER I                          @ UTILITY INDEX VRBL
010        INTEGER ILAST                      @ I LIMIT
010        INTEGER J                          @ UTILITY INDEX VRBL
010        INTEGER K                          @ UTILITY  INDEX VRBL
010        INTEGER KASE                       @ CASE NUMBER FROM FILE
010        INTEGER L                          @ UTL INDEX VRBL
010        CHARACTER*7 LABL                   @ UTL CHAR VRBL
009        INTEGER NCAS                       @ NUMBER OF CASES
009        INTEGER NPAR                       @ NUMBER OF PARAMATERS
009        INTEGER NVAR                       @ NUMBER OF VARIABLES
009        REAL P ( 10 )                      @ REGRESSINON PARAMETERS
010        CHARACTER*24 PALB                  @ LABEL FOR PARAM EST
010       *  / 'PARAMETER         ESTIMATE' /
009        REAL PHOL ( 200 )                  @ PREDICTED FRACT HOLD TIME
010        CHARACTER*22 PLBL                  @ LABEL FOR NUM PARAMS
010       *  / '  NUMBER OF PARAMETERS'/
009        REAL PSIG ( 10 )                   @ ST DEV OF PARAMETERS
009        CHARACTER*80 PTIT                  @ PROBLEM TITLE
010        CHARACTER*16 PTLB                  @ LABEL FOR PROBLEM TITLE
010       *  /'PROBLEM TITLE IS'/
009        CHARACTER*80 RTIT                  @ REGRESSION TITLE
010        CHARACTER*18 RTLB                  @ REGR TITLE LABEL
010       *  /'  REGRESSION TITLE' /
009        INTEGER UNIT                       @ DATA INPUT LOGICAL UNIT
009        REAL X ( 10, 200 )                 @ REGR VRBLS
010       *                                   @ WD 1 - PERF INDEX
010       *                                   @ WD 2 - FRACT HOLD TIME
010       *                                   @ WD 3 - CASE WEIGHT
010       *                                   @ WD 4 - AVAIL HOLD TIME
010       *                                   @ WD 5 TO NVAR-SUBS(0 OR 1)
010        CHARACTER*25 VLBL                  @ LABEL FOR NUM VRBLS
010       * /'TOTAL NUMBER OF VARIABLES'/
009 C
009        START EDIT PAGE
009 C
010        ALIN = FINLBL ( UNIT, 16, PTLB )   @ FIND PROB TITLE LABEL
010        READ ( UNIT, 10 ) PTIT              @ XFR NEXT LINE TO O/P
010 10     FORMAT ( A80 )
```

```
010        ALIN = FINLBL ( UNIT, 25, VLBL )  @ FIN NUM VRBLS LABEL
010        DECODE ( 20, ALIN ) NVAR          @ XFR NUM VRBLS TO O/P
010 20     FORMAT ( 48X, I7 )
009        ALIN = FINLBL ( UNIT, 18, RTLB )  @ FIND REGR TITLE LABEL
010        READ ( UNIT, 10 ) RTIT            @ XFR NEXT LINE TO O/P
010        ALIN = FINLBL ( UNIT, 22, PLBL )  @ FIND NUM PARAMS LBL
010        DECODE ( 25, ALIN ) NPAR          @ XFR NUM PARAMS TO O/P
010 25     FORMAT ( 50X, I7 )
010        ALIN = FINLBL ( UNIT, 20, CLBL )  @ FIND NUM CASES LABL
010        DECODE ( 20, ALIN ) NCAS          @ XFR NUM CASES TO O/P
010        ALIN = FINLBL ( UNIT, 29, COLB )  @ FIND CORR MATRIX LBL
009        DO 40 I = 1, 5                    @ MOVE FWD FIVE LINES
009          READ ( UNIT, 30 ) ALIN
009 30       FORMAT ( A132 )
009 40     CONTINUE
009        J = 1
009        DO 60 I = 1, NPAR                 @ READ CORR MATRIX
009          K = J + I - 1
009          READ ( UNIT, 50 )               @ INTO O/P ARRAY
009      *     ( CORR ( L ), L = J, K )
009 50       FORMAT ( 12X, 11F12.4 )
009          J = J + I
009 60     CONTINUE
009        ALIN = FINLBL ( UNIT, 24, PALB )  @ FIND PARAM EST LBL
009        DO 70 I = 1, 2                    @ MOVE FWD TWO LINES
009          READ ( UNIT, 30 ) ALIN
009 70     CONTINUE
009        DO 90 I = 1, NPAR                 @ READ PARAMS, ST DEVS
009          READ ( UNIT, 80 )
009      *       P ( I ), PSIG ( I )
010 80       FORMAT ( 8X, 2( 1X, F16.6 ) )
009 90     CONTINUE
010        LABL = '    CASE'
010        ALIN = FINLBL ( UNIT, 7, LABL )   @ FIND CASES DATA
009        DO 100 I = 1, 2                   @ MOVE FWD TWO LINES
009          READ ( UNIT, 30 ) ALIN
009 100    CONTINUE
009        ILAST = MIN ( 8, NVAR+3 )
010        DO 120 J = 1, NCAS                @ READ CASES DATA
009          READ ( UNIT, * )
009      *   KASE, ( DUMY(I), I = 1, ILAST )
010          IF ( J .EQ. KASE ) THEN         @ MOVE DATA TO O/P
010            X ( 1, J ) = DUMY ( 6 )
010            X ( 2, J ) = DUMY ( 3 )
010            X ( 3, J ) = DUMY ( 5 )
010            X ( 4, J ) = DUMY ( 7 )
010            X ( 5, J ) = DUMY ( 8 )
010            PHOL ( J ) = DUMY ( 1 )
009          ELSE
011            WRITE ( 6, 110 ) J, KASE      @ DATA ERROR
009 110        FORMAT ( ' CASE INDEX MISMATCH',
011      *     ' IN READIN,/, FILE READ INDEX = ', I3,
009      *       ' CASE NO. = ', I3 )
009          ENDIF
009 120    CONTINUE
009        IF ( NVAR .GT. 5 ) THEN           @ READ MORE CASES
009          DO 130 I = 1, 3                 @ MOVE FWD THREE LINES
```

```
009              READ ( UNIT, 30 )
009 130        CONTINUE
009            ILAST = NVAR - 5
010            DO 150 J = 1, NCAS
009              READ ( UNIT, * )
009      *         KASE, ( DUMY(I), I = 1, ILAST )
010              IF ( J .EQ. KASE ) THEN
010                DO 140 I = 1, ILAST
010                  X ( I + 5, J ) = DUMY ( I )
009 140            CONTINUE
010              ELSE
011                WRITE ( 6, 110 ) J, KASE  @ DATA ERROR
009              ENDIF
009 150        CONTINUE
009          ENDIF
009          RETURN
009          END

END ELT.
```

```
@ELT,L NLR.FINLBL
ELT017 RL1B70 09/15-17:10:34-(12,)
009          CHARACTER*132 FUNCTION FINLBL
009        *       (
009        *          UNIT,                     @ INPUT
009        *          NCHR,                     @ INPUT
009        *          LABL                      @ INPUT
009        *          )
011 C**    NAME: PASS*NLR.FINLBL
008 C**
011 C**    USAGE: LBL=FINLBL( UNIT, NCHR, LABL )
008 C**
011 C**    PURPOSE: LOCATE AND READ A STRING LABELLING
011 C**             SPECIFIC DATA IN A PRINTOUT FILE
008 C**
011 C**    LIMITATIONS: STRING MUST EXIST EXACTLY IN INPUT FILE
008 C**
011 C**    WARNINGS: WORKS ONLY ON N*BMDP81 P3R ( 81 VERS ) PRINTOUT
008 C**
011 C**    SUBPROGRAMS REQUIRED: NONE
008 C**
011 C**    ARGUMENTS:
008 C**
011 C**      INPUT:
011 C**           UNIT                      @ LOGICAL UNIT TO READ FROM
011 C**           NCHR                      @ NUM CHARS IN LABEL INPUT
012 C**           LABL                      @ LABEL TO SEARCH FOR
008 C**
011 C**      OUTPUT:
012 C**           FINLBL                    @ LINE CONTAINING THE LABEL
008 C**
011 C**    NOTES: NONE
008 C**
011 C**    PROGRAMMER/ORGANIZATION: HOFMOCKEL-JL/CSC
008 C**
011 C**    ALGORITHM: INPUT - READ SEQUENTIALLY THROUGH FILE
011 C**               FROM CURRENT LINE UNTIL A MATCH FOR
011 C**               THE INPUT LABEL IS LOCATED - OUTPUT
008 C**
011 C**    APPLICABILITY: ASCII FORTRAN
008 C**
011 C**    KEYWORDS: P3R PRINTOUT FILE, LABEL, SEARCH
008 C**
011 C**    RECORD OF MODIFICATIONS: INITIAL PROGRAM 8-26-82
008 C**
008 C**    WAIVERS: NONE
008          START EDIT PAGE
008
009 C
012          CHARACTER*30 LABEL             @ LABEL TO FIND
009          CHARACTER*30 LABL              @ INPUT ARG LABEL
009          CHARACTER*30 LINE              @ LINE TO MATCH
009          INTEGER NCHR                   @ NUM CHARS IN LABEL
009          INTEGER UNIT                   @ LOGICAL UNIT
009          FINLBL = ' '
009 10       CONTINUE
009            READ ( UNIT, 20,             @ FIND LABELED LINE
```

```
009      *    ERR = 30, END = 50 ) FINLBL
009 20      FORMAT ( A132 )
009         LINE = ' '
009         LINE = FINLBL ( 1:NCHR )
009         LABEL = ' '
009         LABEL = LABL ( 1:NCHR )
009         IF ( LINE .NE. LABEL ) GO TO 10
009         GO TO 70
009 30      CONTINUE
010         WRITE ( 6, 40 ) LABEL
009 40      FORMAT ( ' READ ERROR IN FINLBL' ,/,
010      *    ' WHILE SEARCHING LABEL: ', A30 )
009         GO TO 70
009 50      CONTINUE
010         WRITE ( 6, 60 ) LABEL
009 60      FORMAT ( ' PREMATURE EOF IN FINLBL' ,/,
009      *    ' WHILE SEARCHING LABEL: ', A50 )
009 70      CONTINUE
009         RETURN
009         END

END ELT.
```

```
@ELT,L NLR.GETCOV
LLTOI7 RLIB70 09/15-17:10:49-(4,)
       000        SUBROUTINE GETCOV
       000       *     (
       000       *        NPAR,                          @ INPUT
       000       *        PSIG,                          @ INPUT
       000       *        CORR,                          @ INPUT
       000       *        COVR                           @ OUTPUT
       000       *     )
       003 C**   NAME: PASS*NLR.GETCOV
       000 C**
       003 C**   USAGE: CALL GETCOV ( NPAR, PSIG, CORR, COVR )
       000 C**
       003 C**   PURPOSE: CONVERT THE REGRESSION EQUATION PARAMETER
       003 C**            CORRELATION MATRIX TO A COVARIANCE MATRIX
       000 C**
       003 C**   LIMITATIONS: NONE
       000 C**
       003 C**   WARNINGS: NONE
       000 C**
       003 C**   SUBPROGRAMS REQUIRED: NONE
       000 C**
       003 C**   ARGUMENTS:
       000 C**
       003 C**      INPUT:
       003 C**             NPAR                      @ NUM OF REGR EQN PARAMS
       003 C**             PSIG                      @ REGRPARAM ST DEVS
       003 C**             CORR                      @ CORRELATION MATRIX
       000 C**
       003 C**      OUTPUT:
       003 C**             COVR                      @ COVARIANCE MATRIX
       000 C**
       003 C**   NOTES: NONE
       000 C**
       003 C**   PROGRAMMER/ORGANIZATION: HOFMOCKEL-JL/CSC
       000 C**
       003 C**   ALGORITHM: INPUT - MULTIPLY CORRELATION MATRIX BY
       004 C**              DIAGONAL STANDARD DEVIATION MATRIX
       004 C**              TO YIELD COVARIANCE MATRIX - OUTPUT
       000 C**
       003 C**   APPLICABILITY: ASCII FORTRAN
       000 C**
       003 C**   KEYWORDS: CORRELATION, COVARIANCE, MATRIX, STANDARD
       003 C**             DEVIATION, REGRESSION PARAMETERS
       000 C**
       003 C**   RECORD OF MODIFICATIONS: INITIAL PROGRAM 8-30-82
       000 C**
       000 C**   WAIVERS: NONE
       000        START EDIT PAGE
       000
       000        REAL CORR ( 50 )               @ PARAM CORR MATRIX
       000        REAL COVR ( 50 )               @ PARAM COVAR MATRIX
       002        INTEGER I                      @ SQ MAT ROW IDX
       002        INTEGER J                      @ SQ MAT COL IDX
       002        INTEGER K                      @ TRIAG MAT IDX
       000        INTEGER NPAR                   @ NUM OF PARAMS
       000        REAL PSIG ( 10 )               @ PARAM ST DEVS
```

```
000 C
000 C
000 C
002          K = 0                             * PRESET TRIAG IDX
002          DO 20 I = 1, NPAR                 * SQ MAT ROW LOOP
002            DO 10 J = 1, I                  * SQ MAT COL LOOP
002              K = K + 1                     * INCR TRIAG MAT IDX
002              COVR ( K ) = CORR ( K ) *     * CONVERT CORR TO COVR
000        *       PSIG ( I )*PSIG ( J )
001 10         CONTINUE
000 20       CONTINUE
000          RETURN
000          END

END ELT.
```

```
@ELT,L NLR.PRTCOV
ELT0T7 RLIB70 09/15-17:10:58-(5,)
001        SUBROUTINE PRTCOV
001       *    (
001       *      PTIT,                         @ INPUT
001       *      RTIT,                         @ INPUT
001       *      NPAR,                         @ INPUT
001       *      COVR                          @ INPUT
001       *    )
004 C**   NAME: PASS*NLR.PRTCOV
001 C**
004 C**   USAGE: CALL PRTCOV ( PTIT, RTIT, NPAR, COVR )
001 C**
004 C**   PURPOSE: PRINTOUT THE REGRESSION EQUATION
004 C**            PARAMETER COVARIANCE MATRIX
001 C**
004 C**   LIMITATIONS: NONE
001 C**
004 C**   WARNINGS: NONE
001 C**
004 C**   SUBPROGRAMS REQUIRED: NONE
001 C**
004 C**   ARGUMENTS:
001 C**
004 C**      INPUT:
004 C**             PTIT                   @ PROBLEM TITLE
004 C**             RTIT                   @ REGRESSION TITLE
004 C**             NPAR                   @ NUM REGR EQN PARAMS
004 C**             COVR                   @ COVARIANCE MATRIX
001 C**
004 C**      FILE OUTPUT:
004 C**                   PRINTOUT FORMAT ON LU 6
001 C**
005 C**   NOTES: NONE
001 C**
004 C**   PROGRAMMER/ORGANIZATION: HOFMOCKEL-JL/CSC
001 C**
004 C**   ALGORITHM: INPUT - PRINT FORMATTED MATRIX - EXIT
001 C**
004 C**   APPLICABILITY: ASCII FORTRAN
001 C**
004 C**   KEYWORDS: COVARIANCE MATRIX, REGRESSION PARAMETERS
001 C**
004 C**   RECORD OF MODIFICATIONS: INITIAL PROGRAM 9-5-82
001 C**
001 C**   WAIVERS: NONE
001        START EDIT PAGE
001
001        REAL COVR ( 50 )                    @ PARAM COVAR MATRIX
001        INTEGER I                           @ ROW INDEX VRBL
001        INTEGER J                           @ BEG OF COLS
001        INTEGER K                           @ END OF COLS
002        INTEGER L                           @ TRIAG MAT IDX
001        INTEGER NPAR                        @ NUM PARAMS
001        CHARACTER*4 PLAB ( 10 )             @ PARAM LABELS
001       */'P1','P2','P3','P4','P5',
001       * 'P6','P7','P8','P9','P10'/
```

```
001        CHARACTER*80 PTIT                        * PROBLEM TITLE
001        CHARACTER*80 RTIT                        * REGRESSION TITLE
002        WRITE ( 6, 10 ) PTIT, RTIT               * NEW PG & TITLES
001 10     FORMAT ( '1', //,
003       *  ' PROBLEM TITLE IS:',/, A80,
002       *  /,' REGRESSION TITLE IS:',
003       *  /, A80 /,/,
003       *  ' PARAMETER COVARIANCE MATRIX:',
002       *  / )
002        WRITE ( 6, 20 )                          * LABEL COLS
001       *  (PLAB ( I ), I = 1, NPAR )
002 20     FORMAT ( 12X, 10( 8X, A4 ) ,/ )
002        WRITE ( 6, 30 )                          * COL IDX LABELS
001       *  ( I, I = 1, NPAR )
002 30     FORMAT ( /, 12X, 10 ( I10, 2X )  )
002        J = 1                                    * BEG COL IDX
002        DO 50 I = 1, NPAR                        * SQ MAT ROW LOOP
001          K = J + I - 1                          * END OF COLS IDX
001          WRITE ( 6, 40 ) PLAB ( I ), I,
001       *   ( COVR ( L ), L = J, K )              * PRT ONE ROW
003 40       FORMAT( 1X,A4,I5,2X,10F12.6 )
001          J = J + I                              * RESET BEG COL
001 50     CONTINUE
001        RETURN
001        END

END ELT.
```

```
@ELT,L NLR.GETSXD
ELT017 RLIB70 09/15-17:11:26-(13,)
009          SUBROUTINE GETSXD
009         *    (
009         *             NPAR,              @ INPUT
009         *             NCAS,              @ INPUT
009         *                P,              @ INPUT
009         *                X,              @ INPUT
009         *             SLRD,              @ OUTPUT
009         *             ICTR,              @ OUTPUT
009         *              NSX,              @ OUTPUT
009         *               SX               @ OUTPUT
009         *                 )
012 C**     NAME: PASS+NLR.GETSXD
009 C**
012 C**     USAGE: CALL GETSXD ( NPAR, NCAS, P, X,
012 C**                          SLRD, ICTR, NSX, SX )
009 C**
012 C**     PURPOSE: REARRANGE THE HOLDING TIME DATA FROM A
012 C**              PERFORMANCE INDEX BASIS TO A SIGNAL
012 C**              EXCESS BASIS. AT THE SAME TIME COMBINE
012 C**              THE DATA FOR ALL TARGETS IN THE DATA SET.
012 C**              ALSO GET SOURCE LEVEL LESS RECOGNITION
012 C**              DIFFERENTIAL FOR EACH TARGET AND COUNT
012 C**              THE NUMBER OF CASES FOR EACH TARGET.
009 C**
012 C**     LIMITATIONS: NONE
009 C**
012 C**     WARNINGS: NONE
009 C**
012 C**     SUBPROGRAMS REQUIRED: NONE
009 C**
012 C**     ARGUMENTS:
009 C**            ,
012 C**        INPUT:
012 C**              NPAR                  @ NUM REGR EQN PARAMS
012 C**              NCAS                  @ NUM REGR CASES(DATA PTS)
012 C**                 P                  @ REGR EQN PARAMS
012    C**              X                  @ REGR VARIABLES
009 C**
009 C**
012 C**        OUTPUT:
012 C**              SLRD                  @ SRCE LVL - RECOG DIFF PER TGT
012 C**              ICTR                  @ COUNT OF CASES PER TGT
013 C**               NSX                  @ NUMBER OF SIGNAL EXCESS PTS
012 C**                SX                  @ SIGNAL EXCESS DATA
009 C**
012 C**     NOTES: NONE
009 C**
012 C**     PROGRAMMER/ORGANIZATION: HOFMOCKEL-JL/CSC
009 C**
013 C**     ALGORITHM: PASS THROUGH THE DATA CASE BY CASE AND
013 C**                PROPORTIONALLY ASSIGN HOLDING TIME AND
013 C**                AVAILABLE HOLDING TIME TO SIGNAL EXCESS
013 C**                BINS BASED ON THE OVERLAP WITH PERFORMANCE
013 C**                INDEX BINS.  USE THE REGRESSION PARAMETERS
013 C**                TO ESTIMATE THE SIGNAL EXCESS FOR A PARTICULAR
```

```
013 C**             PERFORMANCE INDEX.
009 C**
012 C**  APPLICABILITY: ASCII FORTRAN
009 C**
012 C**  KEYWORDS: SIGNAL EXCESS, PERFORMANCE INDEX
009 C**
012 C**  RECORD OF MODIFICATIONS: INITIAL PROGRAM 8-25-82
009 C**
009 C**  WAIVERS: NONE
009       START EDIT PAGE
009
009       REAL DIFR                             @ SX BIN OVERLAP
009       REAL FIN                              @ FRACT IN SX BIN
009       REAL FOUT                             @ FRACT OUT OF BIN
009       INTEGER I                             @ UTIL INDEX VRBL
009       INTEGER ICTR ( 10 )                   @ COUNT OF CASES/SOURCE
010       INTEGER IX                            @ ICTR INDEX INCR
009       INTEGER J                             @ UTIL INDEX VRBL
009       INTEGER K                             @ UTIL INDEX VRBL
009       REAL MIDL                             @ MIDDLE OF SX BIN
009       INTEGER NCAS                          @ NUMBER OF CASES
009       INTEGER NPAR                          @ NUM OF PARAMS
009       INTEGER NSRC                          @ NUM OF SOURCES
009       REAL P ( 10 )                         @ REGRESSION PARAMS
009       REAL SLRD ( 10 )                      @ SRC LVL - DET THR
011       REAL SX ( 4, 200 )                    @ VRBLS VS SX
009      *                                      @ WD1=SX ( SIGNAL EXCESS )
009      *                                      @ WD2=FHT (FRACT HOLD TIME)
009      *                                      @ WD3=HT (OBS HOLD TIME)
009      *                                      @ WD4=AHT ( AVAIL HOLD TIME)
009       REAL SXB                              @ SX BIASED +45 DB
009       REAL X ( 10, 200 )                    @ VRBLS VS PERFORMANCE INDEX
009      *                                      @ WD1=PI ( PERF INDEX )
009      *                                      @ WD2=FHT
009      *                                      @ WD3=CASEWT
009      *                                      @ WD4=AHT
009      *                                      @ WD5...WDN=SOURCES ( 00 OR 1 )
009       REAL XIPR                             @ SAVE PRIOR VRBL
009 C
009       START EDIT PAGE
009 C
010       DO 20 J = 1, 200                      @ CLR SX, USE AS ACCUM
010         DO 10 I = 1, 4
009           SX ( I, J ) = 0.0
010 10      CONTINUE
009 20    CONTINUE
009       NSRC = NPAR - 1                       @ NUMBER SOURCES
009       SLRD ( 1 ) = - P ( 1 ) / P ( 2 )      @ 1ST SRC SL-RD
009       ICTR ( 1 ) = 0
009       DO 30 I = 2, NSRC                     @ SRCS 2 THRU N
009         SLRD ( I ) = SLRD ( 1 )
009      *     - P ( I + 1 ) / P ( 2 )          @ COMBINE 1ST, NTH SRCS
009         ICTR ( I ) = 0
009 30    CONTINUE
009       XIPR = 0.0                            @ PRESET PRIOR VRBL SAV
009       I = 1
010       IX = 4
```

```
010        DO 60 J = 1, NCAS                         @ LOOP THRU CASES
010          IF ( X(I+IX, J ) .NE. XIPR )THEN
010            XIPR = 1.0                            @ SAVE PRIOR VRBL
009            I = I + 1                             @ INDEX CASES/SOURCE
010            IF ( I .EQ. 2 ) IX = 3
009          ENDIF
009          ICTR ( I ) = ICTR ( I ) + 1             @ COUNT CASES/SOURCE
009          SXB = SLRD ( I ) -
010     *      X ( 1, J ) + 90.0                     @ BIAS SX +90 DB
009          K = INT ( SXB/1.5 )                     @ SX INDEX ( POSITIV )
010          IF ( K .LT. 1 ) THEN
010            WRITE ( 6, 40 ) K
010 40         FORMAT ( 'ERROR: K=',I5,
010     *        ', RESET K = 1 ' )
010          K = 1
010          ENDIF
010          IF ( K .GT. 200 ) THEN
010          WRITE ( 6, 50 ) K
010 50         FORMAT ( ' ERROR: K=',I5,
010     *        ', RESET K = 200' )
010            K = 200
010          ENDIF
010          MIDL = 0.75 + 1.50*FLOAT ( K )          @ MIDDLE OF SX BIN
009          DIFR = SXB - MIDL                       @ SX BIN OVERLAP
009          FOUT = ABS ( DIFR ) / 1.5               @ FRACT OUT OF BIN
009          FIN = 1.0 - FOUT                        @ FRACT IN THE BIN
010          SX ( 1, K ) = MIDL - 90.0               @ REMOVE SX BIAS
009          SX ( 3, K ) = SX ( 3, K ) +             @ PROCESS PORTIONS OF
009     *      FIN*X ( 2, J )*X ( 4, J )             @ DATA IN THE BIN
010          SX ( 4, K ) = SX ( 4, K ) +
010     *        FIN*X ( 4, J )
009          IF ( DIFR .NE. 0.0 ) THEN               @ PROCESS PORTIONS OF
010            IF ( DIFR .GT. 0.0 ) K = K +1         @ DATA OVERLAPPING
010            IF (( DIFR .LT. 0.0 ) K = K -1        @ AN ADJACENT BIN
009            SX ( 1,K ) = MIDL +
010     *        SIGN ( 1.5, DIFR ) -90.0
009            SX ( 3, K ) = SX ( 3, K ) +
009     *        FOUT*X ( 2, J )*X ( 4, J )
009            SX ( 4, K ) = SX ( 4, K ) +
009     *        FOUT*X ( 4, J )
009          ENDIF
010 60     CONTINUE                                  @ END LOOP ON CASES
009        K = 0
010        DO 80 J = 1, 200                          @ LOOP TO PACK SX DATA
010          IF ( SX ( 4, J ) .NE. 0.0 )THEN         @ ANY DATA IN LOC ?
009            K = K + 1                             @ PACKED SX INDEX
010            DO 70 I = 1, 4                        @ LOOP THRU WDS
009              IF ( I .EQ. 2 ) THEN
009                SX ( I, K ) =
010     *            SX ( 3, J )/SX ( 4, J )         @ FRACT HOLD TIME
009              ELSE
009                SX ( I, K ) = SX ( I, J )         @ MOVE THE DATA
009              ENDIF
009              SX ( I, J ) = 0.0                   @ CLR VACATED LOC
010 70         CONTINUE                              @ END DATA WDS LOOP
010          ENDIF
010 80     CONTINUE                                  @ END PACK SX LOOP
```

```
000170      009      NSX = K                        * SET NUM SX ITEMS IN O/P
000171      009      RETURN
000172      009      END

END ELT.
```

```
@ELT,L NLR.PRTSXD
ELT017 RLIB70 09/15-17:11:36-(6,)
002         SUBROUTINE PRTSXD
002        *       (
002        *         PTIT,                        @ INPUT
002        *         RTIT,                        @ INPUT
002        *         NPAR,                        @ INPUT
002        *            P,                        @ INPUT
002        *         SLRD,                        @ INPUT
002        *         ICTR,                        @ INPUT
002        *          NSX,                        @ INPUT
002        *           SX                         @ INPUT
002        *               )
006 C**    NAME: PASS*NLR.PRTSXD
002 C**
006 C**    USAGE: CALL PRTSXD ( PTIT, RTIT, NPAR, P
006 C**                         SLRD, ICTR, NSX, SX )
002 C**
006 C**    PURPOSE: PRINT THE HOLDING TIME DATA BASED
006 C**             ON 1.5 DB SIGNAL EXCESS DATA BINS.
002 C**
006 C**    LIMITATIONS: NONE
002 C**
006 C**    WARNINGS: NONE
002 C**
006 C**    SUBPROGRAMS REQUIRED: NONE
002 C**
006 C**    ARGUMENTS:
002 C**
006 C**       INPUT:
006 C**             PTIT                      @ PROBLEM TITLE
006 C**             RTIT                      @ REGRESSION TITLE
006 C**             NPAR                      @ NUM REGR PARAMS
006 C**                P                      @ REGRESSION PARAMS
006 C**             SLRD                      @ SRCE LVL - RECOG DIFF(DET THR)
006 C**             ICTR                      @ COUNT OF CASES PER TGT
006 C**              NSX                      @ NUM SIG EX DATA PTS
006 C**               SX                      @ SIGNAL EXCESS DATA
002 C**
006 C**       FILE OUTPUT: PRINTED FORMAT ON LU 6
002 C**
006 C**    NOTES: NONE
002 C**
006 C**    PROGRAMMER/ORGANIZATION: HOFMOCKEL-JL/CSC
002 C**
006 C**    ALGORITHM: INPUT - PROCESS - PRINTOUT
002 C**
006 C**    APPLICABILITY: ASCII FORTRAN
002 C**
006 C**    KEYWORDS: SIGNAL EXCESS, HOLDING TIME, AVAILABLE TIME,
006 C**              SOURCE LEVEL, RECOGNITION DIFFERENTIAL
002 C**
006 C**    RECORD OF MODIFICATIONS: INITIAL PROGRAM 8-30-82
002 C**
002 C**    WAIVERS: NONE
002         START EDIT PAGE
002
```

```
002         INTEGER ICTR ( 10 )                @ COUNT CASES/SOURCE
002         INTEGER NPAR                       @ NUM OF PARAMS
002         INTEGER NSRC                       @ NUM OF SOURCES
002         INTEGER NSX                        @ NUM ITEMS IS SX DATA
002         REAL P ( 10 )                      @ REGRESSION PARAMS
002         CHARACTER*80 PTIT                  @ PROBLEM TITLE
002         CHARACTER*80 RTIT                  @ REGRESSION TITLE
002         REAL SDSX                          @ STAN DEV OF SX
002         REAL SLRD ( 10 )                   @ SOURCE LVL-DET THRHLD
005         REAL SX ( 4, 200 )                 @ SIG EXCESS DATA
002 C
002 C
002 C
002         WRITE ( 6, 10 ) PTIT, RTIT
003 10      FORMAT ( '1' // ' PROBLEM TITLE ',
003        * 'IS:',/,A80,//,' REGRESSION ',
003        * ' TITLE IS:',/, A80, //,
003        * ' SIGNAL EXCESS DATA:' , / )
002         SDSX = 1.0 / P ( 2 )               @ S.D. IS P(2) INV
002         WRITE ( 6, 20 ) SDSX
003 20      FORMAT (' ', ' S. D. OF S. E. = ',
003        * F5.2, ' DB' )
002         NSRC = NPAR - 1                    @ NUM SRCS
003         WRITE ( 6, 30 )                    @ SRC LVL DATA HDR
004 30      FORMAT ( '0', 2X, 'SOURCE #', 4X,
004        * 'SL - RD',4X, '# OF CASES', / )
003         WRITE ( 6, 40 )                    @ SL DATA
003        *  (I, SLRD(I), ICTR(I), I=1,NSRC )
003 40      FORMAT ( ' ', 3X, I5, 2X, F10.2,
003        * 3X, I5 )
002         WRITE ( 6, 50 )                    @ SX DATA  HDR
003 50      FORMAT ( '0', 5X, 'SE', 8X, 'FHT',
002        * 8X, 'HT', 8X, 'AT', / )
002         WRITE ( 6, 60 )                    @ SX DATA PRTOUT
003        *  ( ( SX(I,J), I = 1, 4 ),
003        *    J = 1, NSX )
003 60      FORMAT ( ' ', 3X, F6.2, 3X, F8.5,
003        *  2F10.1 )
002         RETURN
002         END

END ELT.

@
```

```
@ELT,L NLR.RUN/SXPROC
ELT0T7 RLIB70 10/19-11:41:03-(8,)
        005 @RUN,S/NR SXPROC,DLK72310230A/HOFMOCKEL-JL,PASS,5,100
        006 @SYM PRINT$,,CSCRMT
        006 @ASG,A PRT5.
        006 @USE PRT,PRT5
        006 @PRX,U PRT.
        004 @XQT PASS+NLR.SXPROC
        004  $INPUTS
        005    FILNAM='NLRDAT',
        006    ELEM='PRT1',
        008    VERS='MSQ',
        004    COVAR=T,
        004    SIGEX=T,
        005    STOP=F,
        004  $END
        005  $INPUTS
        006    ELEM='PRT2',
        005  $END
        005  $INPUTS
        006    ELEM='PRT3',
        005    STOP=T,
        005  $END
        005 @BRKPT PRINT$

END ELT.

@
```

@XQT PASS•NLR.SXPROC

PROBLEM TITLE IS:
REGRESSION ON REAL PI DATA
REGRESSION TITLE IS:
PARAMETERS FROM REAL DATA SET # 1(6 SOURCES)

PARAMETER COVARIANCE MATRIX:

		P1	P2	P3	P4	P5	P6	P7
		1	2	3	4	5	6	7
P1	1	11.820834						
P2	2	-.067482	.000386					
P3	3	-.069131	.000266	.042617				
P4	4	-.179266	.000897	.023185	.047356			
P5	5	-.024570	.000012	.022575	.022593	.028407		
P6	6	-.283548	.001493	.023595	.026036	.022611	.041303	
P7	7	.705974	-.004167	.019690	.012893	.022444	.006451	.249116

PROBLEM TITLE IS:
REGRESSION ON REAL PI DATA

REGRESSION TITLE IS:
PARAMETERS FROM REAL DATA SET # 1(6 SOURCES)

SIGNAL EXCESS DATA:

S. D. OF S. E. = 6.90 DB

SOURCE #	SL - RD	# OF CASES
1	159.32	11
2	159.13	12
3	158.98	13
4	164.81	14
5	158.61	17
6	163.32	4

SE	FHT	HT	AT
-29.25	.00000	.0	7.0
-27.75	.00000	.0	177.7
-26.25	.00077	.5	676.1
-24.75	.00009	.0	455.6
-23.25	.00049	.6	1293.5
-21.75	.00016	.2	1091.8
-20.25	.00000	.0	479.2
-18.75	.00000	.0	450.3
-17.25	.00000	.0	718.7
-15.75	.00119	1.5	1297.8
-14.25	.00465	5.5	1180.8
-12.75	.00593	4.1	693.8
-11.25	.04333	22.9	527.4
-9.75	.05936	27.7	466.5
-8.25	.07442	20.6	276.8
-6.75	.12292	6.7	54.3
-5.25	.47803	9.6	20.0
-3.75	.62027	3.8	6.2
-2.25	.97667	.4	.4

PROBLEM TITLE IS:
REGRESSION ON REAL PI DATA
REGRESSION TITLE IS:
PARAMETERS FROM REAL DATA SET # 2(5 SOURCES)

PARAMETER COVARIANCE MATRIX:

		P1	P2	P3	P4	P5	P6
		1	2	3	4	5	6
P1	1	1.718406					
P2	2	-.009685	.000055				
P3	3	-.032131	.000101	.024910			
P4	4	.031633	-.000262	.013882	.183716		
P5	5	.017083	-.000179	.014032	.015212	.019219	
P6	6	-.019914	.000032	.014419	.014210	.014259	.044027

PROBLEM TITLE IS:
REGRESSION ON REAL PI DATA

REGRESSION TITLE IS:
PARAMETERS FROM REAL DATA SET # 2(5 SOURCES)

SIGNAL EXCESS DATA:

S. D. OF S. E. = 20.79 DB

SOURCE #	SL - RD	# OF CASES
1	143.52	17
2	141.99	17
3	119.12	11
4	165.23	20
5	129.31	15

SE	FHT	HT	AT
-71.25	.00000	.0	71.6
-69.75	.00000	.0	214.2
-68.25	.00000	.0	12.5
-66.75	.00000	.0	24.2
-65.25	.00000	.0	90.2
-63.75	.00060	.2	295.0
-62.25	.00270	.5	193.5
-60.75	.00000	.0	218.2
-59.25	.00000	.0	276.6
-57.75	.00000	.0	214.5
-56.25	.00000	.0	130.3
-54.75	.00000	.0	123.7
-53.25	.00000	.0	105.6
-51.75	.00000	.0	46.8
-50.25	.00000	.0	28.5
-48.75	.00000	.0	60.4
-47.25	.00000	.0	385.4
-45.75	.00262	.9	338.5
-44.25	.00933	3.3	353.7
-42.75	.01066	4.0	373.1
-41.25	.00777	1.6	200.3
-39.75	.00000	.0	105.5
-38.75	.00000	.0	87.8
-36.75	.00000	.0	47.0
-35.25	.00018	.0	121.3
-33.75	.06497	6.5	99.8
-32.25	.09494	9.4	99.1
-30.75	.02196	2.1	94.6
-29.25	.08339	18.2	218.0
-27.75	.10573	41.0	387.6
-26.25	.19807	23.7	119.7
-24.75	.09390	11.2	119.5
-23.25	.13449	21.2	157.8
-21.75	.09147	11.5	126.0
-20.25	.14203	14.0	98.3

-18.75	.17369	14.9	85.6
-17.25	.23128	21.4	92.5
-15.75	.26800	42.1	157.1
-14.25	.29654	56.0	188.8
-12.75	.37708	49.7	131.9
-11.25	.36196	32.8	90.6
-9.75	.27049	19.6	72.5
-8.25	.21075	15.7	74.5
-6.75	.25565	15.6	61.2
-5.25	.53656	11.7	21.9
-3.75	.64266	8.6	13.4
-2.25	.47776	3.5	7.4
-.75	.56382	2.5	4.5
.75	.43949	2.4	5.5
2.25	.00000	.0	4.0
3.75	.00000	.0	4.0
5.25	.00000	.0	2.9

PROBLEM TITLE IS:
REGRESSION ON REAL PI DATA
REGRESSION TITLE IS:
PARAMETERS FROM REAL DATA SET # 3(5 SOURCES)

PARAMETER COVARIANCE MATRIX:

		P1	P2	P3	P4	P5	P6
		1	2	3	4	5	6
P1	1	4.216591					
P2	2	-.024313	.000141				
P3	3	-.064151	.000227	.094363			
P4	4	.090889	-.000672	.023912	.059735		
P5	5	-.072045	.000273	.025437	.023696	.032306	
P6	6	-.051058	.000151	.025242	.024275	.025289	.077012

PROBLEM TITLE IS:
REGRESSION ON REAL PI DATA

REGRESSION TITLE IS:
PARAMETERS FROM REAL DATA SET # 3(5 SOURCES)

SIGNAL EXCESS DATA:

S. D. OF S. E. = 9.59 DB

SOURCE #	SL - RD	# OF CASES
1	157.80	13
2	148.90	13
3	157.69	10
4	166.87	16
5	150.56	13

SE	FHT	HT	AT
-36.75	.00000	.0	2.0
-35.25	.00000	.0	23.5
-33.75	.00000	.0	86.5
-32.25	.00000	.0	197.3
-30.75	.00000	.0	355.0
-29.25	.00000	.0	375.8
-27.75	.00057	.2	278.5
-26.25	.00181	.7	370.9
-24.75	.00677	2.7	406.2
-23.25	.01149	4.9	427.4
-21.75	.00546	4.0	739.5
-20.25	.01015	9.2	910.5
-18.75	.01397	9.2	661.1
-17.25	.03663	10.3	280.8
-15.75	.08686	17.0	195.4
-14.25	.07078	12.8	180.8
-12.75	.06424	10.4	161.5
-11.25	.08790	24.5	278.3
-9.75	.10597	29.0	274.1
-8.25	.21646	23.5	108.7
-6.75	.23709	23.1	97.5
-5.25	.60796	43.8	72.0
-3.75	.63813	73.8	115.7
-2.25	.56654	37.0	65.2
-.75	.40926	26.1	63.8
.75	.51190	30.0	58.6
2.25	.60998	36.0	59.0
3.75	.65529	59.0	90.0
5.25	.57159	70.2	122.8
6.75	.55639	48.4	86.9

STOP NORMAL SXPROC STOP

@XQT PASS*NLR.SXPROC/WB

PROBLEM TITLE IS:
REGRESSION ON REAL PI DATA
REGRESSION TITLE IS:
PARAMETERS FROM REAL DATA SET # 1(6 SOURCES)

PARAMETER COVARIANCE MATRIX:

		P1	P2	P3	P4	P5	P6	P7
		1	2	3	4	5	6	7
P1	1	11.820834						
P2	2	-.067482	.000386					
P3	3	-.069131	.000266	.042617				
P4	4	-.179266	.000897	.023185	.047356			
P5	5	-.024570	.000012	.022575	.022593	.028407		
P6	6	-.283548	.001493	.023595	.026036	.022611	.041303	
P7	7	.705974	-.004167	.019690	.012893	.022444	.006451	.249116

PROBLEM TITLE IS:
REGRESSION ON REAL PI DATA

REGRESSION TITLE IS:
PARAMETERS FROM REAL DATA SET # 1(6 SOURCES)

SIGNAL EXCESS DATA:

S. D. OF S. E. = 6.90 DB

SOURCE #	SL - RD	# OF CASES
1	159.32	11
2	159.13	12
3	158.98	13
4	164.81	14
5	158.61	17
6	163.32	4

SE	FHT	HT	AT
-29.25	.00000	.0	8.0
-27.75	.00000	.0	218.0
-26.25	.00067	.6	843.0
-24.75	.00000	.0	300.0
-23.25	.00052	.8	1543.0
-21.75	.00000	.0	998.0
-20.25	.00000	.0	297.0
-18.75	.00000	.0	398.0
-17.25	.00000	.0	698.0
-15.75	.00000	.0	1494.0
-14.25	.00763	8.9	1168.0
-12.75	.00495	3.3	667.0
-11.25	.05044	25.8	511.0
-9.75	.06478	29.9	461.0
-8.25	.07744	18.1	234.0
-6.75	.33778	3.7	11.0
-5.25	.48396	11.1	23.0
-3.75	.97667	2.0	2.0

PROBLEM TITLE IS:
REGRESSION ON REAL PI DATA
REGRESSION TITLE IS:
PARAMETERS FROM REAL DATA SET # 2(5 SOURCES)

PARAMETER COVARIANCE MATRIX:

		P1	P2	P3	P4	P5	P6
		1	2	3	4	5	6
P1	1	1.718406					
P2	2	-.009685	.000055				
P3	3	-.032131	.000101	.024910			
P4	4	.031633	-.000262	.013882	.183716		
P5	5	.017083	-.000179	.014032	.015212	.019219	
P6	6	-.019914	.000032	.014419	.014210	.014259	.044027

PROBLEM TITLE IS:
REGRESSION ON REAL PI DATA

REGRESSION TITLE IS:
PARAMETERS FROM REAL DATA SET # 2(5 SOURCES)

SIGNAL EXCESS DATA:

S. D. OF S. E. = 20.79 DB

SOURCE #	SL - RD	# OF CASES
1	143.52	17
2	141.99	17
3	119.12	11
4	165.23	20
5	129.31	15

SE	FHT	HT	AT
-69.75	.00000	.0	284.0
-68.25	.00000	.0	7.0
-66.75	.00000	.0	29.0
-65.25	.00000	.0	10.0
-63.75	.00000	.0	328.0
-62.25	.00355	.7	197.0
-60.75	.00000	.0	183.0
-59.25	.00000	.0	254 0
-57.75	.00000	.0	265.0
-56.25	.00000	.0	136.0
-54.75	.00000	.0	110.0
-53.25	.00000	.0	134.0
-51.75	.00000	.0	72.0
-50.25	.00000	.0	17.0
-48.75	.00000	.0	42.0
-47.25	.00000	.0	365.0
-45.75	.00000	.0	347.0
-44.25	.00601	1.9	322.0
-42.75	.01353	4.9	363.0
-41.25	.01045	2.9	275.0
-39.75	.00000	.0	112.0
-38.25	.00000	.0	98.0
-36.75	.00000	.0	46.0
-35.25	.00000	.0	122.0
-33.75	.06560	6.6	100.0
-32.25	.09573	9.5	99.0
-30.75	.02050	1.9	94.0
-29.25	.08294	18.1	218.0
-27.75	.10535	41.1	390.0
-26.25	.20142	23.8	118.0
-24.75	.09868	16.9	171.0
-23.25	.12760	21.3	167.0
-21.75	.08514	9.5	112.0
-20.25	.19703	19.9	101.0
-18.75	.14207	10.1	71.0

-17.25	.28466	32.2	113.0
-15.75	.25899	51.5	199.0
-14.25	.33630	60.2	179.0
-12.75	.45699	39.8	87.0
-11.25	.27820	26.2	94.0
-9.75	.25722	13.4	52.0
-8.25	.18678	17.9	96.0
-6.75	.48048	13.5	28.0
-5.25	.63000	10.1	16.0
-3.75	.66020	7.3	11.0
-2.25	.00000	.0	4.0
-.75	.99333	5.0	5.0
.75	.00000	.0	6.0
2.25	.00000	.0	2.0
3.75	.00000	.0	6.0

PROBLEM TITLE IS:
REGRESSION ON REAL PI DATA
REGRESSION TITLE IS:
PARAMETERS FROM REAL DATA SET # 3(5 SOURCES)

PARAMETER COVARIANCE MATRIX:

		P1	P2	P3	P4	P5	P6
		1	2	3	4	5	6
P1	1	4.216591					
P2	2	-.024313	.000141				
P3	3	-.064151	.000227	.094363			
P4	4	.090889	-.000672	.023912	.059735		
P5	5	-.072045	.000273	.025437	.023696	.032306	
P6	6	-.051058	.000151	.025242	.024275	.025289	.077012

PROBLEM TITLE IS:
REGRESSION ON REAL PI DATA

REGRESSION TITLE IS:
PARAMETERS FROM REAL DATA SET # 3(5 SOURCES)

SIGNAL EXCESS DATA:

S. D. OF S. E. = 9.59 DB

SOURCE #	SL - RD	# OF CASES
1	157.80	13
2	148.90	13
3	157.69	10
4	166.87	16
5	150.56	13

SE	FHT	HT	AT
-35.25	.00000	.0	5.0
-33.75	.00000	.0	52.0
-32.25	.00000	.0	155.0
-30.75	.00000	.0	298.0
-29.25	.00000	.0	424.0
-27.75	.00000	.0	310.0
-26.25	.00134	.5	397.0
-24.75	.00292	1.0	341 0
-23.25	.01377	6.1	441.0
-21.75	.00315	3.0	952.0
-20.25	.01504	11.0	732.0
-18.75	.00980	7.2	733.0
-17.25	.05361	14.7	274.0
-15.75	.12214	18.8	154.0
-14.25	.03687	5.5	149.0
-12.75	.04267	7.0	165.0
-11.25	.09224	15.3	166.0
-9.75	.08639	36.6	424.0
-8.25	.23665	18.2	77.0
-6.75	.20846	32.3	155.0
-5.25	.60248	10.2	17.0
-3.75	.60883	90.7	149.0
-2.25	.72667	50.1	69.0
-.75	.30882	18.5	60.0
.75	.53150	36.7	69.0
2.25	.46889	20.6	44.0
3.75	.71858	57.5	80.0
5.25	.58716	61.1	104.0
6.75	.55639	82.9	149.0

STOP NORMAL SXPROC STOP

@BRKPT PRINTS

APPENDIX F

NONLINEAR REGRESSION PLOTS
COMPUTER PROGRAM PACKAGE

NLRPLT

HOFMOCK

7213

07OCT82

FILENAME • PRT3 USERID • HOFMOCKEL-JL ACCOUNT • DTA72130230A CREATED AT: 08:00:13 07 OCT 82

123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012

```
@ELT,L NLRPLT.MAP/NLRPLT
ELT0T7 RLIB70 10/09-10:47:20-(7,)
000001       004 SEG MAIN
000002       003 IN PASS*NLRPLT.MAIN/NLRPLT
000003       004 SEG READ*,(MAIN)
000004       006 IN PASS*NLRPLT.READIN
000005       004 IN PASS*NLR.FINLBL
000006       004 SEG COV*,(MAIN)
000007       004 IN PASS*NLR.GETCOV
000008       004 IN PASS*NLR.PRTCOV
000009       004 SEG SLRD*,(MAIN)
000010       003 IN PASS*NLRPLT.GETSLR
000011       003 IN PASS*NLRPLT.PRTSLR
000012       007 SEG HOLD*,(MAIN)
000013       003 IN PASS*NLRPLT.GETACT
000014       003 IN PASS*NLRPLT.GETPRD
000015       006 IN PASS*NLRPLT.GETCFI
000016       007 SEG PLTS*,(MAIN)
000017       003 IN PASS*NLRPLT.PLTALL
000018       006 IN PASS*NLRPLT.PLTONE
000019       003 LIB N*AIMSL.
000020       003 LIB N*ADISSPLA.
000021       003 END

END ELT.
```

```
@ELT,L NLRPLT.MAIN/NLRPLT
ELT017 RLIB70 10/09-10:46:28-(15,)
        011 C**  NAME: PASS*NLRPLT.MAIN/NLRPLT
        011 C**  USAGE: @XQT PASS*NLRPLT.NLRPLT
        011 C**
        011 C**  PURPOSE: PROCESS THE PRINT FILE FROM A BMDP P3R
        011 C**        (1981 VERS) NONLINEAR REGRESSION ANALYSIS RUN
        011 C**        TO REARRANGED THE DATA FOR PLOTTING THE NON-
        011 C**        LINEAR REGRESSION EQUATION PREDICTIONS AND
        011 C**        THE ASSOCIATED OBSERVED DATA.
        011 C**
        011 C**  LIMITATIONS: THE PRINT FILE FROM A P3R RUN MUST BE SAVED
        011 C**               AS AN ELEMENT OF A FILE.  THE MED PROCESSOR
        011 C**               MAY BE USED TO CONVERT BREAKPOINTED PRINT
        011 C**               FILES TO ELEMENTS OF FILES.
        011 C**
        011 C**  WARNINGS: IF PRINTOUT FILE CONTAINS ASTERISKS (****.**)
        011 C**            BECAUSE FORMAT SPECS WERE EXCEEDED DURING P3R
        011 C**            EXECUTION THEY SHOULD BE CHANGED TO 9999.99 BY
        011 C**            MEANS OF THE TEXT EDITOR BEFORE ATTEMPTING TO
        011 C**            READ THE PRINTOUT FILE WITH THIS PROGRAM.
        011 C**
        012 C**  SUBPROGRAMS REQUIRED: GETSLR, PRTSLR, GETCOV, PRTCOV,
        012 C**                        READIN, FINLBL, GETPRD, GETACT, PRTALL, ELTIN
        011 C**
        011 C**  FILES:
        011 C**
        011 C**     INPUT: PRINT FILE.ELEMS FROM P3R RUNS.
        011 C**             READ ON LU 8.
        011 C**
        011 C**    OUTPUT: PRINT FILE OUTPUT ON LU 6
        011 C**             PLOT FILE PLOT$.
        011 C**
        011 C**  NOTES: NONE
        011 C**
        011 C**  PROGRAMMER/ORGANIZATION: HOFMOCKEL-JL/CSC
        011 C**
        011 C**  ALGORITHM: SEARCH THROUGH THE FILE ELEMENT FOR
        011 C**             LABELS ASSOCIATED WITH DESIRED DATA.
        011 C**             READ THE DATA, THEN PROCESS TO PROCESS
        011 C**             TO CONVERT THE CORRELATION MATRIX TO
        011 C**             THE COVARIANCE MATRIX. PRINTOUT THE
        011 C**             COVARIANCE MATRIX IF REQUESTED.CALCULATE
        011 C**             PREDICTED FRACTIONAL HOLDING TIMES FOR
        011 C**             EACH SOURCE AND CONFIDENCE INTERVAL DATA
        011 C**            AS WELL.
        011 C**
        011 C**  APPLICABILITY: ASCII FORTRAN
        011 C**
        011 C**  KEYWORDS: HOLD TIME, PROBABILITY OF
        011 C**            DETECTION, COVARIANCE MATRIX,
        011 C**            CONFIDENCE INTERVALS.
        011 C**
        011 C**  RECORD OF MODIFICATIONS: INITIAL PROGRAM 9 - 27 - 82
        011 C**
        011 C**  WAIVERS: NONE
        011       START EDIT PAGE
```

```
011
011      REAL CORR ( 50 )                   @ CORRELATION MATRIX(PARAMS)
011      LOGICAL COVAR                      @ FLAG COVARIANCE PRT
011      REAL COVR ( 50 )                   @ COVARIANCE MATRIX(PARAMS)
012      CHARACTER*12 ELEM / ' ' /          @ FILE ELEMENT NAME
011      LOGICAL ELTCHK                     @ ELEMENT CHECK FUNC
012      LOGICAL FINK / .TRUE. /            @ FLAG INK CALL ONCE
012      CHARACTER*12 FILNAM / ' ' /        @ FILE NAME
011      INTEGER FSTAT                      @ FILE STATUS WD
011      INTEGER ICTR ( 10 )                @ COUNT ITEMS/SOURCE
012      LOGICAL LEVELS                     @ PRT SL -RD FLAG
011      INTEGER NCAS                       @ NUM OF CASES
012      INTEGER NPLT                       @ SEQ NUM PLOT
012      INTEGER NSRC                       @ NUM OF SOURCES
011      INTEGER NPAR                       @ NUM OF PARAMS
011      INTEGER NVAR                       @ NUM OF VRBLS
011      REAL P ( 10 )                      @ REGR EQN VRBLS
012      LOGICAL PLOTS                      @ FLAG PLOTS
011      REAL PSIG ( 10 )                   @ STAN DEV OF PARAMS
012      REAL RMSQ                          @ RESIDUAL MEAN SQUARE
011      CHARACTER*80 PTIT                  @ PROBLEM TITLE
011      CHARACTER*80 RTIT                  @ REGRESSION TITLE
011      REAL SLRD ( 10 )                   @ SRC LVL - DET THR
011      LOGICAL STOP                       @ RUN STOP SIGNAL
011      INTEGER UNIT / 8 /                 @ LOG UNIT FOR DATA IN
012      CHARACTER*12 VERS / ' ' /          @ ELEM VERS NAME
011      REAL X ( 10, 200 )                 @ REGR EQN VRBLS
012      REAL XA ( 4, 200 )                 @ X END PTS, OBS DATA CROSSES
012      REAL XP ( 61 )                     @ PREDICTED IND VRBL COORDS
012      REAL YA ( 4, 200 )                 @ Y END PTS, OBS DATA CROSSES
014      REAL YC ( 61, 2, 10 )              @ CONF INTERVAL Y VALS
012      REAL YP ( 61, 10 )                 @ PRED DEP VRBLS COORDS
011 C
012      NAMELIST / INPUTS/ COVAR, ELEM, FILNAM,
012     * LEVELS, PLOTS, STOP, UNIT, VERS
011 C
011 C
011 C
011 10   CONTINUE
011      READ ( 5, INPUTS )                 @ RUNSTREAM INPUTS
011      OPEN ( UNIT, IOSTAT=FSTAT,         @ ASSIGN DATA IN FILE
011     * FILE=FILNAM, STATUS='OLD' )
011      IF ( FSTAT .GE. 0 ) THEN           @ PROCESS IF STATUS OK
011        IF ( ELTCHK ( UNIT, ELEM,        @ CHK ELEM/VERS
011     *      VERS ) ) THEN
011          CALL ELTIN ( UNIT, ELEM,       @ SET UP FOR ELTIN
011     *            VERS )
011          CALL READIN ( UNIT, PTIT,      @ READ DATA FILE
011     *      RTIT, NVAR, NPAR, CORR,
012     *      NCAS, P, PSIG, X, RMSQ )
012          CALL GETSLR ( NPAR, NCAS, P,   @ CALC SL - RD
012     *                  X, SLRD, ICTR)
012          IF ( LEVELS )                  @ PRT SL -RD VS SRC
012     *      CALL PRTSLR ( PTIT, RTIT,
012     *      NPAR, P, SLRD, ICTR )
012          CALL GETCOV ( NPAR, PSIG,      @ GET COVARIANCE MATRIX
011     *        CORR, COVR )
```

```
012           IF ( COVAR )                     @ PRT COVAR IF FLAG
012      *      CALL PRTCOV ( PTIT, RTIT,
011      *        NPAR, COVR )
012           CALL GETPRD( NPAR, P, XP, YP )@ GET PRED VALUES
012           CALL GETACT( NCAS, X, XA, YA )@ GET ACTUAL OBS DATA
012 C                                          @ FORM CROSSES THRU DATA PTS
012 C                                          @ SIZE INDICATES CASE WTS
012           CALL GETCFI ( COVR, P, NPAR,     @ GET CONF INTERV CURVE DATA
012      *      RMSQ, NCAS, XP, YP, YC )
015           IF ( PLOTS ) THEN                @ DO ALL PLOTS
015           NSRC = NPAR - 1                  @ NUM SOURCES
012             IF ( FINK ) CALL INK           @ SPECIFY PEN
012      *          ( 'PEN 2 BLACK$' )
012             FINK = .FALSE.                 @ LIMIT INK CALLS TO 1
012             NPLT = NPLT + 1                @ SEQ NUM OF PLOT
012             CALL PLTALL ( RTIT, XP, YP, @ PLT ALL SRCS TOGETHER
012      *        NSRC, XA, YA, NCAS, NPLT )
015             IA = 1                         @ PRE ESET INDEX FOR XA/YA
012             DO 20 I = 1, NSRC              @ LOOP TO PLOT EA SRC
012               NPLT = NPLT+ 1               @ SEQ PLT NUM
014               CALL PLTONE ( RTIT, XP,      @ CALL TO PLOT EA SRC CURVE
012      *          YP(1,I), XA(1,IA),
014      *        YA(1,IA), ICTR(I),
015      *        YC(1,1,I), I, NPLT )
015               IA = ICTR(I) + IA            @ INDEX TO THE SRC OBS DATA
012 20          CONTINUE
011           ENDIF
011         ELSE
012           WRITE ( 6, 30 ) ELEM, VERS,      @ ELEM/VERS ERROR
011      *        FILNAM
013 30       FORMAT ( ' ERROR: ELEM', A12,
012      *     ' VERS', A12,
011      *       ' NOT FOUND IN FILE ', A12 )
011         ENDIF
011       ELSE
012         WRITE ( 6, 40 ) FILNAM, FSTAT      @ FILE ASG ERROR
012 40      FORMAT ( ' ERROR: COULD NOT',
011      *   ' ASSIGN FILE ', A12,
011      *     ' FAC STATUS= ', O12 )
011       ENDIF
011       IF ( .NOT. STOP ) GO TO 10           @ READ ANOTHER LIST
011       CLOSE ( UNIT )
011       STOP ' NORMAL NLRPLT STOP '
011       END

END ELT.
```

```
@ELT,L NLRPLT.READIN
ELT0T7 RLIB70 10/09-10:46:15-(9,)
        005         SUBROUTINE READIN
        005       *     (
        005       *         UNIT,                          @ INPUT
        005       *         PTIT,                          @ OUTPUT
        005       *         RTIT,                          @ OUTPUT
        005       *         NVAR,                          @ OUTPUT
        005       *         NPAR,                          @ OUTPUT
        005       *         CORR,                          @ OUTPUT
        005       *         NCAS,                          @ OUTPUT
        005       *            P,                          @ OUTPUT
        005       *         PSIG,                          @ OUTPUT
        005       *            X,                          @ OUTPUT
        005       *         RMSQ                           @ OUTPUT
        005       *             )
        005 C**   NAME: PASS*NLR.READIN
        005 C**
        005 C**   USAGE: CALL READIN ( UNIT, PTIT, RTIT, NVAR, NPAR,
        005 C**                        CORR, NCAS, P, PSIG, X, PHOL )
        005 C**
        005 C**   PURPOSE: READ SELECTED DATA FROM A P3R(81 VERS)
        005 C**            PRINTOUT FILE.
        005 C**
        005 C**   LIMITATIONS: ONLY ONE P3R RUN PER PRINTOUT FILE
        005 C**
        005 C**   WARNINGS: IF PRINTOUT FILE CONTAINS ASTERISKS (****.**)
        005 C**             BECAUSE FORMAT SPECS WERE EXCEEDED DURING P3R
        005 C**             EXECUTION THEY SHOULD BE CHANGED TO 9999.99 BY
        005 C**             MEANS OF THE TEXT EDITOR BEFORE ATTEMPTING TO
        005 C**             READ THE PRINTOUT FILE WITH THIS PROGRAM.
        005 C**
        005 C**   SUBPROGRAMS REQUIRED: FINLBL
        005 C**
        005 C**   ARGUMENTS:
        005 C**
        005 C**      INPUT:
        005 C**            UNIT                        @ LOGICAL UNIT FOR INPUT
        005 C**
        005 C**      OUTPUT:
        005 C**            PTIT                        @ PROBLEM TITLE
        005 C**            RTIT                        @ REGRESSION TITLE
        005 C**            NVAR                        @ NUM REGR VRBLS
        005 C**            CORR                        @ CORR MATRIX ( REGR PARAMS)
        005 C**            NCAS                        @ NUM CASES(DATA PTS) IN REGR
        005 C**               P                        @ REGR EQN PARAMS
        005 C**            PSIG                        @ STAN DEVS OF PARAMS
        005 C**               X                        @ REGR EQN VRBLS
        005 C**            PHOL                        @ PREDICTED FRACT HOLD TIMES
        005 C**
        005 C**
        005 C**   NOTES: NONE
        005 C**
        005 C**   PROGRAMMER/ORGANIZATION: HOFMOCKEL/CSC
        005 C**
        005 C**   ALGORITHM: INPUT - SEARCH FOR LABEL IN PRINTOUT FILE -
        005 C**              READ ASSOCIATED DATA - OUTPUT
```

```
005 C**
005 C**  APPLICABILITY: ASCII FORTRAN
005 C**
005 C**  KEYWORDS: REGRESSION PARAMETERS, CORRELATION MATRIX, CASE DATA
005 C**           HOLDING TIME, PERFORMANCE INDEX
005 C**
005 C**  RECORD OF MODIFICATIONS: INITIAL PROGRAM 8-27-82
005 C**
005 C**  WAIVERS: NONE
005        START EDIT PAGE
005
005        CHARACTER*132 ALIN                  @ BUFFER FOR ONE LINE
005        CHARACTER*20 CLBL                   @ LABEL FOR NUM CASES
005       * /'NUMBER OF CASES READ'/
005        CHARACTER*29 COLB                   @ LABEL FOR CORR MATRIX
005       */'ASYMPTOTIC CORRELATION MATRIX'/
005        REAL CORR ( 50 )                    @ CORRELATION MATRIX
005        REAL DUMY ( 10 )                    @ DUMMY ARRAY
005        CHARACTER*132 FINLBL                @ FUNCTION FINLBL(FIND LABEL)
005        INTEGER I                           @ UTILITY INDEX VRBL
005        INTEGER ILAST                       @ I LIMIT
005        INTEGER J                           @ UTILITY INDEX VRBL
005        INTEGER K                           @ UTILITY  INDEX VRBL
005        INTEGER KASE                        @ CASE NUMBER FROM FILE
005        INTEGER L                           @ UTL INDEX VRBL
005        CHARACTER*7 LABL                    @ UTL CHAR VRBL
005        INTEGER NCAS                        @ NUMBER OF CASES
005        INTEGER NPAR                        @ NUMBER OF PARAMATERS
005        INTEGER NVAR                        @ NUMBER OF VARIABLES
005        REAL P ( 10 )                       @ REGRESSINON PARAMETERS
005        CHARACTER*24 PALB                   @ LABEL FOR PARAM EST
005       *  / 'PARAMETER       ESTIMATE' /
005        CHARACTER*22 PLBL                   @ LABEL FOR NUM PARAMS
005       *  / '  NUMBER OF PARAMETERS'/
005        REAL PSIG ( 10 )                    @ ST DEV OF PARAMETERS
005        CHARACTER*80 PTIT                   @ PROBLEM TITLE
005        CHARACTER*16 PTLB                   @ LABEL FOR PROBLEM TITLE
005       *  /'PROBLEM TITLE IS'/
005        REAL RMSQ                           @ RESIDUAL MEAN SQUARE
005        CHARACTER*80 RTIT                   @ REGRESSION TITLE
005        CHARACTER*18 RTLB                   @ REGR TITLE LABEL
005       *  /'  REGRESSION TITLE' /
005        INTEGER UNIT                        @ DATA INPUT LOGICAL UNIT
005        REAL X ( 10, 200 )                  @ REGR VRBLS
005       *                                    @ WD 1 - PERF INDEX
005       *                                    @ WD 2 - FRACT HOLD TIME
005       *                                    @ WD 3 - CASE WEIGHT
005       *                                    @ WD 4 - AVAIL HOLD TIME
005       *                                    @ WD 5 TO NVAR-SUBS(0 OR 1)
005        CHARACTER*25 VLBL                   @ LABEL FOR NUM VRBLS
005       * /'TOTAL NUMBER OF VARIABLES'/
005 C
005        START EDIT PAGE
005 C
005        ALIN = FINLBL ( UNIT, 16, PTLB )    @ FIND PROB TITLE LABEL
005        READ ( UNIT, 10 ) PTIT               @ XFR NEXT LINE TO O/P
005 10     FORMAT ( A80 )
```

```
005        ALIN = FINLBL ( UNIT, 25, VLBL )  @ FIN NUM VRBLS LABEL
005        DECODE ( 20, ALIN ) NVAR          @ XFR NUM VRBLS TO O/P
005 20     FORMAT ( 48X, I7 )
005        ALIN = FINLBL ( UNIT, 18, RTLB )  @ FIND REGR TITLE LABEL
005        READ ( UNIT, 10 ) RTIT            @ XFR NEXT LINE TO O/P
005        ALIN = FINLBL ( UNIT, 22, PLBL )  @ FIND NUM PARAMS LBL
005        DECODE ( 25, ALIN ) NPAR          @ XFR NUM PARAMS TO O/P
005 25     FORMAT ( 50X, I7 )
005        ALIN = FINLBL ( UNIT, 20, CLBL )  @ FIND NUM CASES LABL
005        DECODE ( 20, ALIN ) NCAS          @ XFR NUM CASES TO O/P
005        ALIN = FINLBL ( UNIT, 29, COLB )  @ FIND CORR MATRIX LBL
005        DO 40 I = 1, 5                    @ MOVE FWD FIVE LINES
005          READ ( UNIT, 30 ) ALIN
005 30       FORMAT ( A132 )
005 40     CONTINUE
005        J = 1
005        DO 60 I = 1, NPAR                 @ READ CORR MATRIX
005          K = J + I - 1
005          READ ( UNIT, 50 )               @ INTO O/P ARRAY
005       *     ( CORR ( L ), L = J, K ) .
005 50       FORMAT ( 12X, 11F12.4 )
005          J = J + I
005 60     CONTINUE
007        READ ( UNIT, 65 ) RMSQ            @ READ RESID MEAN SQ
008 65     FORMAT ( 20X, E25.10 )
005        ALIN = FINLBL ( UNIT, 24, PALB )  @ FIND PARAM EST LBL
005        DO 70 I = 1, 2                    @ MOVE FWD TWO LINES
005          READ ( UNIT, 30 ) ALIN
005 70     CONTINUE
005        DO 90 I = 1, NPAR                 @ READ PARAMS, ST DEVS
005          READ ( UNIT, 80 )
005       *      P ( I ), PSIG ( I )
005 80       FORMAT ( 8X, 2( 1X, F16.6 ) )
005 90     CONTINUE
005        LABL = '    CASE'
005        ALIN = FINLBL ( UNIT, 7. LABL )   @ FIND CASES DATA
005        DO 100 I = 1, 2                   @ MOVE FWD TWO LINES
005          READ ( UNIT, 30 ) ALIN
005 100    CONTINUE
005        ILAST = MIN ( 8, NVAR+3 )
005        DO 120 J = 1, NCAS                @ READ CASES DATA
005          READ ( UNIT, * )
005       *  KASE, ( DUMY(I), I = 1, ILAST )
005          IF ( J .EQ. KASE ) THEN         @ MOVE DATA TO O/P
005            X ( 1, J ) = DUMY ( 6 )
005            X ( 2, J ) = DUMY ( 3 )
005            X ( 3, J ) = DUMY ( 5 )
005            X ( 4, J ) = DUMY ( 7 )
005            X ( 5, J ) = DUMY ( 8 )
005          ELSE
005            WRITE ( 6, 110 ) J, KASE      @ DATA ERROR
005 110        FORMAT ( ' CASE INDEX MISMATCH',
009       *    ' IN READIN',/,' FILE READ INDEX = ',I3,
005       *      ' CASE NO. = ', I3 )
005          ENDIF
005 120    CONTINUE
005        IF ( NVAR .GT. 5 ) THEN           @ READ MORE CASES
```

```
005          DO 130 I = 1, 3                  @ MOVE FWD THREE LINES
005            READ ( UNIT, 30 )
005 130      CONTINUE
005          ILAST = NVAR - 5
005          DO 150 J = 1, NCAS
005            READ ( UNIT, * )
005     *        KASE, ( DUMY(I), I = 1, ILAST )
005            IF ( J .EQ. KASE ) THEN
005              DO 140 I = 1, ILAST
005                X ( I + 5, J ) = DUMY ( I )
005 140          CONTINUE
005            ELSE
005                WRITE ( 6, 110 ) J, KASE  @ DATA ERROR
005            ENDIF
005 150      CONTINUE
005        ENDIF
005        RETURN
005        END

END ELT.
```

```
@ELT,L NLR.FINLBL
ELT017 RLIB70 10/09-10:47:41-(12,)
       009          CHARACTER*132 FUNCTION FINLBL
       009         *       (
       009         *        UNIT,                       @ INPUT
       009         *        NCHR,                       @ INPUT
       009         *        LABL                        @ INPUT
       009         *        )
       011 C**     NAME: PASS*NLR.FINLBL
       008 C**
       011 C**     USAGE: LBL=FINLBL( UNIT, NCHR, LABL )
       008 C**
       011 C**     PURPOSE: LOCATE AND READ A STRING LABELLING
       011 C**              SPECIFIC DATA IN A PRINTOUT FILE
       008 C**
       011 C**     LIMITATIONS: STRING MUST EXIST EXACTLY IN INPUT FILE
       008 C**
       011 C**     WARNINGS: WORKS ONLY ON N*BMDP81 P3R ( 81 VERS ) PRINTOUT
       008 C**
       011 C**     SUBPROGRAMS REQUIRED: NONE
       008 C**
       011 C**     ARGUMENTS:
       008 C**
       011 C**        INPUT:
       011 C**               UNIT                   @ LOGICAL UNIT TO READ FROM
       011 C**               NCHR                   @ NUM CHARS IN LABEL INPUT
       012 C**               LABL                   @ LABEL TO SEARCH FOR
       008 C**
       011 C**        OUTPUT:
       012 C**               FINLBL                 @ LINE CONTAINING THE LABEL
       008 C**
       011 C**     NOTES: NONE
       008 C**
       011 C**     PROGRAMMER/ORGANIZATION: HOFMOCKEL-JL/CSC
       008 C**
       011 C**     ALGORITHM: INPUT - READ SEQUENTIALLY THROUGH FILE
       011 C**                FROM CURRENT LINE UNTIL A MATCH FOR
       011 C**                THE INPUT LABEL IS LOCATED - OUTPUT
       008 C**
       011 C**     APPLICABILITY: ASCII FORTRAN
       008 C**
       011 C**     KEYWORDS: P3R PRINTOUT FILE, LABEL, SEARCH
       008 C**
       011 C**     RECORD OF MODIFICATIONS: INITIAL PROGRAM 8-26-82
       008 C**
       008 C**     WAIVERS: NONE
       008          START EDIT PAGE
       008
       009 C
       012          CHARACTER*30 LABEL              @ LABEL TO FIND
       009          CHARACTER*30 LABL               @ INPUT ARG LABEL
       009          CHARACTER*30 LINE               @ LINE TO MATCH
       009          INTEGER NCHR                    @ NUM CHARS IN LABEL
       009          INTEGER UNIT                    @ LOGICAL UNIT
       009          FINLBL = ' '
       009 10       CONTINUE
       009            READ ( UNIT, 20,              @ FIND LABELED LINE
```

```
009        *    ERR = 30, END = 50 ) FINLBL
009 20        FORMAT ( A132 )
009          LINE = ' '
009          LINE = FINLBL ( 1:NCHR )
009          LABEL = ' '
009          LABEL = LABL ( 1:NCHR )
009          IF ( LINE .NE. LABEL ) GO TO 10
009          GO TO 70
009 30       CONTINUE
010          WRITE ( 6, 40 ) LABEL
009 40       FORMAT ( ' READ ERROR IN FINLBL' ,/,
010        *   ' WHILE SEARCHING LABEL: ', A30 )
009          GO TO 70
009 50       CONTINUE
010          WRITE ( 6, 60 ) LABEL
009 60       FORMAT ( ' PREMATURE EOF IN FINLBL' ,/,
009        *   ' WHILE SEARCHING LABEL: ', A50 )
009 70       CONTINUE
009          RETURN
009          END

END ELT.
```

```
@ELT,L NLR.GETCOV
ELT0T7 RLIB70 10/09-10:48:07-(4,)
 000        SUBROUTINE GETCOV
 000       *     (
 000       *        NPAR,                          @ INPUT
 000       *        PSIG,                          @ INPUT
 000       *        CORR,                          @ INPUT
 000       *        COVR                           @ OUTPUT
 000       *     )
 003 C**   NAME: PASS*NLR.GETCOV
 000 C**
 003 C**   USAGE: CALL GETCOV ( NPAR, PSIG, CORR, COVR )
 000 C**
 003 C**   PURPOSE: CONVERT THE REGRESSION EQUATION PARAMETER
 003 C**            CORRELATION MATRIX TO A COVARIANCE MATRIX
 000 C**
 003 C**   LIMITATIONS: NONE
 000 C**
 003 C**   WARNINGS: NONE
 000 C**
 003 C**   SUBPROGRAMS REQUIRED: NONE
 000 C**
 003 C**   ARGUMENTS:
 000 C**
 003 C**      INPUT:
 003 C**            NPAR                       @ NUM OF REGR EQN PARAMS
 003 C**            PSIG                       @ REGRPARAM ST DEVS
 003 C**            CORR                       @ CORRELATION MATRIX
 000 C**
 003 C**      OUTPUT:
 003 C**            COVR                       @ COVARIANCE MATRIX
 000 C**
 003 C**   NOTES: NONE
 000 C**
 003 C**   PROGRAMMER/ORGANIZATION: HOFMOCKEL-JL/CSC
 000 C**
 003 C**   ALGORITHM: INPUT - MULTIPLY CORRELATION MATRIX BY
 004 C**              DIAGONAL STANDARD DEVIATION MATRIX
 004 C**              TO YIELD COVARIANCE MATRIX - OUTPUT
 000 C**
 003 C**   APPLICABILITY: ASCII FORTRAN
 000 C**
 003 C**   KEYWORDS: CORRELATION, COVARIANCE, MATRIX, STANDARD
 003 C**             DEVIATION, REGRESSION PARAMETERS
 000 C**
 003 C**   RECORD OF MODIFICATIONS: INITIAL PROGRAM 8-30-82
 000 C**
 000 C**   WAIVERS: NONE
 000        START EDIT PAGE
 000
 000        REAL CORR ( 50 )                   @ PARAM CORR MATRIX
 000        REAL COVR ( 50 )                   @ PARAM COVAR MATRIX
 002        INTEGER I                          @ SQ MAT ROW IDX
 002        INTEGER J                          @ SQ MAT COL IDX
 002        INTEGER K                          @ TRIAG MAT IDX
 000        INTEGER NPAR                       @ NUM OF PARAMS
 000        REAL PSIG ( 10 )                   @ PARAM ST DEVS
```

```
000 C
000 C
000 C
002          K = 0                                 @ PRESET TRIAG IDX
002          DO 20 I = 1, NPAR                     @ SQ MAT ROW LOOP
002            DO 10 J = 1, I                      @ SQ MAT COL LOOP
002              K = K + 1                         @ INCR TRIAG MAT IDX
002              COVR ( K ) = CORR ( K ) *         @ CONVERT CORR TO COVR
000         *      PSIG ( I )*PSIG ( J )
001 10         CONTINUE
000 20       CONTINUE
000          RETURN
000          END

END ELT.

@BRKPT PRINT$
```

```
@ELT,L NLR.PRTCOV
ELT0T7 RLIB70 10/09-10:47:58-(6,)
002          SUBROUTINE PRTCOV
002         *     (
002         *        PTIT,                          @ INPUT
002         *        RTIT,                          @ INPUT
002         *        NPAR,                          @ INPUT
002         *        COVR                           @ INPUT
002         *     )
004 C**     NAME: PASS*NLR.PRTCOV
002 C**
004 C**     USAGE: CALL PRTCOV ( PTIT, RTIT, NPAR, COVR )
002 C**
004 C**     PURPOSE: PRINTOUT THE REGRESSION EQUATION
004 C**              PARAMETER COVARIANCE MATRIX
002 C**
004 C**     LIMITATIONS: NONE
002 C**
004 C**     WARNINGS: NONE
002 C**
004 C**     SUBPROGRAMS REQUIRED: NONE
002 C**
004 C**     ARGUMENTS:
002 C**
004 C**        INPUT:
004 C**              PTIT                       @ PROBLEM TITLE
004 C**              RTIT                       @ REGRESSION TITLE
004 C**              NPAR                       @ NUM REGR EQN PARAMS
004 C**              COVR                       @ COVARIANCE MATRIX
002 C**
004 C**        FILE OUTPUT:
004 C**                    PRINTOUT FORMAT ON LU 6
002 C**
005 C**     NOTES: NONE
002 C**
004 C**     PROGRAMMER/ORGANIZATION: HOFMOCKEL-JL/CSC
002 C**
004 C**     ALGORITHM: INPUT - PRINT FORMATTED MATRIX - EXIT
002 C**
004 C**     APPLICABILITY: ASCII FORTRAN
002 C**
004 C**     KEYWORDS: COVARIANCE MATRIX, REGRESSION PARAMETERS
002 C**
004 C**     RECORD OF MODIFICATIONS: INITIAL PROGRAM 9-5-82
002 C**
002 C**     WAIVERS: NONE
002          START EDIT PAGE
002
002          REAL COVR ( 50 )                       @ PARAM COVAR MATRIX
002          INTEGER I                              @ ROW INDEX VRBL
002          INTEGER J                              @ BEG OF COLS
002          INTEGER K                              @ END OF COLS
003          INTEGER L                              @ TRIAG MAT IDX
002          INTEGER NPAR                           @ NUM PARAMS
002          CHARACTER*4 PLAB ( 10 )                @ PARAM LABELS
002         */'P1','P2','P3','P4','P5',
002         * 'P6','P7','P8','P9','P10'/
```

```
002       CHARACTER*80 PTIT                        @ PROBLEM TITLE
002       CHARACTER*80 RTIT                        @ REGRESSION TITLE
003       WRITE ( 6, 10 ) PTIT, RTIT               @ NEW PG & TITLES
002 10    FORMAT ( '1', //,
003      *  ' PROBLEM TITLE IS:',/, A80,
003      *  /,' REGRESSION TITLE IS:',
003      *  /, A80 /,/,
003      *  ' PARAMETER COVARIANCE MATRIX:',
003      *  / )
003       WRITE ( 6, 20 )                          @ LABEL COLS
002      *  (PLAB ( I ), I = 1, NPAR )
003 20    FORMAT ( 12X, 10( 8X, A4 ) ,/ )
003       WRITE ( 6, 30 )                          @ COL IDX LABELS
002      *  ( I, I = 1, NPAR )
003 30    FORMAT ( /, 12X, 10 ( I10, 2X )  )
003       J = 1                                    @ BEG COL IDX
003       DO 50 I = 1, NPAR                        @ SQ MAT ROW LOOP
002         K = J + I - 1                          @ END OF COLS IDX
002         WRITE ( 6, 40 ) PLAB ( I ), I,
002      *    ( COVR ( L ), L = J, K )             @ PRT ONE ROW
006 40      FORMAT( 1X,A4,I5,2X,10F12.5 )
002         J = J + I                              @ RESET BEG COL
002 50    CONTINUE
002       RETURN
002       END

END ELT.
```

```
@ELT,L  NLRPLT.GETSLR
ELT017 RLIB70 10/07-08:00:45-(3,)
       000          SUBROUTINE GETSLR
       000       *     (
       000       *              NPAR,                  @ INPUT
       000       *              NCAS,                  @ INPUT
       000       *                 P,                  @ INPUT
       000       *                 X,                  @ INPUT
       000       *              SLRD,                  @ OUTPUT
       000       *              ICTR                   @ OUTPUT
       000       *                    )
       000 C**  NAME: PASS*NLRPLT.GETSLR
       000 C**
       000 C**  USAGE: CALL GETSLR ( NPAR, NCAS, P, X,
       000 C**                       SLRD, ICTR )
       000 C**
       000 C**  PURPOSE: CALCULATE SOURCE LEVEL LESS RECOGNITION
       000 C**           DIFFERENTIAL FOR EACH TARGET AND COUNT
       000 C**           THE NUMBER OF CASES FOR EACH TARGET.
       000 C**
       000 C**  LIMITATIONS: NONE
       000 C**
       000 C**  WARNINGS: NONE
       000 C**
       000 C**  SUBPROGRAMS REQUIRED: NONE
       000 C**
       000 C**  ARGUMENTS:
       000 C**
       000 C**     INPUT:
       000 C**           NPAR                  @ NUM REGR EQN PARAMS
       000 C**           NCAS                  @ NUM REGR CASES(DATA PTS)
       000 C**         , P                     @ REGR EQN PARAMS
       001 C**           X                     @ REGR VARIABLES
       000 C**
       000 C**
       000 C**     OUTPUT:
       000 C**           SLRD                  @ SRCE LVL - RECOG DIFF PER TGT
       000 C**           ICTR                  @ COUNT OF CASES PER TGT
       000 C**
       000 C**  NOTES: NONE
       000 C**
       000 C**  PROGRAMMER/ORGANIZATION: HOFMOCKEL-JL/CSC
       000 C**
       000 C**  ALGORITHM: ESTIMATE THE STANDARD DEVIATION OF
       000 C**             THE SIGNAL EXCESS AND THE SOURCE
       000 C**             LEVELS LESS RECOGNITION DIFFERENTIALS
       000 C**             USING THE REGRESSION EQUATION PARAMETERS.
       000 C**             PASS THROUGH THE DATA AND COUNT THE
       000 C**             NUMBER OF CASES FOR EACH SOURCE.
       000 C**
       000 C**
       000 C**  APPLICABILITY: ASCII FORTRAN
       000 C**
       000 C**  KEYWORDS: SOURCE LEVELS, RECOGNITION DIFFERENTIALS
       000 C**
       000 C**  RECORD OF MODIFICATIONS: INITIAL PROGRAM 9-27-82
       000 C**
```

```
000 C**  WAIVERS: NONE
000        START EDIT PAGE
003 C
000        INTEGER I                        @ UTIL INDEX VRBL
000        INTEGER ICTR ( 10 )              @ COUNT OF CASES/SOURCE
000        INTEGER IX                       @ ICTR INDEX INCR
000        INTEGER J                        @ UTIL INDEX VRBL
000        INTEGER NCAS                     @ NUMBER OF CASES
000        INTEGER NPAR                     @ NUM OF PARAMS
000        INTEGER NSRC                     @ NUM OF SOURCES
000        REAL P ( 10 )                    @ REGRESSION PARAMS
000        REAL SLRD ( 10 )                 @ SRC LVL - DET THR
000        REAL X ( 10, 200 )               @ VRBLS VS PI
000        REAL XIPR                        @ SAVE PRIOR VRBL
000 C
000        START EDIT PAGE
000 C
000        NSRC = NPAR - 1                  @ NUMBER SOURCES
000        SLRD ( 1 ) = - P ( 1 ) / P ( 2 ) @ 1ST SRC SL-RD
000        ICTR ( 1 ) = 0
000        DO 10 I = 2, NSRC                @ SRCS 2 THRU N
000          SLRD ( I ) = SLRD ( 1 )
000     *      - P ( I + 1 ) / P ( 2 )      @ COMBINE 1ST, NTH SRCS
000          ICTR ( I ) = 0
000 10     CONTINUE
000        XIPR = 0.0                       @ PRESET PRIOR VRBL SAV
000        I = 1
000        IX = 4
000        DO 20 J = 1, NCAS                @ LOOP THRU CASES
000          IF ( X(I+IX, J ) .NE. XIPR )THEN
000            XIPR = 1.0                   @ SAVE PRIOR VRBL
000            I = I + 1                    @ INDEX CASES/SOURCE
000            IF ( I .EQ. 2 ) IX = 3
000          ENDIF
000          ICTR ( I ) = ICTR ( I ) + 1    @ COUNT CASES/SOURCE
000 20     CONTINUE                         @ END LOOP ON CASES
000        RETURN
000        END
```

END ELT.

@HDG,P *ELT*   FILE: NLRPLT   *** MAGPLT ***

```
@ELT,L  NLRPLT.PRTSLR
ELT0T7 RLIB70 10/07-08:00:52-(1,)
000      SUBROUTINE PRTSLR
000      *     (
000      *        PTIT,                     @ INPUT
000      *        RTIT,                     @ INPUT
000      *        NPAR,                     @ INPUT
000      *           P,                     @ INPUT
000      *        SLRD,                     @ INPUT
000      *        ICTR                      @ INPUT
000      *              )
000 C**  NAME: PASS*NLRPLT.PRTSLR
000 C**
000 C**  USAGE: CALL PRTSLR ( PTIT, RTIT, NPAR, P
000 C**                       SLRD, ICTR )
000 C**
000 C**  PURPOSE: PRINT THE SOURCE LEVEL LESS RECOGNITION
000 C**           DIFFERENTIAL FOR EACH SOURCE AND
000 C**           THE NUMBER OF CASES FOR EACH SOURCE.
000 C**
000 C**  LIMITATIONS: NONE
000 C**
000 C**  WARNINGS: NONE
000 C**
000 C**  SUBPROGRAMS REQUIRED: NONE
000 C**
000 C**  ARGUMENTS:
000 C**
000 C**     INPUT:
000 C**           PTIT                      @ PROBLEM TITLE
000 C**           RTIT                      @ REGRESSION TITLE
000 C**           NPAR                      @ NUM REGR PARAMS
000 C**              P                      @ REGRESSION PARAMS
000 C**           SLRD                      @ SRCE LVL - RECOG DIFF(DET THR)
000 C**           ICTR                      @ COUNT OF CASES PER TGT
000 C**
000 C**     FILE OUTPUT: PRINTED FORMAT ON LU 6
000 C**
000 C**  NOTES: NONE
000 C**
000 C**  PROGRAMMER/ORGANIZATION: HOFMOCKEL-JL/CSC
000 C**
000 C**  ALGORITHM: INPUT - PROCESS - PRINTOUT
000 C**
000 C**  APPLICABILITY: ASCII FORTRAN
000 C**
000 C**  KEYWORDS: SOURCE LEVEL, RECOGNITION DIFFERENTIAL
000 C**
000 C**  RECORD OF MODIFICATIONS: INITIAL PROGRAM 9-27-82
000 C**
000 C**  WAIVERS: NONE
000       START EDIT PAGE
000
000       INTEGER ICTR ( 10 )               @ COUNT CASES/SOURCE
000       INTEGER NPAR                      @ NUM OF PARAMS
000       INTEGER NSRC                      @ NUM OF SOURCES
000       REAL P ( 10 )                     @ REGRESSION PARAMS
```

```
000       CHARACTER*80 PTIT                     @ PROBLEM TITLE
000       CHARACTER*80 RTIT                     @ REGRESSION TITLE
000       REAL SDSX                             @ STAN DEV OF SX
000       REAL SLRD ( 10 )                      @ SOURCE LVL-DET THRHLD
000 C
000 C
000 C
000       WRITE ( 6, 10 ) PTIT, RTIT
000 10    FORMAT ( '1' // ' PROBLEM TITLE ',
000      * 'IS:',/,A80,//,' REGRESSION ',
000      * ' TITLE IS:',/, A80, //,
000      * ' ESTIMATED LEVELS DATA:' , / )
000       SDSX = 1.0 / P ( 2 )                  @ S.D. IS P(2) INV
000       WRITE ( 6, 20 ) SDSX
000 20    FORMAT ( '-', ' S. D. OF S. E. = ',
000      * F5.2, ' DB' )
000       NSRC = NPAR - 1                       @ NUM.SRCS
000       WRITE ( 6, 30 )                       @ SRC LVL DATA HDR
000 30    FORMAT ( '0', 2X, 'SOURCE #', 4X,
000      * 'SL - RD',4X, '# OF CASES', / )
000       WRITE ( 6, 40 )                       @ SL DATA
000      *  (I, SLRD(I), ICTR(I), I=1,NSRC )
000 40    FORMAT ( ' ', 3X, I5, 2X, F10.2,
000      * 3X, I5 )
000       RETURN
000       END
```

END ELT.

@HDG,P *ELT*   FILE: NLRPLT   *** READIN ***

```
@ELT,L NLRPLT.GETACT
ELT0T7 RLIB70 10/09-10:46:54-(11,)
007          SUBROUTINE GETACT
007        *                     (
007        *                       NCAS,            @ INPUT
007        *                          X,            @ INPUT
007        *                         XA,            @ OUTPUT
007        *                         YA             @ OUTPUT
007        *                         )
007 C**   NAME: PASS*NLRPLT.GETACT
007 C**
007 C**   USAGE: .
007 C**
007 C**   PURPOSE: CALCULATE THE END POINT VALUES FOR THE
007 C**            CROSSES WHICH MARK THE ACTUAL DATA ON
007 C**            THE NONLINEAR REGRESSION PLOTS.
007 C**
007 C**   LIMITATIONS: NONE
007 C**
007 C**   WARNINGS: NONE
007 C**
007 C**   SUBPROGRAMS REQUIRED: SQRT
007 C**
007 C**   ARGUMENTS:
007 C**
007 C**      INPUT:   NCAS                      @ NUM CASES (DATA PTS)
007 C**               X                         @ REGR EQN VRBLS
007 C**
007 C**      INPUT/OUTPUT: NONE
007 C**
007 C**      OUTPUT:   XA                       @ IND VRBL (END PTS)
007 C**
007 C**   NOTES: .
007 C**
007 C**   PROGRAMMER/ORGANIZATION: HOFMOCKEL-JL/CSC
007 C**
007 C**   ALGORITHM: INPUT ACTUAL OBSERVED DATA POINTS AND THE
007 C**              CASE WEIGHTS ASSOCIATED WITH THEM. CALCULATE
007 C**              THE END POINTS OF CROSSES WHICH MARK THE DATA
007 C**              POINTS AND INDICATE THE WEIGHT OF THE CASE
007 C**              BY MAKING THE SIZE OF THE CROSS PROPORTIONAL
007 C**              TO THE SQUARE ROOT OF THE CASE WEIGHT.
007 C**              OUTPUT THE ENDPTS OF THE CROSSES.
007 C**
007 C**   APPLICABILITY: ASCII FORTRAN
007 C**
007 C**   KEYWORDS: CASE WEIGHTS, OBSERVED DATA, REGRESSION.
007 C**
007 C**   RECORD OF MODIFICATIONS: INITIAL PROGRAM 9-27-82
007 C**
007 C**   WAIVERS: NONE
007          START EDIT PAGE
007 C
008          REAL DELX                          @ CROSS LEG X INC
008          REAL DELY                          @ CROSS LEG Y INC
007          INTEGER I                          @ INDEX VRBL
007          INTEGER NCAS                       @ NUM CASES(DATA PTS)
```

```
008        REAL MAXWT                          @ MAXIMUM CASEWT
008        REAL X ( 10, 200 )                  @ REGR EQN VRBLS
008        REAL XM                             @ MULT VRBL FOR END PT CALC
007        REAL XA ( 4, 200 )                  @ OBS IND VRBL DATA X'S
007        REAL YA ( 4, 200 )                  @ OBS DEP VRBL DATA X'S
007 C
007        MAXWT = 0.0                         @ INITIALIZE MAXWT
007        DO 10 I = 1, NCAS                   @ LOOP TO FIND MAX WT
008          MAXWT = AMAX1 ( MAXWT, X(3,I) )   @ SAVE LARGEST VAL
007 10     CONTINUE                            @ END CASES LOOP
010        XM = 2.50/SQRT ( MAXWT )            @ X MULT FOR CROSS LEGS
008        DO 20 I = 1, NCAS                   @ LOOP THRU CASES
008          DELX = XM * SQRT ( X(3,I) )       @ X INC DATA PT TO END PT
011          DELX = AMAX1 ( DELX, 0.05 )       @ LIMIT DELX > .01
008          DELY = DELX / 37.9                @ Y INC DATA PT TO END PT
008          XA ( 1, I ) = X ( 1, I ) - DELX   @ FILL END PTS OF CROSSES
008          YA ( 1, I ) = X ( 2, I ) - DELY
008          XA ( 2, I ) = X ( 1, I ) + DELX
008          YA ( 2, I ) = X ( 2, I ) + DELY
008          XA ( 3, I ) = XA ( 1, I )
008          YA ( 3, I ) = YA ( 2, I )
008          XA ( 4, I ) = XA ( 2, I )
008          YA ( 4, I ) = YA ( 1, I )
008 20     CONTINUE                            @ END CASES LOOP
008        RETURN
008        END

END ELT.
```

```
@ELT,L NLRPLT.GETPRD
ELT0T7 RLIB70 10/09-10:47:03-(5,)
001       SUBROUTINE GETPRD
001      *                    (
001      *                     NPAR,                              @ INPUT
001      *                        P,                              @ INPUT
001      *                       XP,                              @ OUTPUT
001      *                       YP                               @ OUTPUT
001      *                    )
001 C**  NAME: PASS*NLRPLT.GETPRD
001 C**
001 C**  USAGE: CALL GETPRD ( NPAR, P, XP, YP )
001 C**
001 C**  PURPOSE: FORM THE PREDICTED VALUES FOR THE REGRESSION
001 C**          EQUATION BASED ON A NONLINEAR REGRESSION
001 C**          USING THE COMPLEMENT OF THE CUMULATIVE
001 C**          GAUSSIAN.
001 C**
001 C**  LIMITATIONS: NONE
001 C**
001 C**  WARNINGS: NONE
001 C**
001 C**  SUBPROGRAMS REQUIRED: MDNOR ( IMSL-8 LIB )
001 C**
001 C**  ARGUMENTS:
001 C**
001 C**     INPUT:     NPAR                 @ NUM PARAMS
001 C**                   P                 @ REG EQN PARAMS
001 C**
001 C**     INPUT/OUTPUT: NONE
001 C**
001 C**     OUTPUT:    XP                   @ IND VRBL VALUS
001 C**                YP                   @ DEP VRBL VALUS
001 C**
001 C**  NOTES: NONE
001 C**
001 C**  PROGRAMMER/ORGANIZATION: HOFMOCKEL-JL/CSC
001 C**
001 C**  ALGORITHM: INPUT PARAMETERS - EVALUATE THE CUM GAUSS,
001 C**             THEN COMPLEMENT ( 1.0 - A ).  THE EFFECTS
001 C**             OF MULTIPLE SOURCES ARE ADDED IN AS THE
001 C**             DUMMY VARIABLES ASSOCIATED WITH PARAMS
001 C**             P(3)...P(NPAR).
001 C**
001 C**  APPLICABILITY: ASCII FORTRAN
001 C**
001 C**  KEYWORDS: PREDICTION, REGRESSION, GAUSSIAN, HOLD TIME
001 C**
001 C**  RECORD OF MODIFICATIONS: INITIAL PROGRAM 9-27-82
001 C**
001 C**  WAIVERS: NONE
001       START EDIT PAGE
001 C
001       REAL A                            @ AREA UNDER GAUSSIAN
001       INTEGER I                         @ INDEX VRBL
001       INTEGER J                         @ INDEX VRBL
001       INTEGER NPAR                      @ NUM PARAMS
```

```
001        INTEGER NSRC                              @ NUM OF SOURCES
001        REAL P ( 10 )                             @ REGR EQN PARAMS
004        REAL XP ( 61 )                            @ PRED INDP VRBL VALS
001        REAL YP ( 61, 10 )                        @ PRED DEP VRBL VALS
001        REAL Z                                    @ STAT VALUE
001 C
001        NSRC = NPAR - 1                           @ NUM SOURCES SET
004        XP ( 1 ) = 130.0
004        DO 10 I = 2, 61                           @ FILL INDP VRBL
004          XP ( I ) = XP ( I - 1 ) + 1.0
004 10     CONTINUE
004        DO 30 J = 1, NSRC                         @ LOOP ON SOURCES
004          DO 20 I = 1, 61                         @ LOOP INDP VRBL VALS
005            Z = P ( 1 ) + P ( 2 )*XP ( I )@ BASIC STAT
002            IF ( J .GT. 1 ) THEN                  @ DUMY VRBL EFFECTS
003              Z = Z + P ( J + 1 )                 @ Y-INTERCEPT ADDED
001            ENDIF
001            CALL MDNOR ( Z, A )                   @ AREA UNDER GAUSSIAN
001            YP ( I, J ) = 1.0 - A                 @ CPL GAUSSIAN
004 20       CONTINUE                                @ END IND VRB LOOP
004 30     CONTINUE                                  @ END SOURCES LOOP
001        RETURN
001        END

END ELT.
```

```
@ELT,L NLRPLT.GETCFI
ELT017 RLIB70 10/09-10:46:43-(12,)
       008        SUBROUTINE GETCFI
       008       *                 (
       008       *                  COVR,          @ INPUT
       008       *                     P,          @ INPUT
       008       *                  NPAR,          @ INPUT
       008       *                  RMSQ,          @ INPUT
       008       *                  NCAS,          @ INPUT
       008       *                    XP,          @ INPUT
       008       *                    YP,          @ INPUT
       008       *                    YC           @ OUTPUT
       009       *                        )
       009 C**   NAME: PASS*NLRPLT.CFI
       009 C**
       009 C**   USAGE: CALL GETCFI ( COVR, P, NPAR, RMSQ,
       009 C**          NCAS, XP, YP, YC )
       009 C**
       009 C**   PURPOSE: CONSTRUCT THE CONFIDENCE INTERVALS ABOUT
       009 C**            THE PREDICTED VALUES OBTAINED FROM
       009 C**            A NONLINEAR REGRESSION USING THE
       009 C**            UCLA BMDP P3R PROGRAM.
       009 C**
       009 C**   LIMITATIONS: THE COVARIANCE MATRIX OF THE PARAMETERS
       009 C**                 IS REQUIRED AS WELL AS THE PREDICTED
       009 C**                VALUES FROM THE REGRESSION.
       009 C**
       009 C**   WARNINGS: NONE
       009 C**
       009 C**   SUBPROGRAMS REQUIRED: MDSTI    ( N*AIMSL LIB )
       009 C**
       009 C**   ARGUMENTS:
       009 C**
       009 C**      INPUT;
       009 C**            COVR                     @ INPUT, COVARIANCE MATRIX (PARAMS)
       009 C**            P                        @ INPUT, PARAMS OF REGR EQN ( COEF )
       009 C**            NPAR                     @ INPUT, NUM OF PARAMS
       009 C**            RMSQ                     @ INPUT, RESID MEAN SQUARE
       009 C**            NCAS                     @ INPUT, NUM OF OBS DATA PTS
       009 C**            XP                       @ INPUT, PRED INDP VRBL
       009 C**            YP                       @ INPUT, PRED DEP VRBL
       009 C**
       009 C**      INPUT/OUTPUT: NONE
       009 C**
       009 C**      OUTPUT:
       009 C**            YC                       @ OUTPUT, CONF LIMITS, YP
       009 C**
       009 C**   NOTES: NONE
       009 C**
       009 C**   PROGRAMMER/ORGANIZATION: HOFMOCKEL-JL/CSC
       009 C**
       009 C**   ALGORITHM: INPUT THE COVARIANCE MATRIX FOR THE PARAMETERS
       009 C**              AND THE PARAMETERS ALONG WITH THE PREDICTED
       009 C**              VALUES OF THE REGRESSION CURVE.  GET THE
       009 C**              CRITICAL T VALUE FROM MDSTI USING DEG OF
       009 C**              FREEDOM EQUAL TO NCAS-NPAR. CONSTRUCT THE
       009 C**              VECTOR MADE UP OF THE FIRST PARTIAL DERIVATIVES
```

```
009 C**              OF THE NONLINEAR PREDICTION FUNCTION WITH
009 C**              RESPECT TO THE PARAMETERS. PRE AND POST MULTIPLY
009 C**              THE COVARIANCE MATRIX BY THE VECTOR IN ROW AND
009 C**              COLUMN FORMAT. FORM THE HALF CONFIDENCE INTERVAL
009 C**              AS THE CRITICAL T VALUE TIMES THE SQRT OF
009 C**              THE RESIDUAL MEAN SQUARE TIMES THE MATRIX
009 C**              MULTIPLICATION RESULT.  OUTPUT THE Y COORDS
009 C**              OF THE BOUNDING CURVE FOR THE CONFIDENCE
009 C**              INTERVALS ON THE PREDICTED VALUES.
009 C**
009 C**    APPLICABILITY: ASCII FORTRAN
009 C**
009 C**    KEYWORDS: CONFIDENCE INTERVAL, COVARIANCE MATRIX
009 C**              RESIDUAL MEAN SQUARE, CRITICAL T VALUE.
009 C**
009 C**    RECORD OF MODIFICATIONS: ORIGINAL PROGRAM 10-5-82
009 C**
009 C**    WAIVERS: NONE
009         START EDIT PAGE
009 C
009         REAL ADD                          @ ADD TERM,MATRIX MULT
009         REAL ALPHA / .05 /                @ CONFIDENCE LEVEL
009         REAL COVR ( 50 )                  @ COVARIANCE MATRIX(PARAMS)
009         REAL DEGF                         @ DEG OF FREEDOM
009         REAL DF ( 10 )                    @ 1ST PARTIAL DERIV OF DEP W/R PAR
009         INTEGER I                         @ UTIL INDEX
009         INTEGER J                         @ UTIL INDEX
009         INTEGER K                         @ UTIL INDEX
009         INTEGER L                         @ SOURCE INDEX
009         INTEGER M                         @ INDP VRBL INDEX
009         INTEGER IER                       @ ERROR CODE FROM MDSTI
009         INTEGER NCAS                      @ NUM OF CASES
009         INTEGER NPAR                      @ NUM OF PARAMS
009         INTEGER, NSRC                     @ NUM OF SOURCES
009         REAL P ( 10 )                     @ REGR EQN PARAMS
009         REAL RMSQ                         @ RESID MEAN SQ
009         REAL STPINV                       @ SQRT(TWOPI) INVERTED
009        *  / 0.398942280 /
009         REAL TEEC                         @ CRITICAL VAL STUDENT'S T
009         REAL VSUM                         @ MATRIX MULT RESULT
009         REAL XP ( 61 )                    @ PREDICTED IND VRBL COORDS
009         REAL YC ( 61, 2, 10 )              @ CONF INTERVAL Y VALS
009         REAL YDEL                         @ + OR - CHG FOR CONF INT
009         REAL YP ( 61, 10 )                @ PRED DEP VRBLS COORDS
009         REAL Z                            @ Z STATISTIC
009 C
009 C
009         NSRC = NPAR - 1                   @ SET NUM OF SOURCES
009         DEGF = FLOAT ( NCAS - NPAR )      @ DEG OF FREEDOM
009         CALL MDSTI ( ALPHA, DEGF,         @ GET CRIT TEE VAL
009        *          TEEC, IER )
009         DO 50 L = 1, NSRC                 @ LOOP THRU ALL SRCS
009          DO 10 I = 1, NPAR                @ CLEAR DERIV VECTOR
009           DF ( I ) = 0.0
009 10       CONTINUE
009          DO 40 M = 1, 61                  @ LOOP ON INDP VRBL
009           Z = P ( 1 ) + P ( 2 )*XP ( M )  @ FORM STAT
```

```
009          IF ( L .GT. 1 )                    @ ADD EXTRA VRBLS EFFECT
009     *      Z = Z + P ( L + 1 )
009          DF ( 1 ) = -STPINV *               @ DERIVATIVE W/R P(1)
010     *      EXP ( -0.50*Z*Z)
009          DF ( 2 ) = XP ( M )*DF ( 1 )       @ DERIVATIVE W/R P ( 2 )
009          IF ( L .GT. 1 )                    @ EXTRA VRBLS EFFECT
009     *      DF ( L + 1 ) = DF ( 1 )
009          VSUM = 0.0                         @ CLR ACC(V' X C X V)
009          K = 0                              @ PRESET COVAR MATRIX INDEX
009          DO 30 I = 1, NPAR                  @ PRE MULT LOOP ( V' X C )
009            DO 20 J = 1, I                   @ POST MULT LOOP ( V )
009              K = K + 1                      @ INCR COVR INDEX
009              ADD = DF ( I ) *               @ FORM MULT TERM
009     *          COVR ( K ) * DF ( J )
009              IF ( I .NE. J )                @ DOUBL OFF DIAG TERMS
009     *          ADD = ADD + ADD
009              VSUM = VSUM + ADD              @ ACCUMULATE RESULT
009 20         CONTINUE
009 30       CONTINUE
009          YDEL = TEEC * SQRT ( VSUM*RMSQ )@ CHG FOR CONF INT
012          YC ( M, 1, L ) =                   @ UPPER CONF BOUND
012     *      YP ( M, L ) + YDEL
012          YC ( M, 2, L ) =                   @ LOWER CONF BOUND
012     *      YP ( M, L ) - YDEL
009 40     CONTINUE
009 50   CONTINUE
009      RETURN
009      END

END ELT.
```

```
@ELT,L NLRPLT.PLTALL
ELT0T7 RLIB70 10/09-10:45:55-(17,)
       013         SUBROUTINE PLTALL (
       013        *                  HDR,             @ INPUT
       014        *                   XP,             @ INPUT
       014        *                   YP,             @ INPUT
       014        *                   NP,             @ INPUT
       013        *                   XA,             @ INPUT
       013        *                   YA,             @ INPUT
       013        *                   NA,             @ INPUT
       014        *                 NPLT              @ INPUT
       014        *                      )
       014 C**   NAME: PASS*NLRPLT.PLTALL
       014 C**
       014 C**   USAGE: CALL PLTALL ( HDR, XP, YP, NP,
       014 C**                        XA, YA, NA, NPLT )
       014 C**
       014 C**   PURPOSE: PLOT PREDICTED CURVES FOR ALL SOURCES OF
       014 C**            SOUND AT AN ARRAY USING THE NONLINEAR
       014 C**            REGRESSION EQUATION RESULTS FROM A RUN
       014 C**            WITH THE UCLA BMDP P3R PROGRAM. ALSO PLOT
       014 C**            THE OBSERVED DATA PTS WITH VARIABLE
       014 C**            SIZE X'S .
       014 C**
       014 C**   LIMITATIONS: ABSCISSA VALUES ARE LIMITED TO THE
       014 C**                RANGE 130 TO 190 AND ORDINATE
       014 C**                VALUES TO THE RANGE 0 TO 1.
       014 C**
       014 C**   WARNINGS: NONE
       014 C**
       014 C**   SUBPROGRAMS REQUIRED: NEWPEN, BGNPL, PAGE, NOCHEK,
       014 C**                         PHYSOR, TITLE, HEADIN, YTICKS,
       014 C**                         XTICKS, YAXANG, INTAXS, HEIGHT,
       014 C**                         GRAF, FRAME, CURVE, NEWPEN,
       014 C**                         DOT, CURVE, RESET, ENDPL
       014 C**                         (ALL FROM N*ADISSPLA LIB )
       014 C**
       014 C**   ARGUMENTS:
       014 C**      INPUT: .
       014 C**                HDR                 @ TITLE OF PLOT
       014 C**                XP                  @ X COORDS FOR PRED CURVES
       014 C**                YP                  @ Y CORRDS FOR PRED CURVES
       014 C**                NP                  @ NUM OF PRED CURVES
       014 C**                XA                  @ X COORDS FOR OBS DATA PTS
       014 C**                                    @ (ENDS OF X'S MARKING PTS)
       014 C**                YA                  @ Y CORRDS FOR OBS DATA PTS
       014 C**                NA                  @ NUM OF OBS DATA PTS
       014 C**                NPLT                @ SEQ NUM OF THIS PLT
       014 C**
       014 C**
       014 C**      INPUT/OUTPUT: NONE
       014 C**
       014 C**      OUTPUT FILE: PLOTS
       014 C**
       014 C**   NOTES: NONE
       014 C**
       014 C**   PROGRAMMER/ORGANIZATION: HOFMOCKEL-JL/CSC
```

```
014 C**
014 C**  ALGORITHM: INPUT THE PREDICTED CURVE COORDS AND THE
014 C**             COORDS FOR THE END PTS OF CROSSES MARK-
014 C**             ING THE ACTUAL OR OBSERVED DATA POINTS
014 C**             THEN PLOT THE PREDICTED CURVES USING A
014 C**             DOTTED LINE FOR EACH AND THE OBSERVED
014 C**             DATA POINTS USING SOLID CROSSES TO
014 C**             MARK THE POINTS.
014 C**
014 C**  APPLICABILITY: ASCII FORTRAN
014 C**
014 C**  KEYWORDS: REGRESSION ANALYSIS, PREDICTION
014 C**
014 C**  RECORD OF MODIFICATIONS: ORIGINAL PROGRAM 9-27-82
014 C**
014 C**  WAIVERS: NONE
014       START EDIT PAGE
014 C
014       CHARACTER*80 HDR                    @ PLOT TITLE
014       INTEGER I                           @ INDEX VRBL
014       INTEGER J                           @ INDEX VRBL
014       INTEGER K / 1 /                     @ LOCAL PLOT NUMBER
014       INTEGER NP                          @ NUM OF PRED CURVES
014       INTEGER NA                          @ NUM OF OBS DATA PTS
014       INTEGER NPLT                        @ SEQ NUM OF THIS PLT
016       CHARACTER*28 TITL                   @ TITLE FOR PLOT
016      * /'PREDICTION FOR ALL PLATFORMS'/
014       REAL X1 ( 2 ) / 130.0, 190.0 /      @ CTRLINE X COORDS
015       REAL XP ( 61 )                      @ X COORDS, PRED CURVE
014       REAL Y0 ( 2 ) / 0.0, 0.0 /          @ Y COORDS X-AXIS
014       REAL Y1 ( 2 ) / 0.5, 0.5 /          @ CTRLINE Y COORDS
014       REAL YP ( 61, 10 )                  @ Y COORDS FOR PRED CURVES
014       REAL XA ( 4, 200 )                  @ X COORDS FOR OBS DATA PTS
014       REAL YA ( 4, 200 )                  @ Y COORDS FOR OBS DATA PTS
015 C
015 C
014       IF ( NPLT .GT. 0 ) K = NPLT         @ USE SEQ NUM IF INPUT
014       CALL NEWPEN ( 2 )                   @ PEN 2 FOR ALL PLOTS
014       CALL BGNPL ( -K )                   @ INITIALIZE PLOT PROGS
014       CALL PAGE (11.,8.5)                 @ SET PAGE SIZE
014       CALL NOCHEK                         @ DELETE POINTS OUT OF RANGE
014       CALL PHYSOR ( 0.9, 1.2 )            @ ORIGIN OF AXES ON PAGE
014       CALL TITLE ( 1H , 1,                @ SET AXES SIZES AND LABEL
014      *  'ABSCISSA$', 100,
013      *  'ORDINATE $',
014      *  100, 9.5, 6.0 )
014       DO 10 J = 72, 1, -1                 @ SRCH BACK TO A CHAR
014       I = J                               @ SAVE INDEX
014       IF ( HDR(J:J) .NE. ' ' )            @ GO IF CHAR FOUND
013      *    GO TO 20
014 10    CONTINUE                            @ END SRCH LOOP
014 20    CONTINUE                            @ I MARKS END OF STRING
016       CALL HEADIN ( TITL, 28, 2, 2 )    @ TITLE FOR THE PLOT
016       CALL HEADIN ( HDR, I, 2, 2 )        @ PUT HEADER ON PLOT
017       CALL YTICKS ( 5 )                   @ FIVE TICKS PER NUMBER
016       CALL XTICKS ( 5 )
014       CALL YAXANG ( 0.0 )                 @ ORDINAT IS SHORT DIM
```

```
014       CALL INTAXS                            @ USE INT NUMS TO LBL X
014       CALL HEIGHT ( 0.1 )                    @ SET HEIGHT OF CHARS
014       CALL GRAF ( 130., 5., 190.,            @ DRAW & LBL AXES
014      *          -0.1, 0.1, 1.0 )
014       CALL XGRAXS ( 130.0, 5.0, 190.0,       @ LBL UPPER ABSCISSA
015      *   9.5, '$ ', -100, 0.0, 6.0 )
014       CALL YGRAXS (-0.1, 0.1, 1.0, 6.0,      @ LBL RIGHT SIDE ORD
014      *     '$ ', -100, 9.5, 0.0 )
014       CALL FRAME                             @ DRAW A FRAME AROUND PLOT
014       CALL CURVE ( X1, Y1, 2, 0 )            @ DRAW CTR LINE
014       CALL CURVE ( X1, Y0, 2, 0 )            @ DRAW X AXIS LINE
014       CALL DOT                               @ DOT THE PRED CURVES
014       DO 30 I = 1, NP                        @ LOOP THRU NUM CURVES
015         CALL CURVE ( XP, YP(1,I),            @ DRAW A PRED CURVE
013      *         61, 0 )
014 30    CONTINUE                               @ END OF PRED LOOP
014       CALL RESET ( 'DOT' )                   @ GO BACK TO SOLID LINES
014       DO 40 I = 1, NA                        @ LOOP THRU OBS DATA PTS
014         CALL CURVE ( XA(1,I), YA(1,I),       @ LOW LEFT TO UP RT
014      *               2, 0 )                  @ OF CROSSES
014         CALL CURVE ( XA(3,I), YA(3,I),       @ LOW RT TO UP LEFT
013      *               2, 0 )
014 40    CONTINUE                               @ END LOOP OBS DATA PTS
014       CALL ENDPL( -K )                       @ FINISH PLOT
014       RETURN                                 @ ONLY PROG EXIT
013       END

END ELT.
```

```
@ELT,L NLRPLT.PLTONE
ELT017 RLIB70 10/09-10:46:05-(8,)
004         SUBROUTINE PLTONE (
004        *                  HDR,            @ INPUT
004        *                   XP,            @ INPUT
004        *                   YP,            @ INPUT
004        *                   XA,            @ INPUT
004        *                   YA,            @ INPUT
004        *                   NA,            @ INPUT
004        *                   YC,            @ INPUT
005        *                 NPAT,            @ INPUT
004        *                 NPLT             @ INPUT
004        *                     )
004 C**  NAME: PASS*NLRPLT.PLTONE
004 C**
004 C**  USAGE: CALL PLTONE ( HDR, XP, YP, XA,
004 C**                       YA, NA, YC, NPLT )
004 C**
004 C**  PURPOSE: PLOT PREDICTED CURVES FOR ONE SOURCE OF
004 C**           SOUND AT AN ARRAY USING THE NONLINEAR
004 C**           REGRESSION EQUATION RESULTS FROM A RUN
004 C**           WITH THE UCLA BMDP P3R PROGRAM. ALSO PLOT
004 C**           THE CONFIDENCE INTERVAL BOUNDS CURVES AND
004 C**           THE OBSERVED DATA PTS WITH VARIABLE
004 C**           SIZE X'S .
004 C**
004 C**  LIMITATIONS: ABSCISSA VALUES ARE LIMITED TO THE
004 C**               RANGE 130 TO 190 AND ORDINATE
004 C**               VALUES TO THE RANGE 0 TO 1.
004 C**
004 C**  WARNINGS: NONE
004 C**
004 C**  SUBPROGRAMS REQUIRED: NEWPEN, BGNPL, PAGE, NOCHEK,
004 C**                        PHYSOR, TITLE, HEADIN, YTICKS,
004 C**                        XTICKS, YAXANG, INTAXS, HEIGHT,
004 C**                        GRAF, FRAME, CURVE, NEWPEN,
004 C**                        DOT, CURVE, RESET, ENDPL
004 C**                        (ALL FROM N*ADISSPLA LIB )
004 C**
004 C**  ARGUMENTS:
004 C**     INPUT: .
004 C**               HDR                 @ TITLE OF PLOT
004 C**               XP                  @ X COORDS FOR PRED CURVES
004 C**               YP                  @ Y COORDS FOR PRED CURVES
004 C**               XA                  @ X COORDS FOR OBS DATA PTS
004 C**                                   @ (ENDS OF X'S MARKING PTS)
004 C**               YA                  @ Y COORDS FOR OBS DATA PTS
004 C**               YC                  @ Y COORDS FOR CONF INTER
004 C**               NA                  @ NUM OF OBS DATA PTS
005 C**               NPAT                @ SEQ NUM OF PLAT
004 C**               NPLT                @ SEQ NUM OF THIS PLT
004 C**
004 C**
004 C**     INPUT/OUTPUT: NONE
004 C**
004 C**     OUTPUT FILE: PLOTS
004 C**
```

```
004 C**  NOTES: NONE
004 C**
004 C**  PROGRAMMER/ORGANIZATION: HOFMOCKEL-JL/CSC
004 C**
004 C**  ALGORITHM: INPUT THE PREDICTED CURVE COORDS AND THE
004 C**             COORDS FOR THE CONFIDENCE INTERVAL BOUNDS
004 C**              AND COORDS FOR THE END PTS OF CROSSES
004 C**              MARKING THE ACTUAL OR OBSERVED DATA POINTS
004 C**              THEN PLOT THE PREDICTED CURVE USING A
004 C**              DOTTED LINE AND THE CONFIDENCE BOUNDS
004 C**              CURVES USING A SOLID LINE, ALSO PLOT
004 C**              DATA POINTS USING SOLID CROSSES TO
004 C**              MARK THE POINTS.
004 C**
004 C**  APPLICABILITY: ASCII FORTRAN
004 C**
004 C**  KEYWORDS: REGRESSION ANALYSIS, PREDICTION
004 C**
004 C**  RECORD OF MODIFICATIONS: ORIGINAL PROGRAM 10-5-82
004 C**
004 C**  WAIVERS: NONE
004         START EDIT PAGE
004 C
004         CHARACTER*80 HDR                  @ PLOT TITLE
004         INTEGER I                         @ INDEX VRBL
004         INTEGER J                         @ INDEX VRBL
004         INTEGER K / 1 /                   @ LOCAL PLOT NUMBER
004         INTEGER NA                        @ NUM OF OBS DATA PTS
004         INTEGER NPLT                      @ SEQ NUM OF THIS PLT
005         CHARACTER*4 PLAT                  @ PLATFORM NUM IN CHAR
005         CHARACTER*32 TITL                 @ PLOT TITLE
005        */'PREDICTION FOR PLATFORM NO.  '/
004         REAL X1 ( 2 ) / 130.0, 190.0 /    @ CTRLINE X COORDS
004         REAL XP ( 61 )                    @ X COORDS, PRED CURVE
004         REAL Y0 ( 2 ) / 0.0, 0.0 /        @ Y COORDS X-AXIS
004         REAL Y1 ( 2 ) / 0.5, 0.5 /        @ CTRLINE Y COORDS
004         REAL YP ( 61, 10 )                @ Y COORDS FOR PRED CURVES
004         REAL XA ( 4, 200 )                @ X COORDS FOR OBS DATA PTS
004         REAL YA ( 4, 200 )                @ Y COORDS FOR OBS DATA PTS
004         REAL YC ( 61, 2, 10 )             @ Y COORDS FOR CONF INT CURVES
005 C
005 C
004         IF ( NPLT .GT. 0 ) K = NPLT       @ USE SEQ NUM IF INPUT
004         CALL NEWPEN ( 2 )                 @ PEN 2 FOR ALL PLOTS
004         CALL BGNPL ( -K )                 @ INITIALIZE PLOT PROGS
004         CALL PAGE (11.,8.5)               @ SET PAGE SIZE
004         CALL NOCHEK                       @ DELETE POINTS OUT OF RANGE
004         CALL PHYSOR ( 0.9, 1.2 )          @ ORIGIN OF AXES ON PAGE
004         CALL TITLE ( 1H , 1,              @ SET AXES SIZES AND LABEL
004        *  'ABSCISSA$', 100,
004        *  'ORDINATE $',
004        *  100, 9.5, 6.0 )
004         DO 10 J = 72, 1, -1               @ SRCH BACK TO A CHAR
004         I = J                             @ SAVE INDEX
004         IF ( HDR(J:J) .NE. ' ' )          @ GO IF CHAR FOUND
004        *     GO TO 20
004 10      CONTINUE                          @ END SRCH LOOP
```

```
004 20     CONTINUE                              @ I MARKS END OF STRING
005        ENCODE ( 25, PLAT ) NPAT
005 25     FORMAT ( I3 )
005        TITL ( 29:32 ) = PLAT ( 1:4 )         @ PUT PLAT NUM IN TITL
005        CALL HEADIN ( TITL, 32, 2, 2 )        @ PUT TITLE ON PLOT
005        CALL HEADIN ( HDR, 1, 2, 2 )          @ PUT HEADER ON PLOT
008        CALL YTICKS ( 5 )                     @ FIVE TICKS PER NUMBER
005        CALL XTICKS ( 5 )
004        CALL YAXANG ( 0.0 )                   @ ORDINAT IS SHORT DIM
004        CALL INTAXS                           @ USE INT NUMS TO LBL X
004        CALL HEIGHT ( 0.1 )                   @ SET HEIGHT OF CHARS
004        CALL GRAF ( 130., 5., 190.,           @ DRAW & LBL AXES
004        *          -0.1, 0.1, 1.0 )
004        CALL XGRAXS ( 130.0, 5.0, 190.0,      @ LBL UPPER ABSCISSA
005        *   9.5, '$ ', -100, 0.0, 6.0 )
004        CALL YGRAXS (-0.1, 0.1, 1.0, 6.0,     @ LBL RIGHT SIDE ORD
004        *      '$ ', -100, 9.5, 0.0 )
004        CALL FRAME                            @ DRAW A FRAME AROUND PLOT
005        CALL GRACE ( 0.0 )                    @ LIMIT POINTS TO AXES
004        CALL CURVE ( X1, Y1, 2, 0 )           @ DRAW CTR LINE
005        CALL CURVE ( X1, Y0, 2, 0 )           @ DRAW BASE LINE
007        CALL BLNK1 ( 0.,9.75,0.,0.54,0 )      @ DO NOT DRAW BELO X AXIS
004        CALL DOT                              @ DOT THE PRED CURVES
005        CALL CURVE ( XP, YP, 61, 0 )          @ DRAW A PRED CURVE
004        CALL RESET ( 'DOT' )                  @ GO BACK TO SOLID LINES
004        DO 30 I = 1, 2                        @ DRAW CONF BOUNDS
005          CALL CURVE ( XP, YC ( 1, I, 1 ),@ ONE BOUND AT A TIME
004        *    61, 0 )
004 30     CONTINUE
005        CALL GRACE ( 0.5 )                    @ LIMIT POINTS 0.5 INCH
006        CALL RESET ( 'BLNKS' )
004        DO 40 I = 1, NA                       @ LOOP THRU OBS DATA PTS
004          CALL CURVE ( XA(1,I), YA(1,I),      @ LOW LEFT TO UP RT
004        *                 2, 0 )              @ OF CROSSES
004          CALL CURVE ( XA(3,I), YA(3,I),      @ LOW RT TO UP LEFT
004        *                 2, 0 )
004 40     CONTINUE                              @ END LOOP OBS DATA PTS
004        CALL ENDPL( -K )                      @ FINISH PLOT
004        RETURN                                @ ONLY PROG EXIT
004        END

END ELT.
```

```
@ELT,L  NLRPLT.RUN/NLRPLT
ELT0T7 RLIB70 10/07-08:00:53-(4,)
000001      000 @XQT PASS*NLRPLT.NLRPLT
000002      000  $INPUTS
000003      003    FILNAM='PASS*NLRDAT',
000004      003    ELEM='PRT1',
000005      000    VERS='S',
000006      000    COVAR=T,
000007      004     LEVELS=T,
000008      001    PLOTS=T,
000009      002    STOP=F,
000010      000  $END
000011      002  $INPUTS
000012      003    ELEM='PRT2',
000013      002  $END
000014      002  $INPUTS
000015      003    ELEM='PRT3',
000016      002    STOP=T,
000017      002  $END

END ELT.
```

@XQT PASS•NLRPLT.NLRPLT

PROBLEM TITLE IS:
REGRESSION ON REAL DATA

REGRESSION TITLE IS:
PARAMETERS FROM DATA SET # 1 (6 PLATFORMS)

ESTIMATED LEVELS DATA:

S. D. OF S. E. = 4.36 DB

SOURCE #	SL - RD	# OF CASES
1	162.60	11
2	162.10	12
3	161.59	13
4	167.71	14
5	161.46	17
6	171.31	4

PROBLEM TITLE IS:
REGRESSION ON REAL DATA
REGRESSION TITLE IS:
PARAMETERS FROM DATA SET # 1 (6 PLATFORMS)

PARAMETER COVARIANCE MATRIX:

		P1	P2	P3	P4	P5	P6	P7
		1	2	3	4	5	6	7
P1	1	343260.28516						
P2	2	-1967.51009	11.30002					
P3	3	-1770.35278	6.31675	1290.93414				
P4	4	-6691.50110	34.57811	689.63813	1323.01344			
P5	5	-450.11075	-1.26380	669.62265	666.49590	742.19324		
P6	6	-9069.41174	48.23654	697.31034	818.04378	664.97683	1125.10039	
P7	7	21662.58887	-128.24821	598.83887	278.00178	684.64915	122.95341	4049.90549

PROBLEM TITLE IS:
REGRESSION ON REAL DATA

REGRESSION TITLE IS:
PARAMETERS FROM DATA SET # 2 (5 PLATFORMS)

ESTIMATED LEVELS DATA:

S. D. OF S. E. = 14.90 DB

SOURCE #	SL - RD	# OF CASES
1	151.82	17
2	149.66	17
3	132.42	11
4	169.47	20
5	139.02	15

PROBLEM TITLE IS:
REGRESSION ON REAL DATA
REGRESSION TITLE IS:
PARAMETERS FROM DATA SET # 2 (5 PLATFORMS)

PARAMETER COVARIANCE MATRIX:

		P1	P2	P3	P4	P5	P6
		1	2	3	4	5	6
P1	1	15637.23706					
P2	2	-88.86859	.50850				
P3	3	-300.82314	1.11091	185.76891			
P4	4	356.84637	-2.65456	100.86990	2437.51260		
P5	5	315.08858	-2.41359	101.42765	119.25811	140.75018	
P6	6	-171.88845	.37239	107.50114	104.71026	104.92690	400.33163

PROBLEM TITLE IS:
REGRESSION ON REAL DATA

REGRESSION TITLE IS:
PARAMETERS FROM DATA SET # 3 (5 PLATFORMS)

ESTIMATED LEVELS DATA:

S. D. OF S. E. = 9.38 DB

SOURCE #	SL - RD	# OF CASES
1	157.79	13
2	148.78	13
3	157.91	10
4	166.82	16
5	150.82	13

PROBLEM TITLE IS:
REGRESSION ON REAL DATA
REGRESSION TITLE IS:
PARAMETERS FROM DATA SET # 3 (5 PLATFORMS)

PARAMETER COVARIANCE MATRIX:

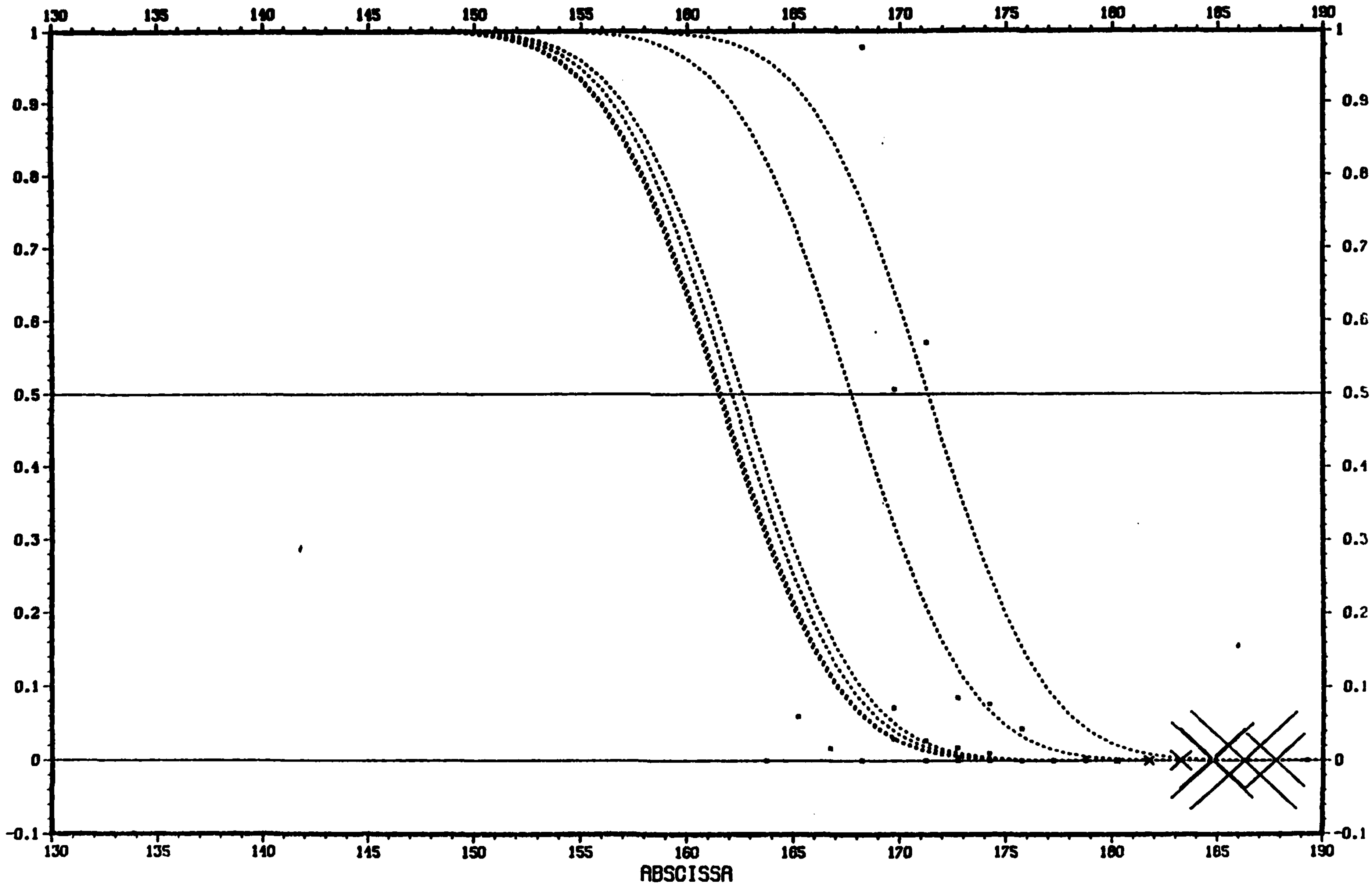
		P1	P2	P3	P4	P5	P6
		1	2	3	4	5	6
P1	1	17227.82104					
P2	2	-99.36263	.57665				
P3	3	-268.70656	.95072	415.77539			
P4	4	373.88765	-2.77929	100.55065	246.31940		
P5	5	-297.13247	1.11404	106.95747	99.76179	134.49627	
P6	6	-210.07983	.60839	106.13107	102.18800	106.30200	318.38564

STOP NORMAL NLRPLT STOP

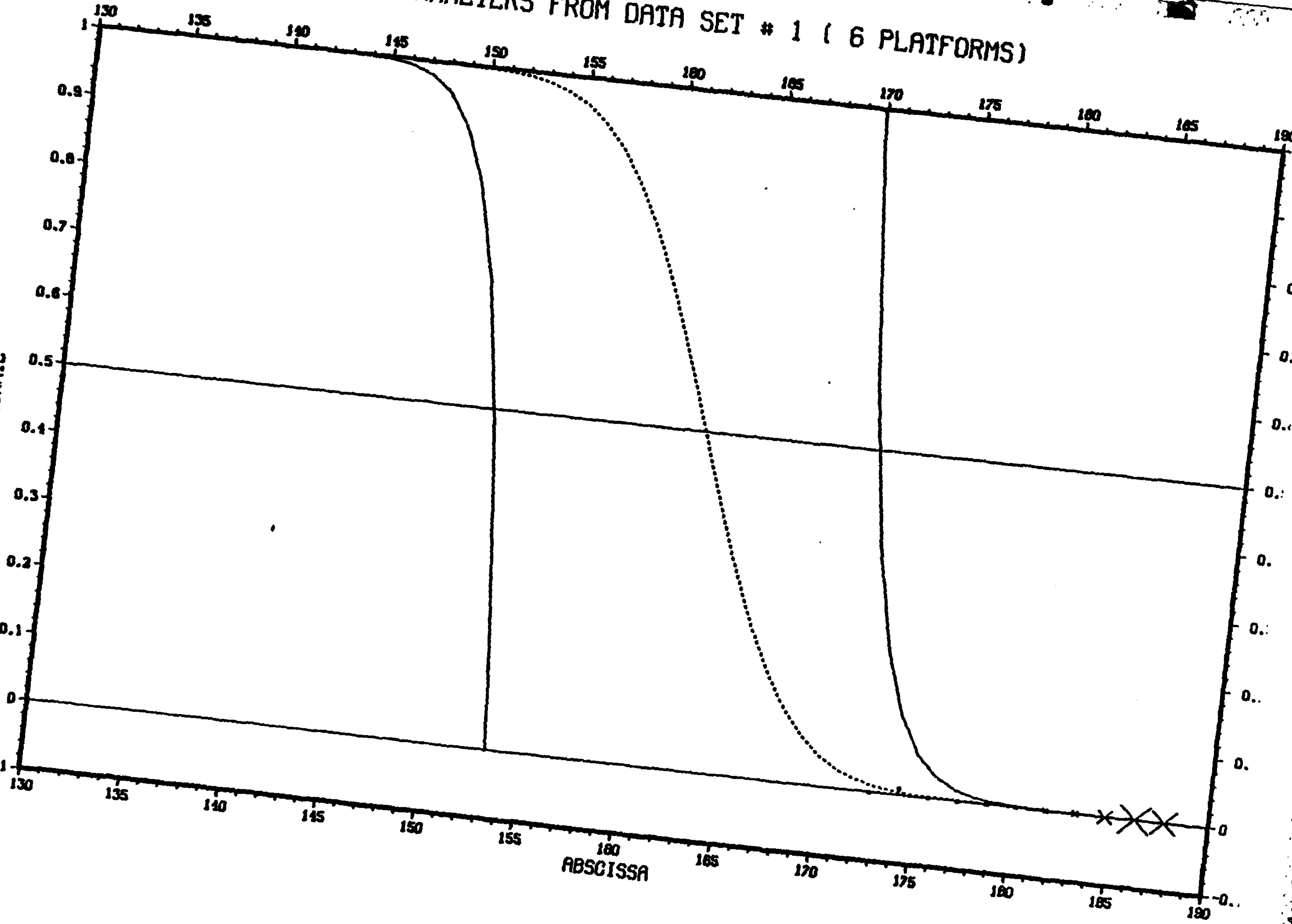
@BRKPT PRINTS

PREDICTION FOR ALL PLATFORMS

PARAMETERS FROM DATA SET # 1 (6 PLATFORMS)



PARAMETERS FROM DATA SET # 1 (6 PLATFORMS)



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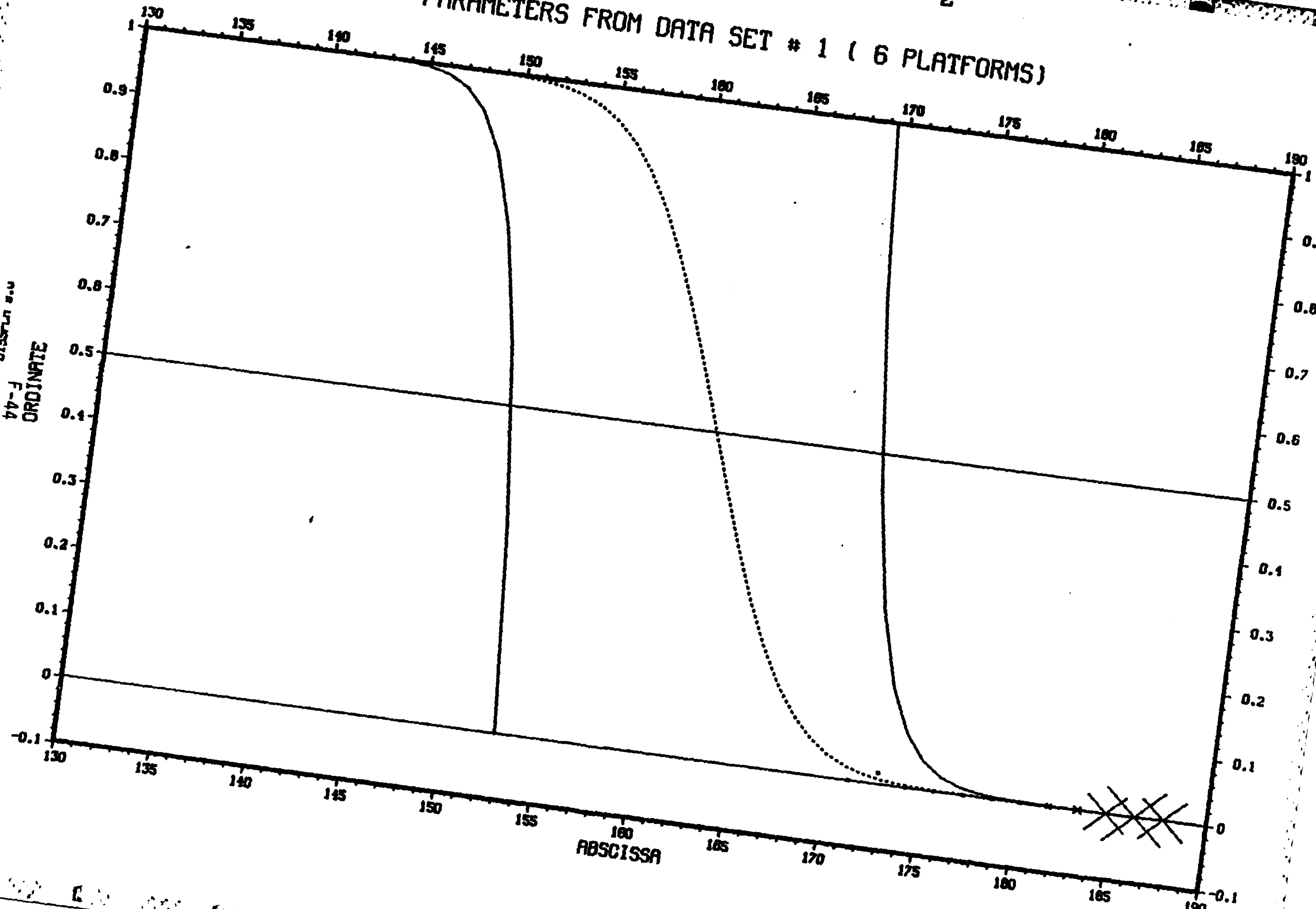
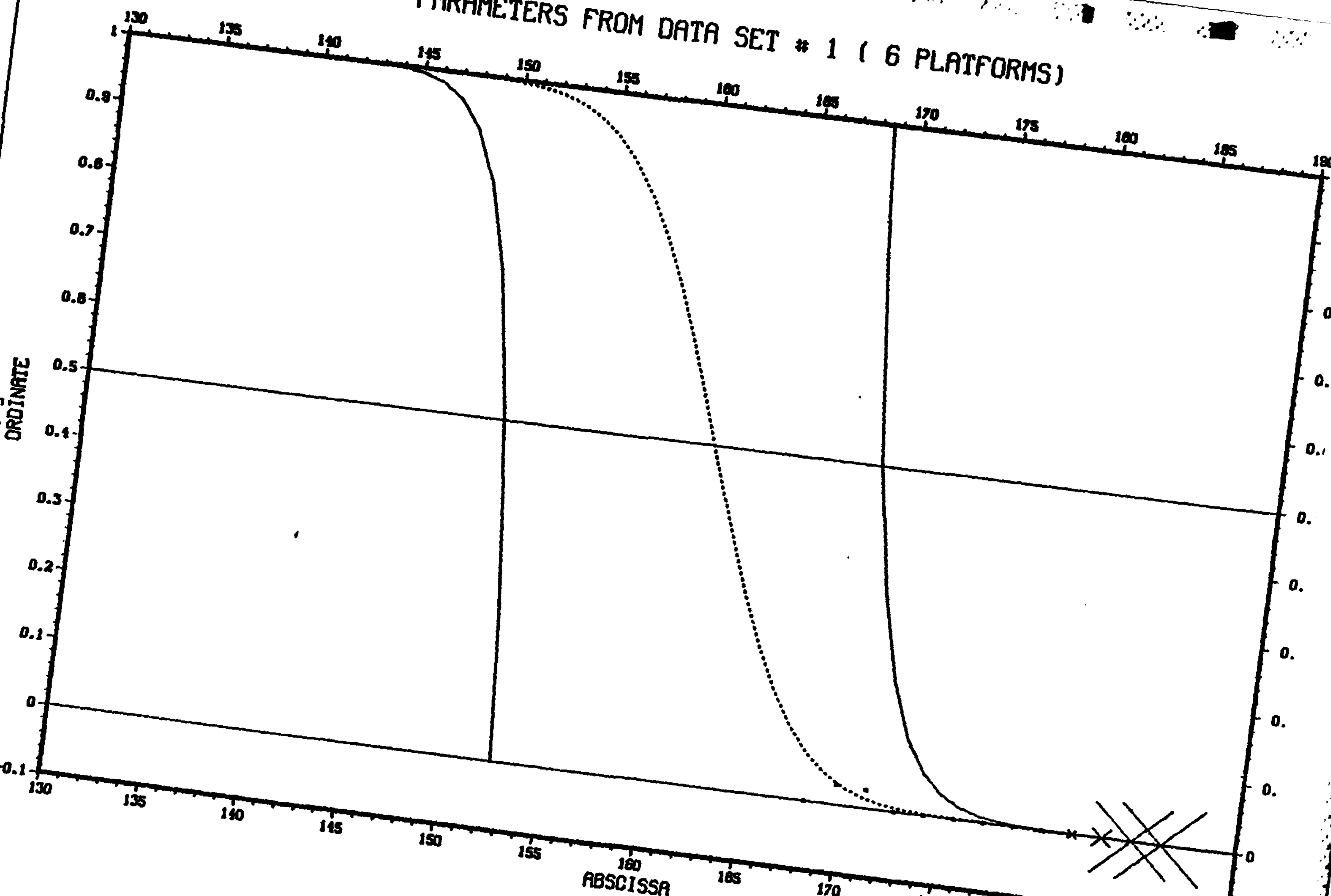
PREDICTION FOR PLATFORM NO. 2

PARAMETERS FROM DATA SET # 1 (6 PLATFORMS)



F-44

PARAMETERS FROM DATA SET # 1 (6 PLATFORMS)



F-45

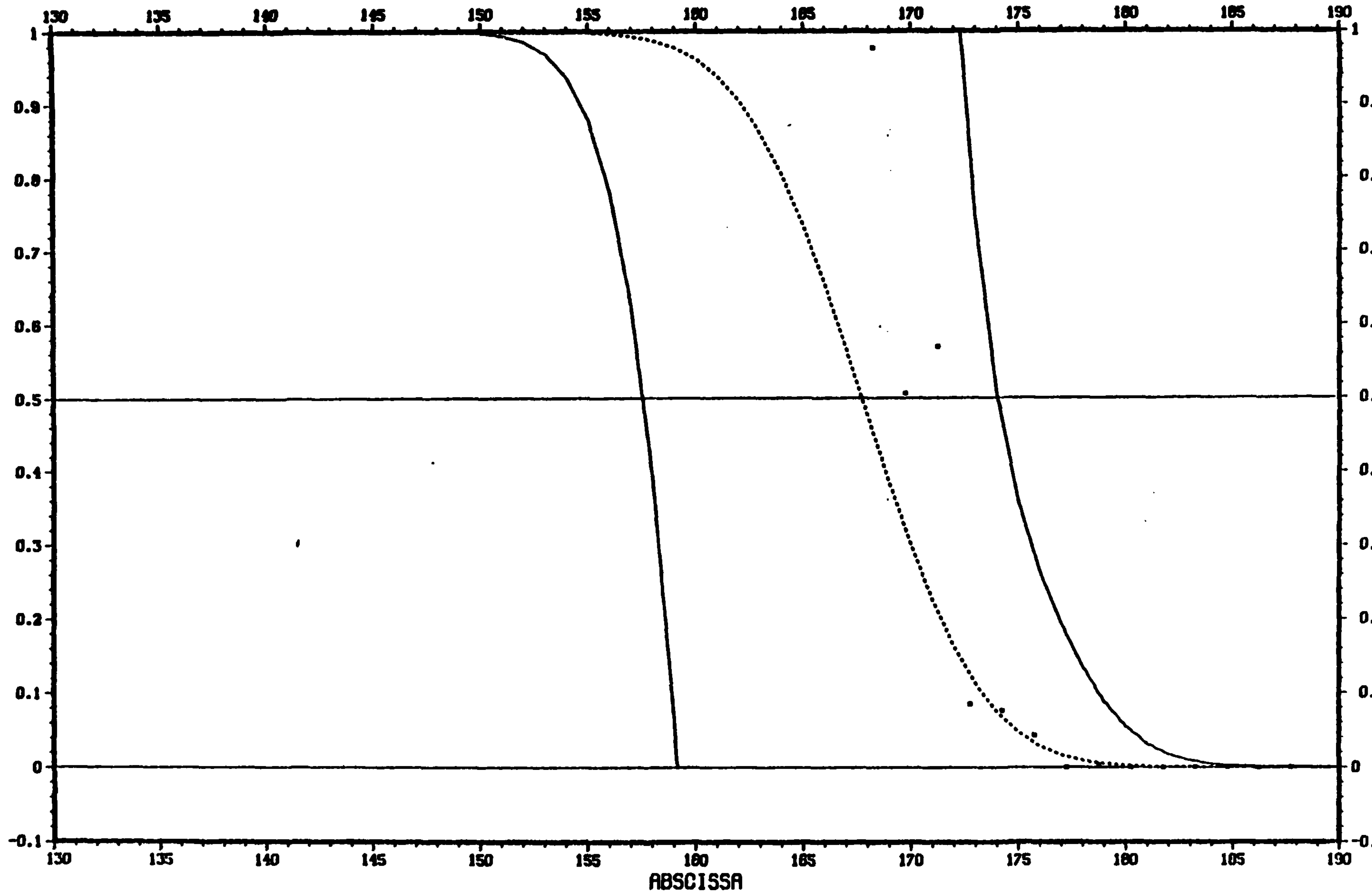
DISSPLA 9.0

17.31.19 THUR 7 OCT, 1982 JOB-JLH

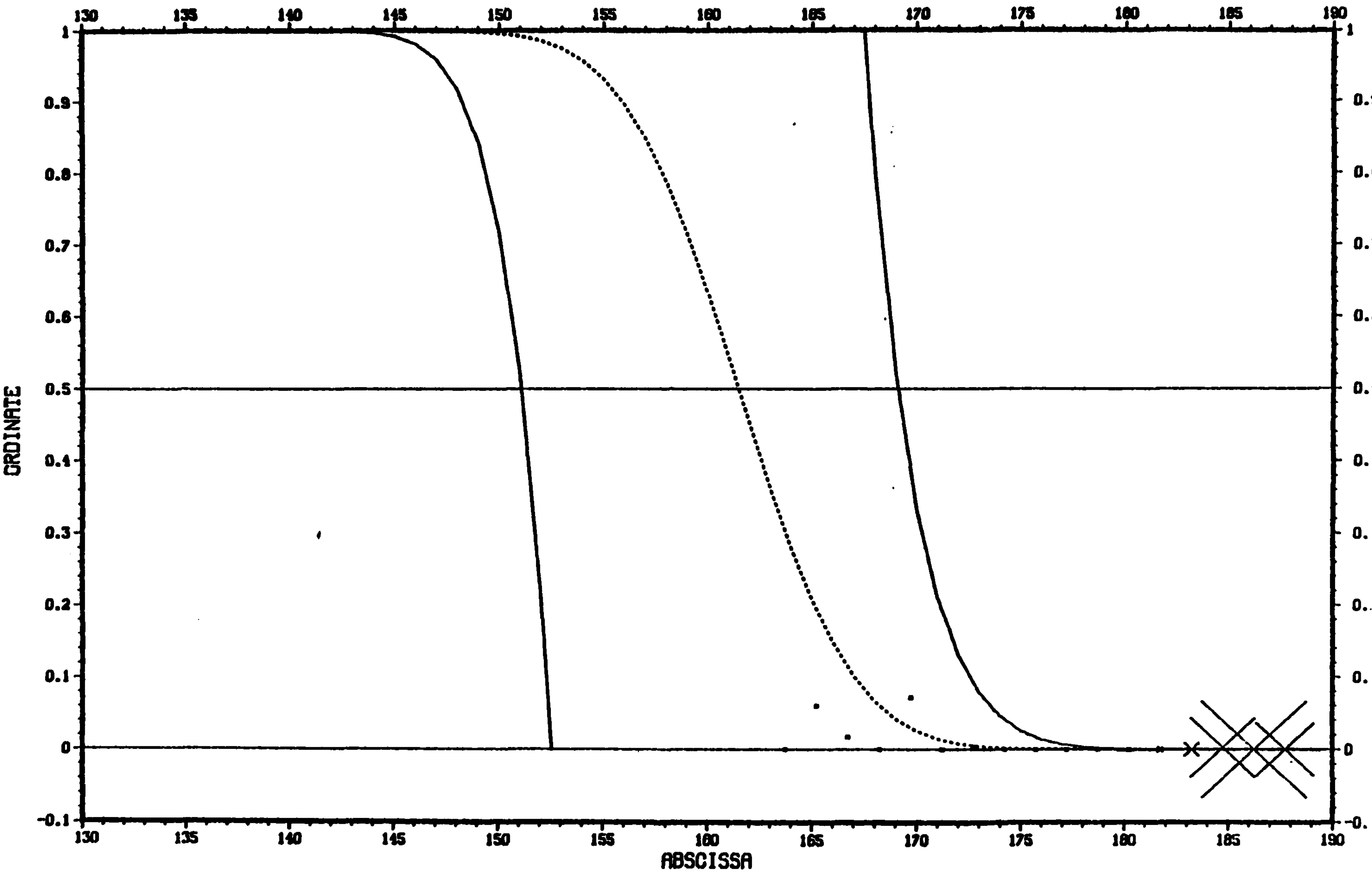
PLOT 4

PREDICTION FOR PLATFORM NO. 4

PARAMETERS FROM DATA SET # 1 (6 PLATFORMS)

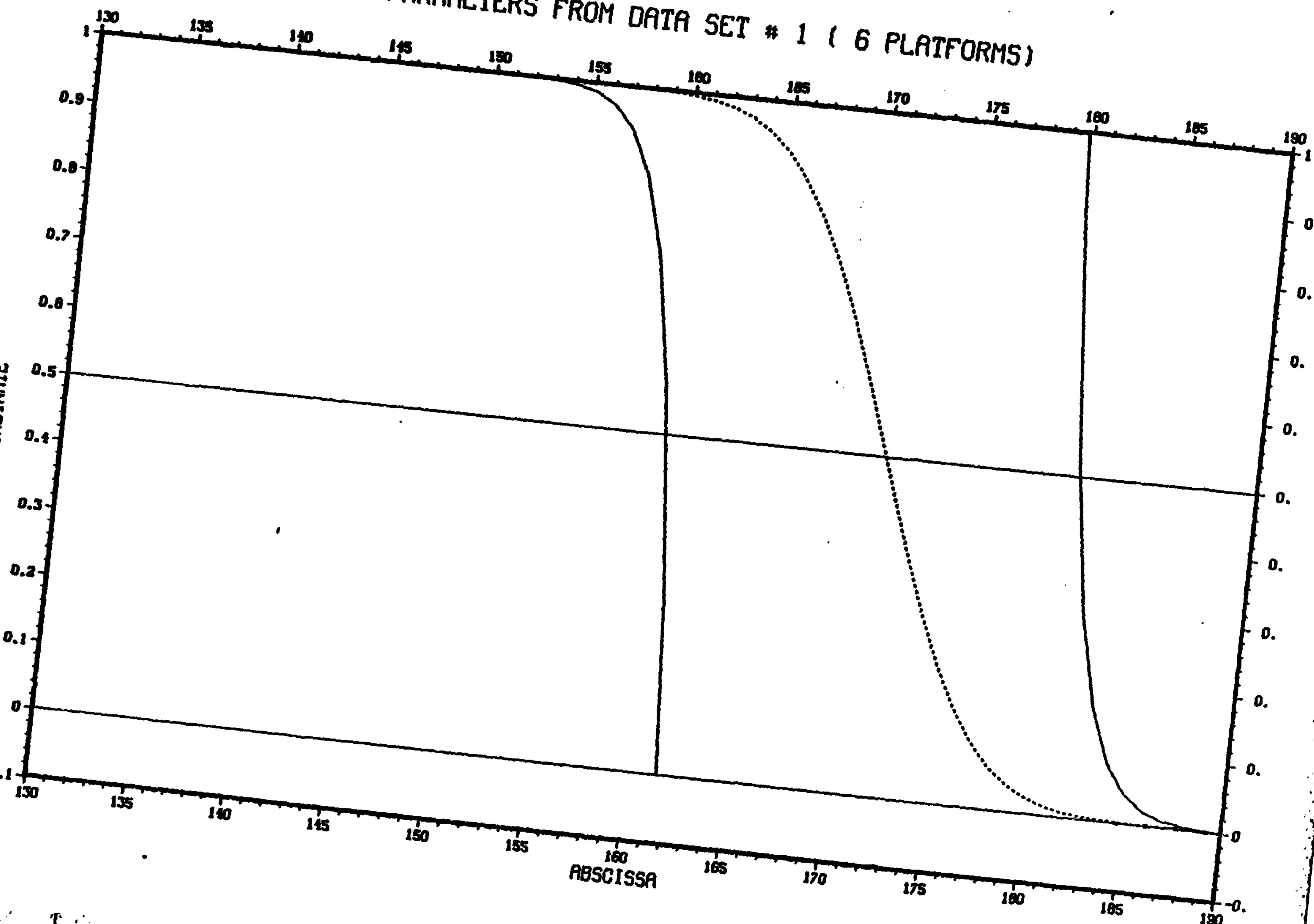


PARAMETERS FROM DATA SET # 1 (6 PLATFORMS)

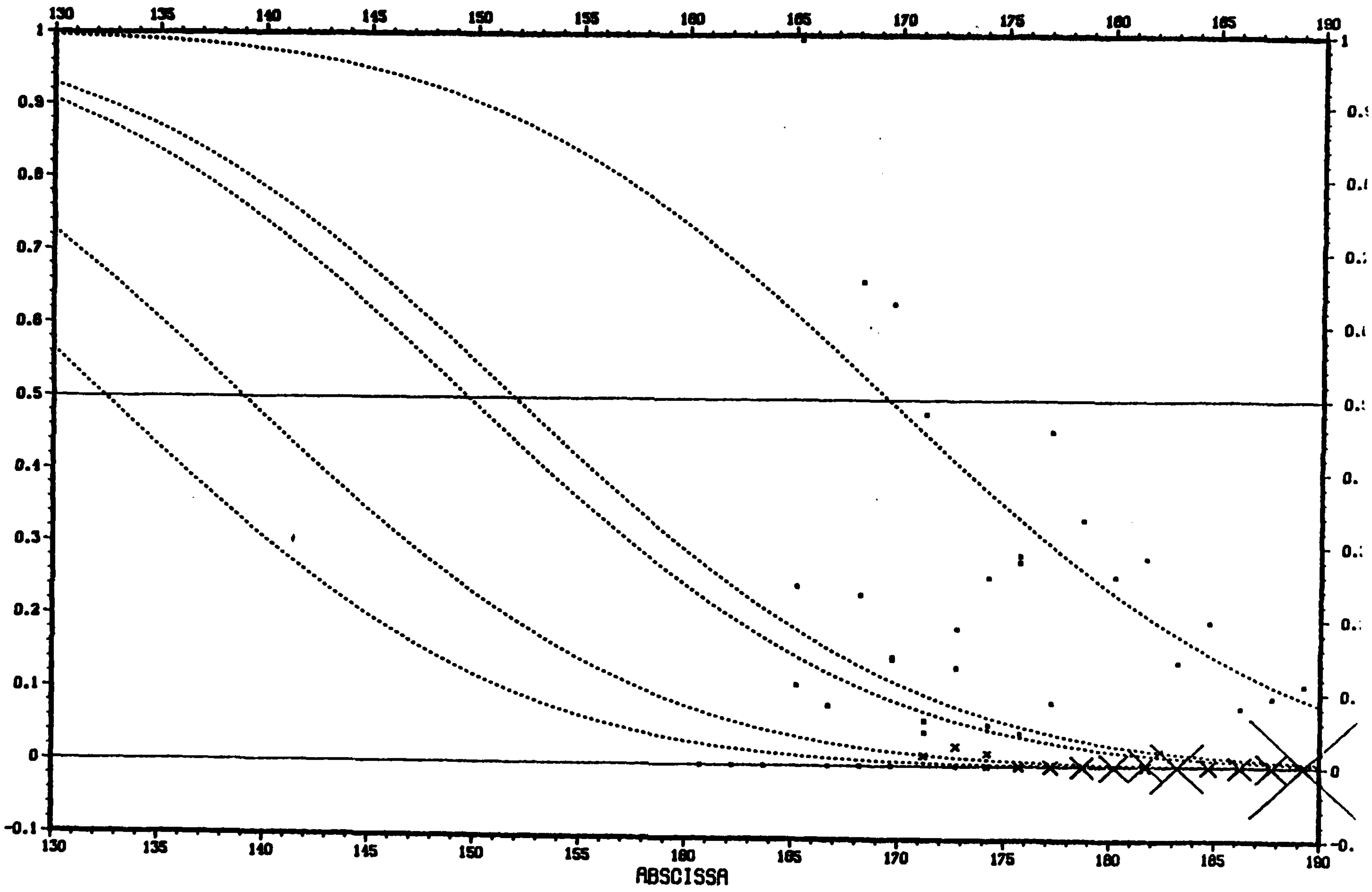


PREDICTION FOR PLATFORM NO. 6

PARAMETERS FROM DATA SET # 1 (6 PLATFORMS)

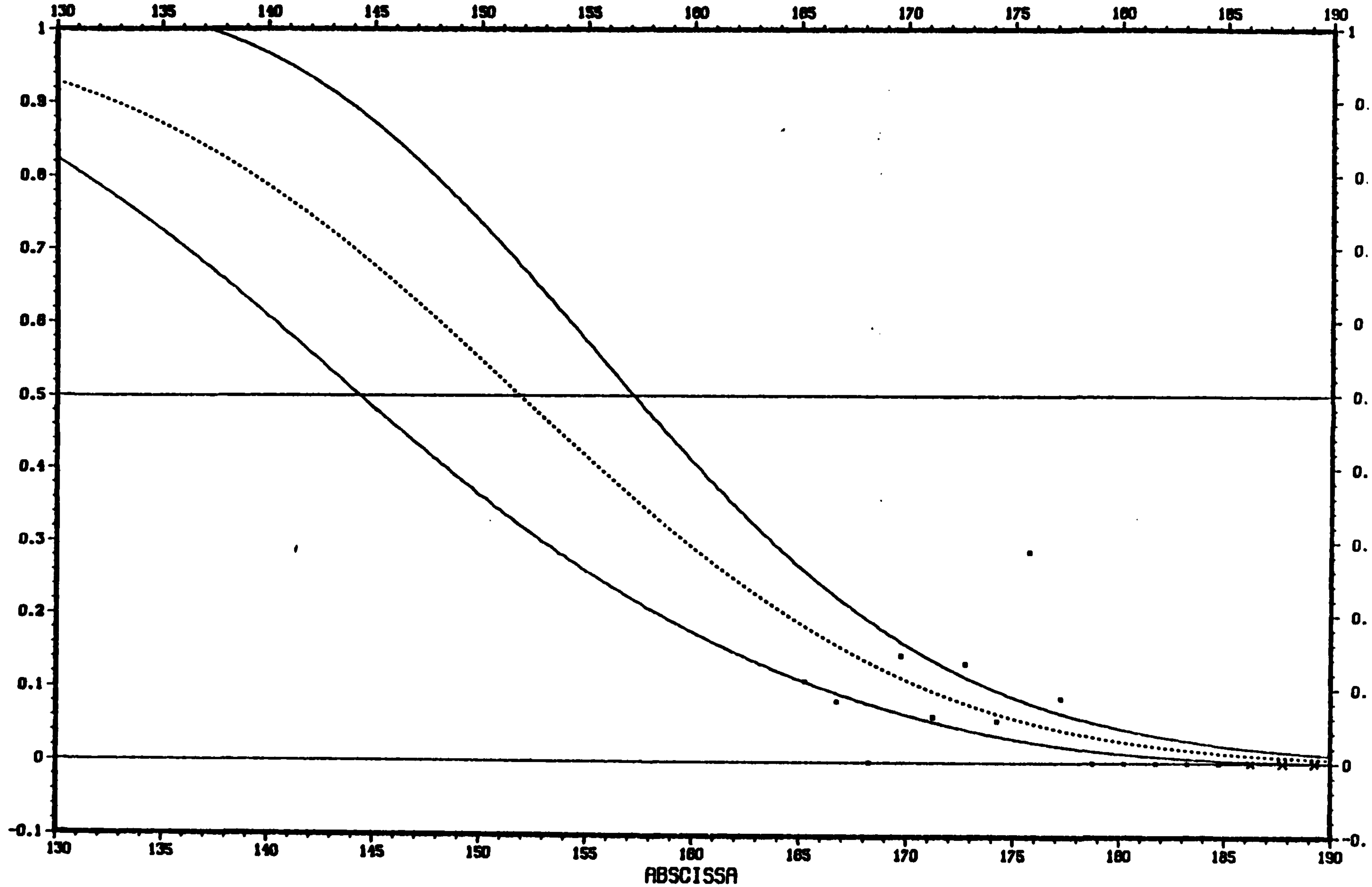


PARAMETERS FROM DATA SET # 2 (5 PLATFORMS)



PREDICTION FOR PLATFORM NO. 1

PARAMETERS FROM DATA SET # 2 (5 PLATFORMS)



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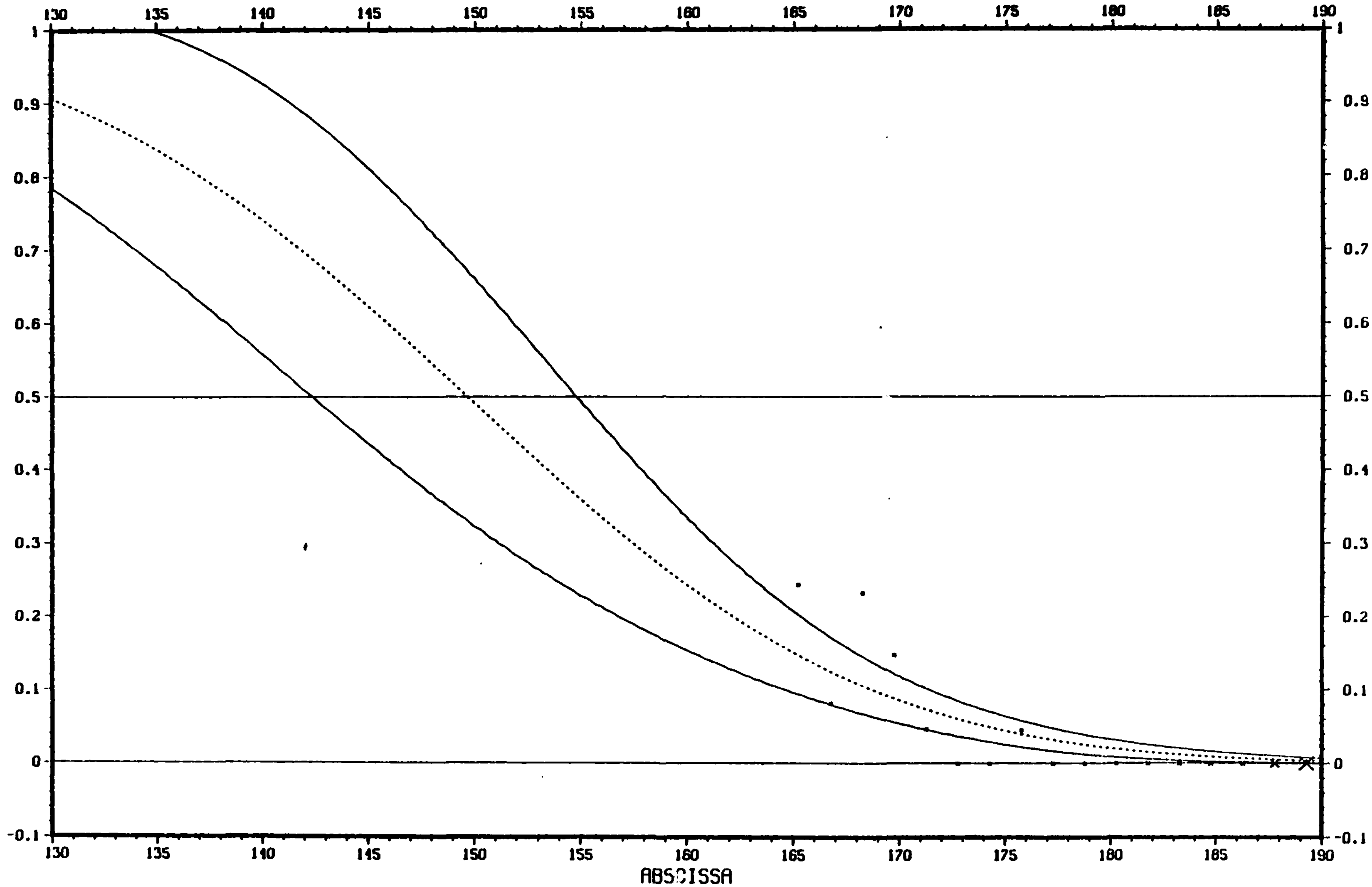
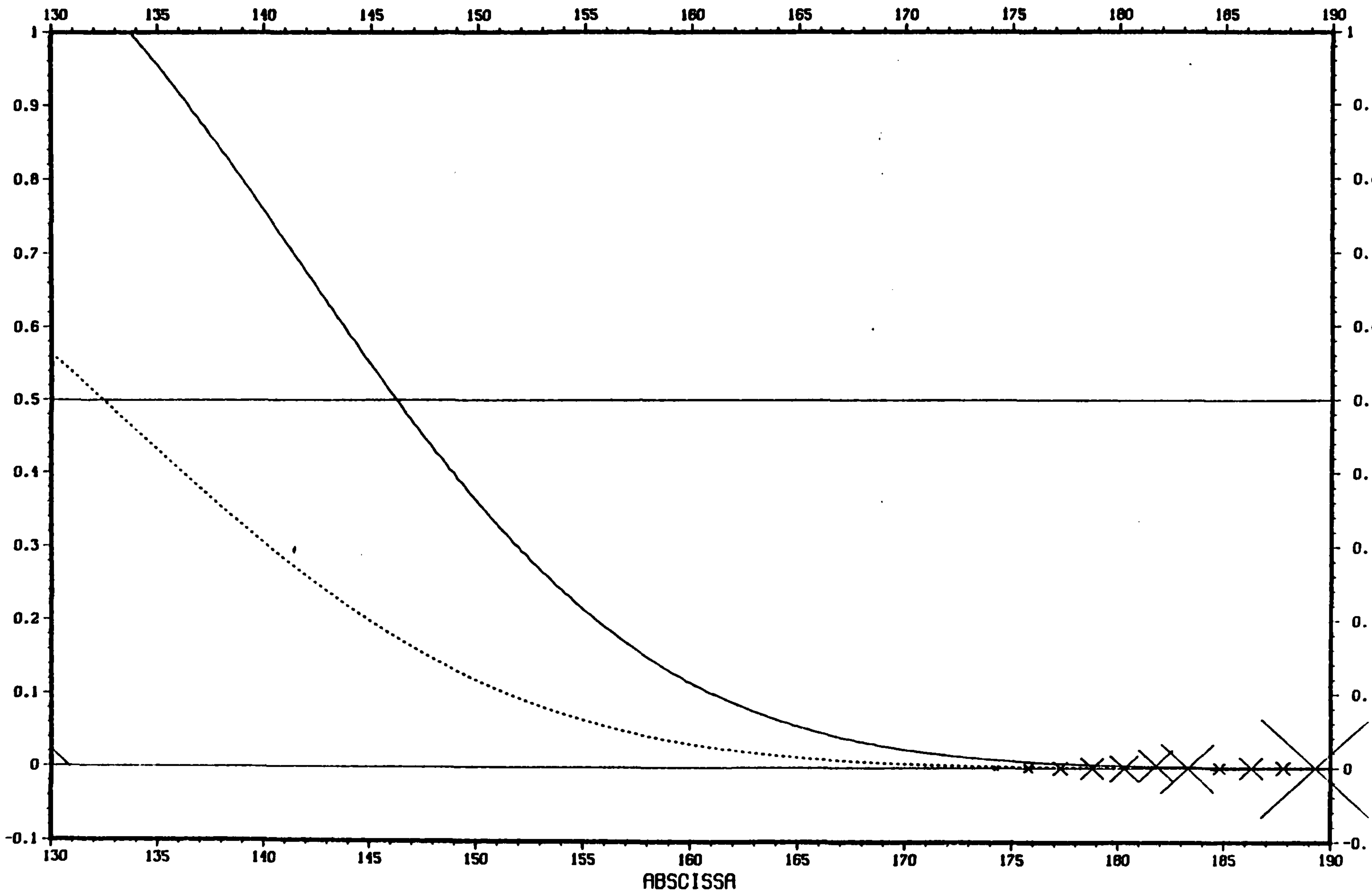
PARAMETERS FROM DATA SET # 2 (5 PLATFORMS)

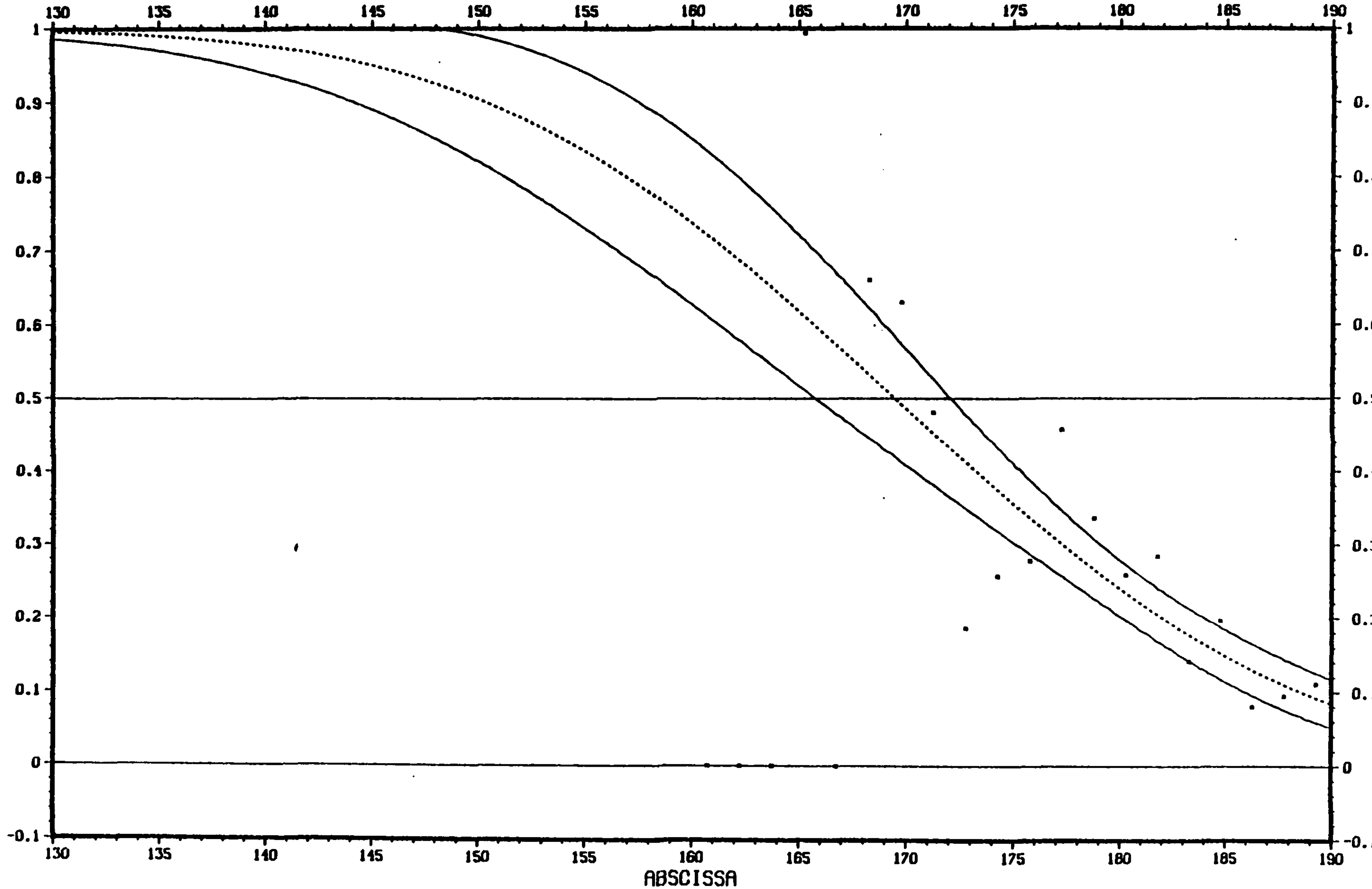


PREDICTION FOR PLATFORM NO. 3

PARAMETERS FROM DATA SET # 2 (5 PLATFORMS)



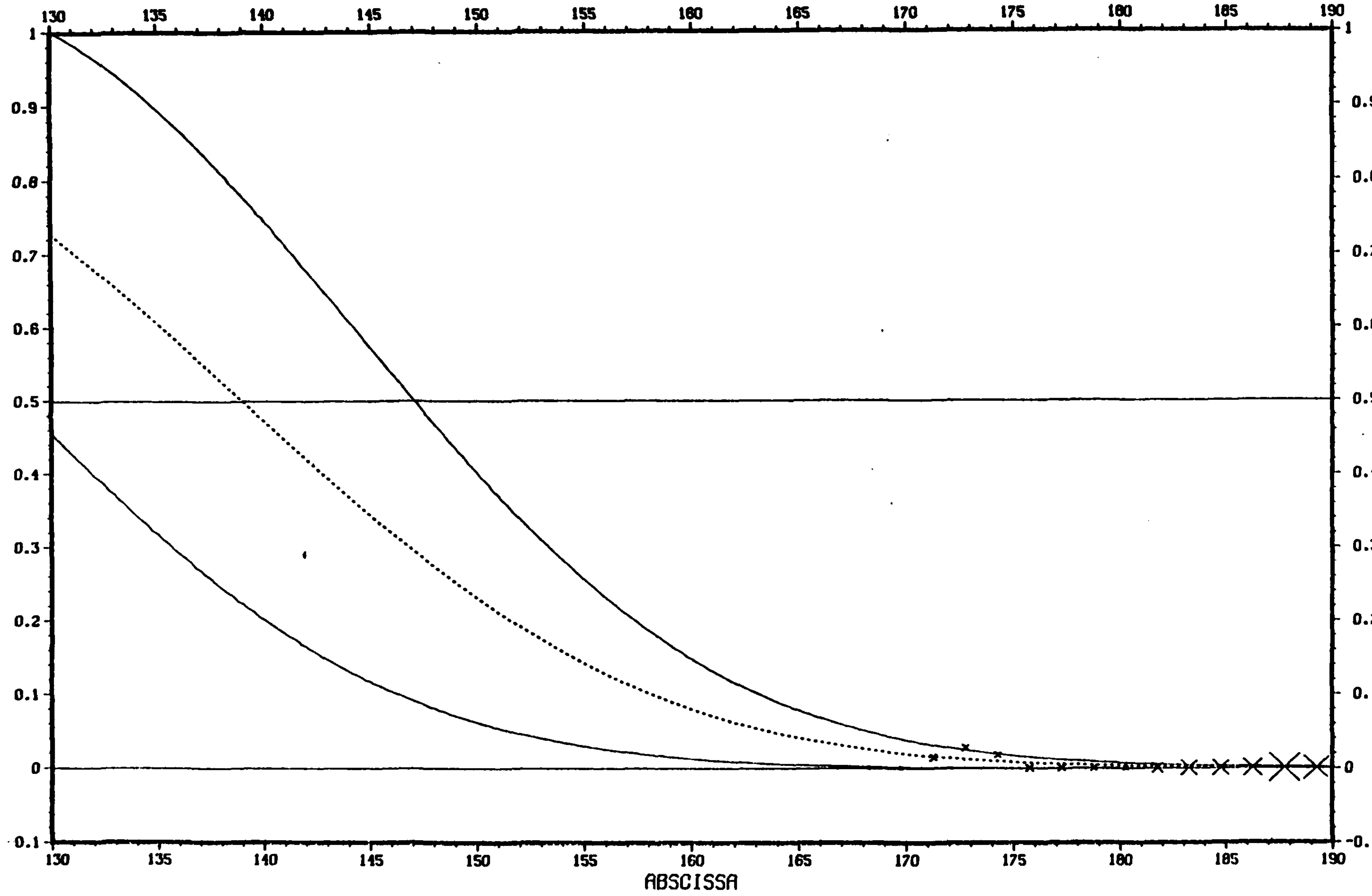
PARAMETERS FROM DATA SET # 2 (5 PLATFORMS)



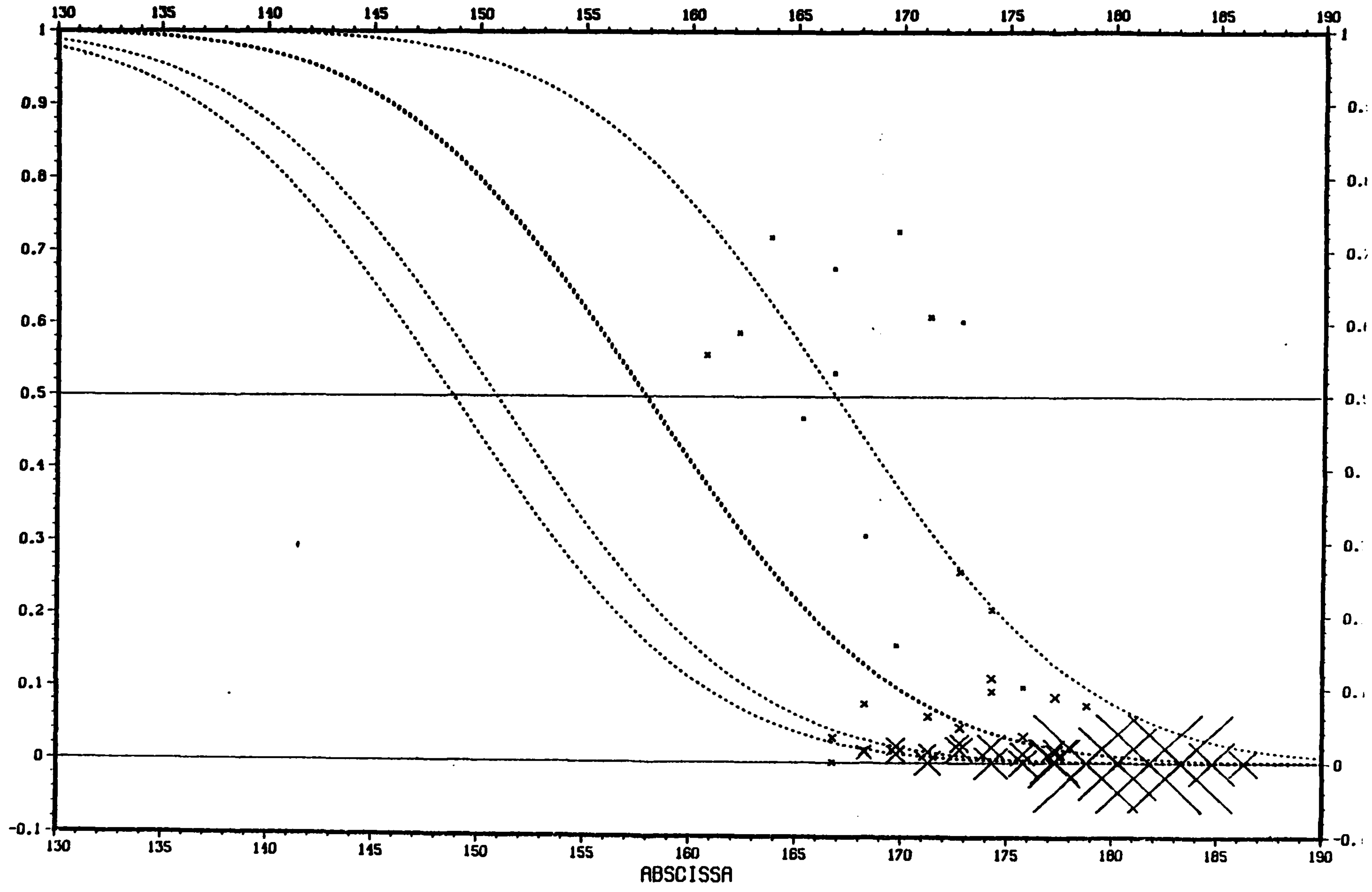
DISSPLA 9.0 JOB-JLH 17.31.43 THUR 7 OCT, 1982

PREDICTION FOR PLATFORM NO. 5

PARAMETERS FROM DATA SET # 2 (5 PLATFORMS)



PARAMETERS FROM DATA SET # 3 (5 PLATFORMS)

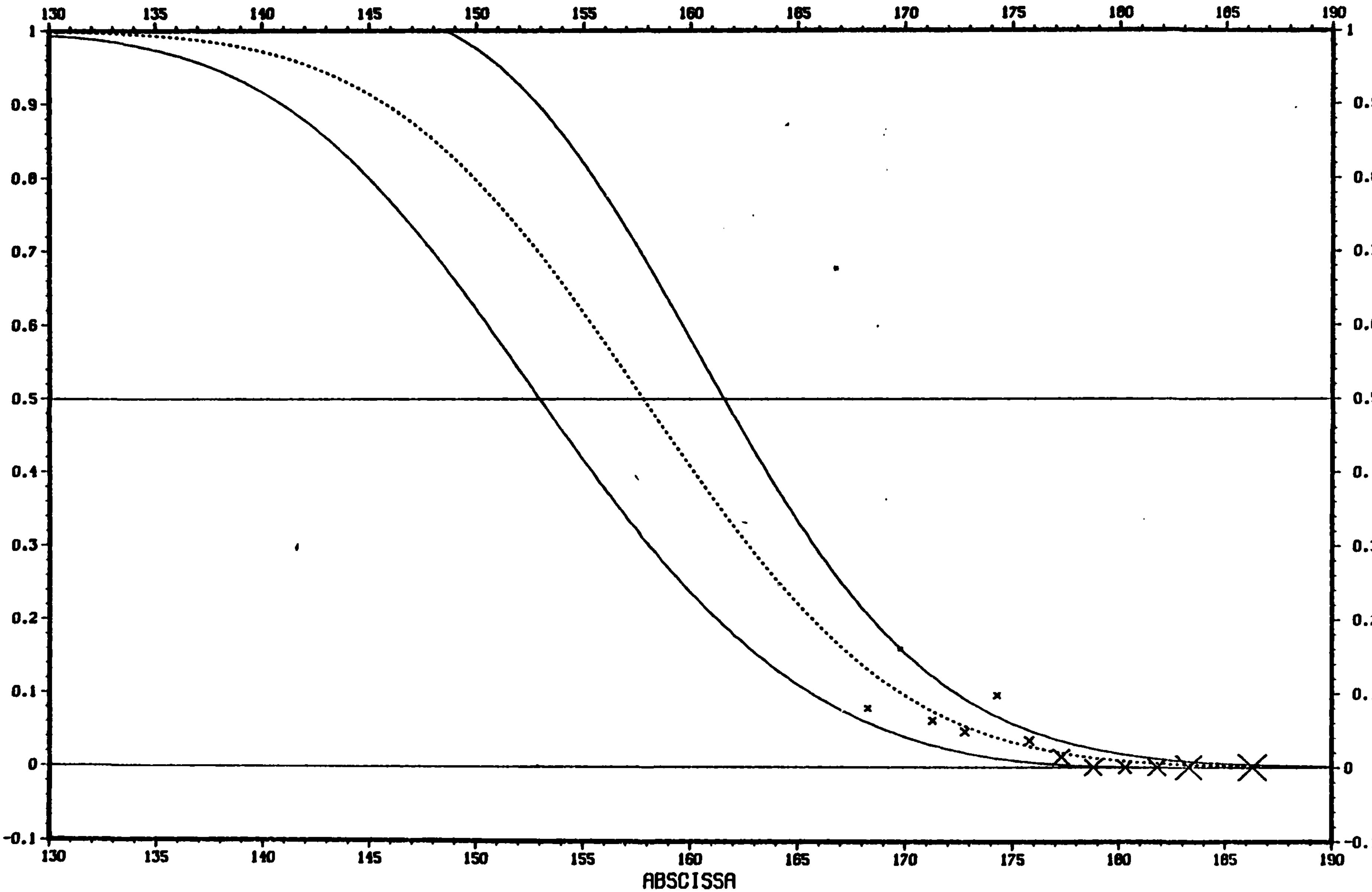


F-55

DISSPLA 9.0 JOB-JLH THUR 7 OCT, 1982

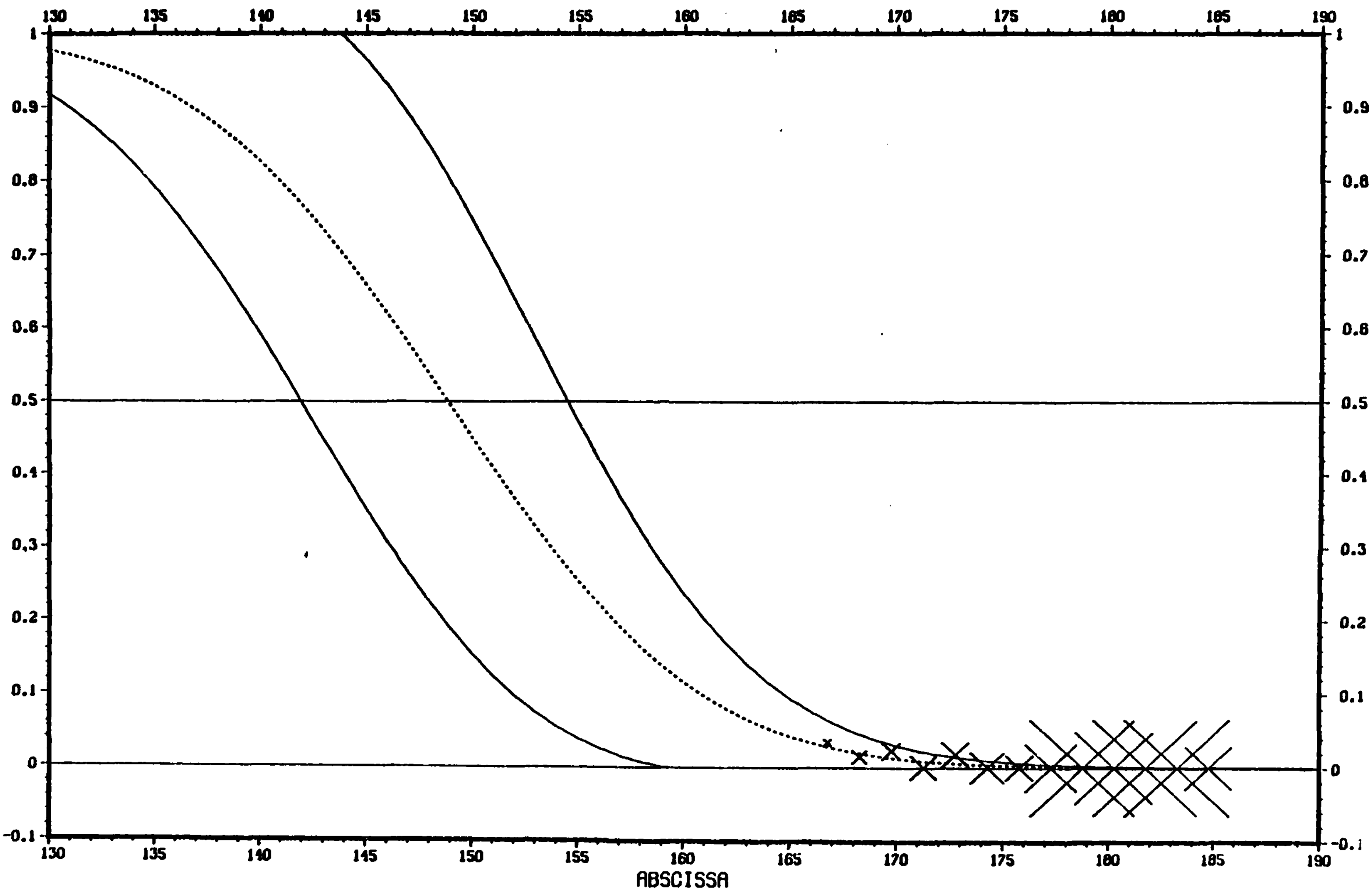
PREDICTION FOR PLATFORM NO. 1

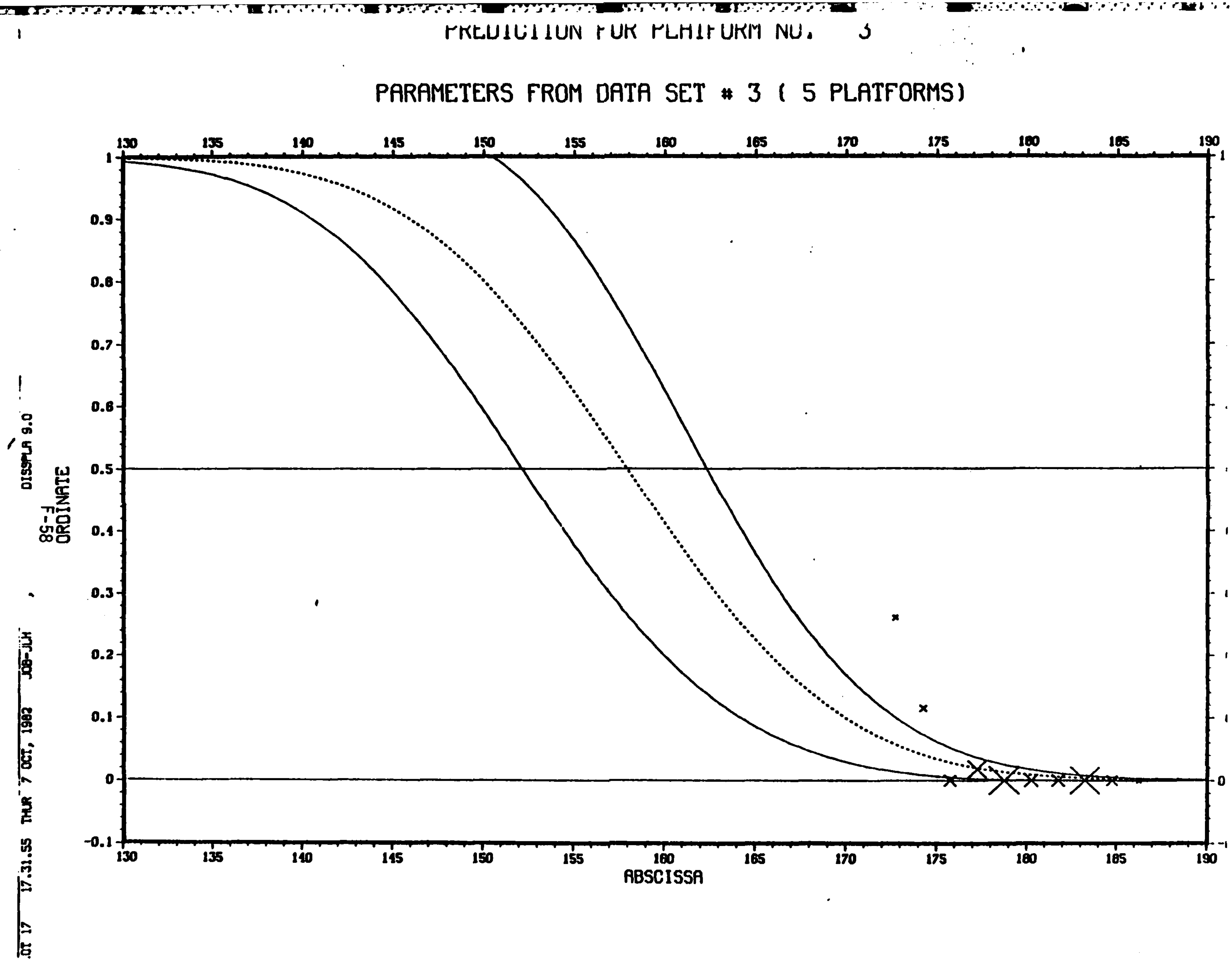
PARAMETERS FROM DATA SET # 3 (5 PLATFORMS)



DISSPLA 9.0 JCB-JLH THUR 7 OCT, 1982 17.31.50 :15

PARAMETERS FROM DATA SET # 3 (5 PLATFORMS)





PREDICTION FOR PLATFORM NO. 3
PARAMETERS FROM DATA SET # 3 (5 PLATFORMS)
130
135
140
145
150
155
160
165
170
175
180
185
190
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
ORDINATE
ABSCISSA
DISSPLA 9.0
OT 17 17.31.55 THUR 7 OCT, 1982 JOB-JLH

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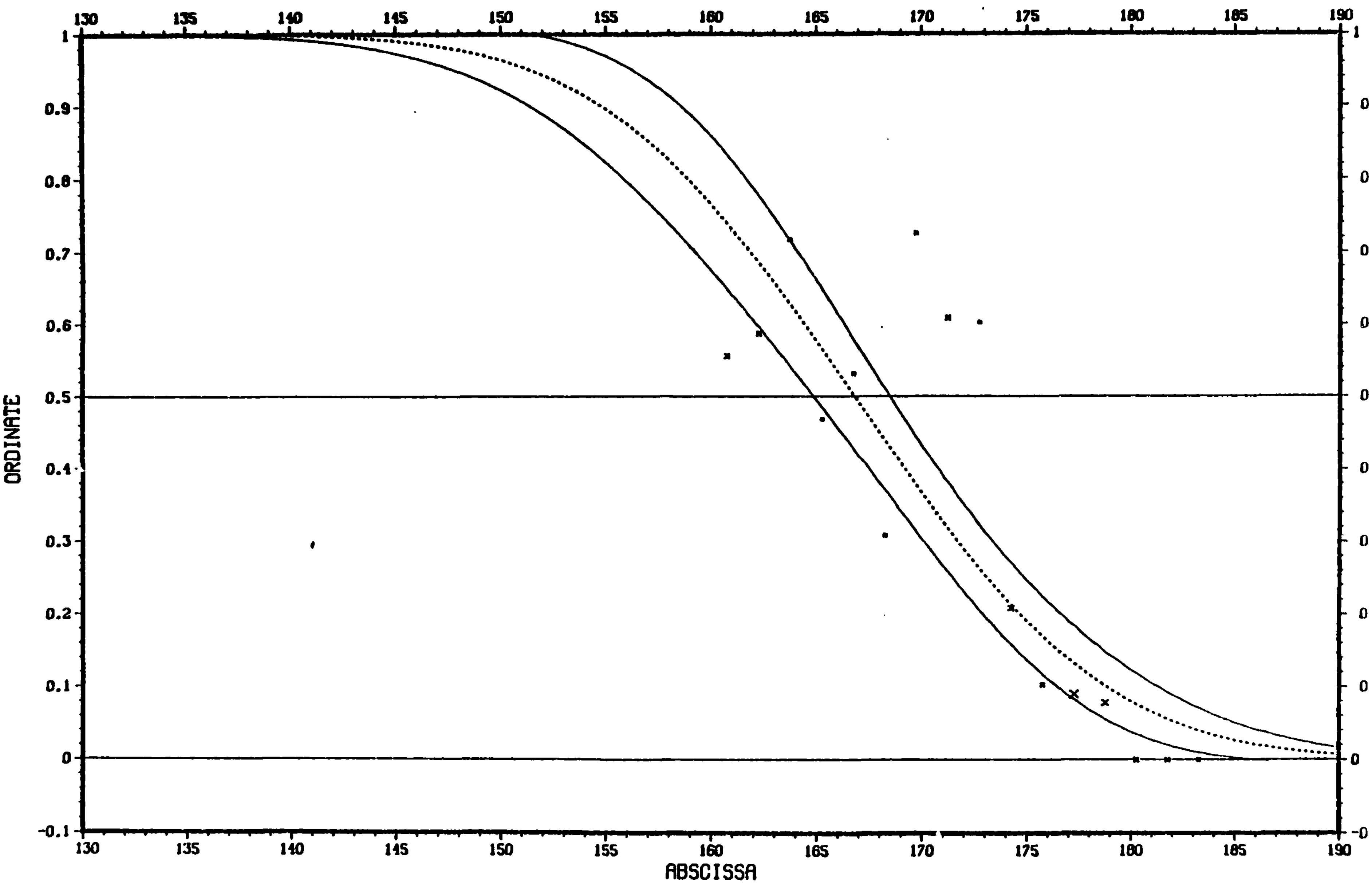
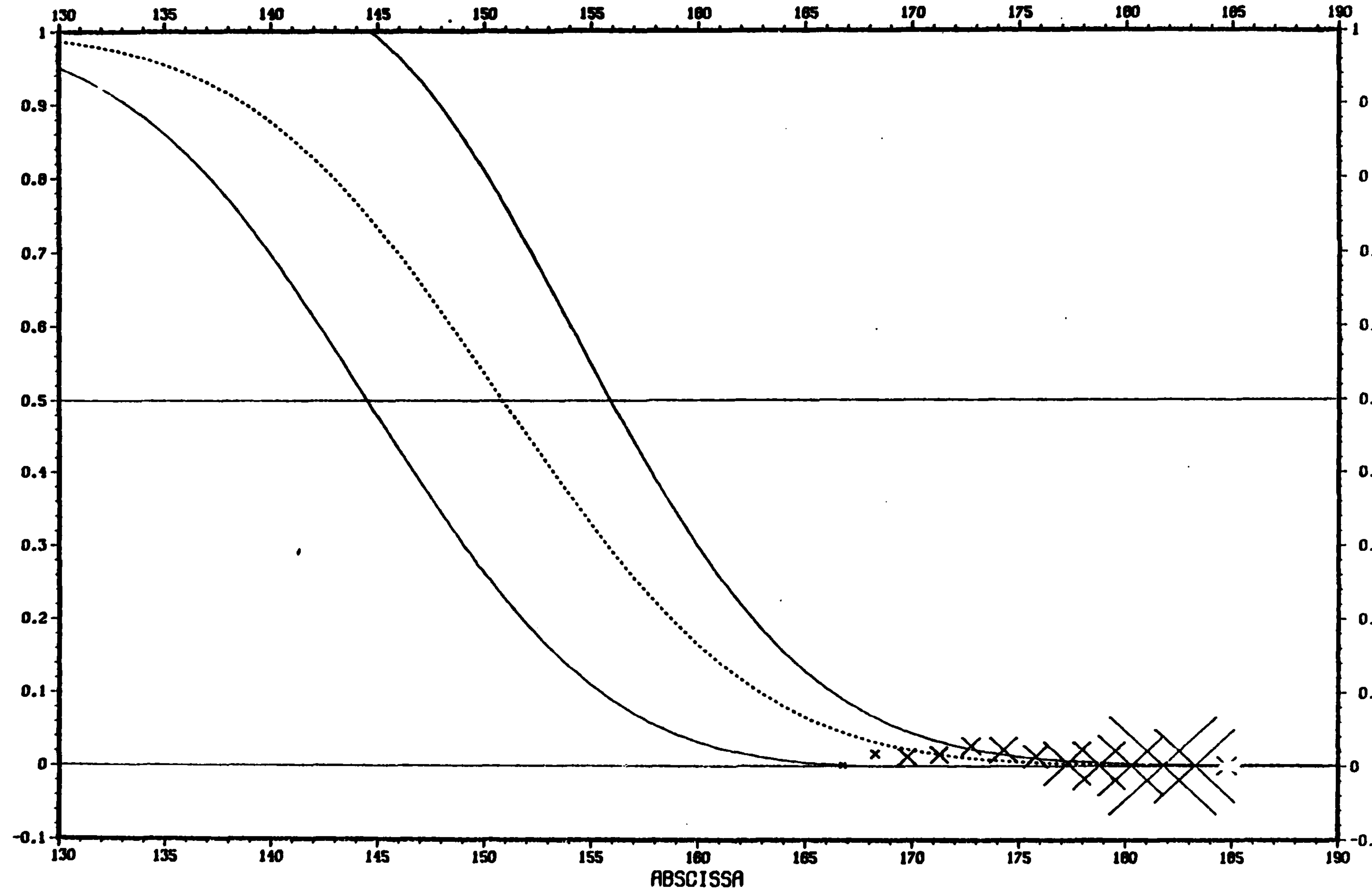
PARAMETERS FROM DATA SET # 3 (5 PLATFORMS)



PREDICTION FOR PLATFORM NO. 5

PARAMETERS FROM DATA SET # 3 (5 PLATFORMS)




FIL