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# Staff Papers Series

Staff Paper P80-23

October 1980

User's Guide

for

"Utility Program (PLOTLINE) for Automatically  
Scaled Graphical Plotting of Continuous Lines"

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## TABLE OF CONTENTS

- I. Identification
- II. General Description
- III. Utility Cards:
  - 1. PRØB Card
  - 2. FØRMAT Card
  - 3. GRAPH Card
  - 4. SELECT Card
  - 5. LABEL Card
  - 6. AXIS Card
- IV. Multiple graphing from one set of data.
- V. Multiple data sets in one run.
- VI. Job cards set up.
- VII. Appendix A: Two graphical plotting examples.
- VIII. Appendix B: Updated user's guide for PLOTTER program.

Staff Papers are published without formal review within the Department of Agricultural and Applied Economics.

PLØTLNE PROGRAM

## User's Guide

I. Identification

Title: Utility Program for Automatically Scaled Graphical Plotting  
of Continuous Lines.

Program Calling Name: PLØTLNE

Languages: FORTRAN Extended 4.0, Compass 3.0, CDC NOS CYBER 74  
operating system.

Computers: CDC 6000/7000/Cyber Series Machines.

Interfaced Plotter: Varian Statos 31 Electrostatic Plotter.

Subroutine Required: UCC PLØTPAC/PLØT31

Memory Requirement: 60,000 words

Programmer: Lung-Fai Wong and Henry Hwang, Department of Agricultural  
and Applied Economics.

Date: August, 1980

NOTE: In some parts of this paper, we used Ø and 0 to distinguish  
the letter "O" and number zero.

## II. General Description

This program is designed for users without a knowledge of FORTRAN language in use of the UCC pen and ink plotting package PLOTPAC to plot a continuous line or lines on a plotter paper. Before plotting, the program will automatically scale the numbers to the size of coordinates specified by users. Users can plot any number of graphs from a single set of data deck (or file) in one run, with a choice of selecting one or more variables against other variables, heading and axis labellings. The capacity of this program is:

No. of data set in one run: unlimited

No. of graphs in one run: unlimited

No. of variables can be read: maximum of 24

No. of observations can be read: maximum of 500

No. of lines can be plotted in a graph: maximum of 5

Size of graph: maximum of 10.5 inches in height and 999.0 inches  
in width, minimum of 3.5 inches in height and 5.0 inches  
in width.

Plotter pen moving step: 0.01 inches

### III. Utility Cards<sup>1/</sup>

#### 1. 'PRØB' Card

| <u>Column</u> | <u>Description</u>                            |
|---------------|-----------------------------------------------|
| 1-4           | PRØB                                          |
| 10            | Input device<br>1=card deck<br>2=tape or disk |
| 13-15         | No. of observations                           |

Option A: Indicate the exact number of observations to be read from the input device, must be less than or equal to 500, or

Option B: If leaving this field blank (or zero) then the program will count the number of observations until it encounters one observation that has blank (or zero) values for all variables read in. This can be accomplished easily by placing one blank card at the end of the data cards. If the input device is a disk or tape, then the program will count the number of observations until it encounters the first end-of-record (EOR) mark.

|       |                                                                                                         |
|-------|---------------------------------------------------------------------------------------------------------|
| 19-20 | Number of graphs to be plotted using this data set.                                                     |
| 24-25 | Number of variables to be read as specified in the FØRMAT card(s), it must be less than or equal to 24. |
| 30    | Number of FØRMAT card(s) that follow, it must be less than or equal to 9.                               |

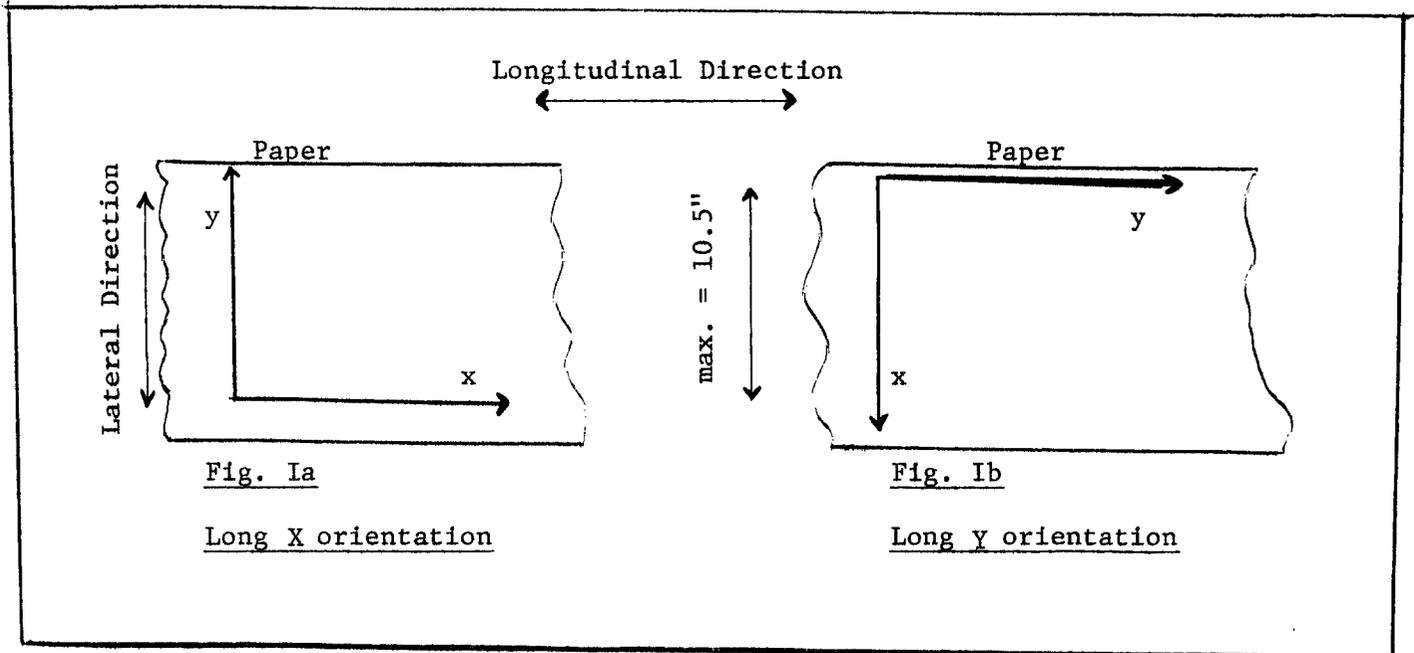
#### 2. FØRMAT Card

Variables will be read as REAL numbers and indexed by a subscript according to their orders in the input device. The data may be read in with the use of any kind of format allowed in FØRTRAN. If data are integers, user should change it to real numbers, i.e., change I3 to F3.0. The format statement must begin with an open parenthesis and end with a closing parenthesis. The number of format cards supplied must correspond to column 30 of the 'PRØB' card.

(If input device is card deck, data cards follow.)

## 3. 'GRAPH' Card

- 1-5                   GRAPH
- 10                    Number of lines to be drawn on this graph.
- 15                    Sorting of the whole data set so that the x-variable (abscissa) of the first line will be sorted in increasing order.  
0 or blank = no, 1 = yes  
This sorting option is important for time series plotting. But users should use it with caution, especially when plotting different x-variables in one graph. Once the data set is sorted according to the increasing order of the x-variable of the first line, the order of the other variables will be changed in the same manner.
- 20                    Indicate the position of the 3-line header label.<sup>2/</sup>  
0 or blank = label inside the graph  
1 = label outside (above) the graph
- 25                    Detect the zero or missing values of the y-variables (ordinate) and assign the average of adjacent values to it.  
0 or blank = no detection  
1 = yes  
The function of this option is to avoid undesirable scale.
- 30                    Detect the zero or missing values of the x-variables (abscissa). It has the same function as the one above,  
0 or blank = no, 1 = yes
- Caution:            The values replaced for zero values will be effective on other graphs too. Thus, if users resort the order of x-variables again in the second graph, the replaced values may not be the average values of the adjacent values. This is because the resort procedure changes the adjacent values.
- 35                    The orientation of the plotting.  
0 or blank = "Long X" orientation as shown in Figure Ia.  
1 = "Long Y" orientation as shown in Figure Ib.



36-40

The length (inches) of the x direction of the graph. It must be in REAL number form. If it is "Long Y" orientation, it should be less than or equal to 10.5 inches, otherwise, it can be up to 999.0 inches. 0 or blank = standard letter size (10.5").

41-45

The length (inches) of the y direction of the graph including the 3-line header label. It must be in REAL number form. If it is "Long X" orientation, the maximum length is 10.5 inches, otherwise, it can be up to 999.0 inches. 0 or blank = standard letter size (8.0").

## 4. 'SELECT' Card

1-6

SELECT

9-10

The  $i^{\text{th}}$  variable in the FORMAT card to be used as the x-variable for this line.

14-15

The  $i^{\text{th}}$  variable in the FORMAT card to be used as the y-variable for this line.

16-45

The legend, name, label, or explanation for this line. Users can use up to 30 characters for this purpose. If legend is not desired, leave it blank.

Users have to supply one 'SELECT' card for each line to be plotted on each graph. The number of 'SELECT' cards should be equal to the value indicated on column 10 of the 'GRAPH' card.

#### 5. 'LABEL' Card

1-5 LABEL

6-55 One card for one line of header label which contains a maximum of 50 characters. Users can use up to 3 lines of header label. Although users may not wish to use all 3 lines, three 'LABEL' cards have to be supplied. If only one line is desired, insert 2 more 'LABEL' cards with blanks on column 6-55. The 3-line header label will be plotted at the top of the graph (either inside or outside) and centered with the x-direction. If users have less than 50 characters for any of the lines, they may want to center the label by skipping some columns. For example, if user has only 10 characters for one of the lines, he should skip 20 columns and start punching on column 26 so that the 10 characters will be plotted on the center of the graph.

#### 6. 'AXIS' Card

1-4 AXIS

6-35 Title for x-axis, maximum of 30 characters.

36-65 Title for y-axis, maximum of 30 characters. Both titles will be centered with their axis. Again, if user has less than 30 characters for axis labels he can center the labels by skipping some columns.

#### IV. Multiple graphing from one set of data

More than one graph can be plotted by repeating cards no. 3, 4, 5, and 6.

#### V. Multiple data sets in one run

More than one set of data can be used by repeating cards no. 1, 2, data cards (if any), 3, 4, 5, and 6.

#### VI. Job cards set up

##### A. Single Data Set From Card Deck

Job name, time.

ACCØUNT, account no., password.

BIN card if not inputting from UNIVAC 1004.

GET, PLØTLNE/ UN=GQM6013.

FETCH, MINNLIB/V=MNF.  
 PLØTLNE.  
 RØUTE, PLØTS, DC=PL, TID=xx, BIN=yy, DEF.<sup>4/</sup>  
 PLØT31.

7-8-9 card

Utility Cards (including data set)

6-7-8-9

xx = The site CØDE of the site at which the user desires the output to be routed to.

TID=BC for Lauderdale University Computer Center

TID=40 for North Hall St. Paul Computer Center

yy = Bin number of shelf at site in which output will be placed by the computer operator.

#### B. Multiple Data Set From Card Deck

Job name, time.

ACCØUNT, account no., password.

BIN card, if needed.

GET, PLØTLNE/UN=GQM6013.

FETCH, MINNLIB/V=MNF.

PLØTLNE.

RØUTE, PLØTS, DC=PL, TID=xx, BIN=yy, DEF.

PLØT31.

7-8-9

Utility cards including first set of data (card 1 to 6)

Utility cards including second set of data

"

"

"

(As many as data sets are needed in this run)

6-7-8-9

#### C. Data Set From Tape, Indirect or Direct Permanent File

Job name, time.

ACCØUNT, account no., password.

BIN card, if needed.

LABEL, TAPE2 . . . . .(if data set from tape)

ATTACH, TAPE2 = file name, . . . . .(if data set from direct file), or

GET, TAPE2 = file name, . . . . .(if data set from indirect file)

R, TAPE2.

GET, PLØTLNE/UN=GQM6013.

FETCH, MINNLIB/V=MNF.

PLØTLNE.

RØUTE, PLØTS, DC=PL, TID=xx, BIN=yy, DEF.

PLØT31,

7-8-9

Utility cards without data deck

6-7-8-9

Two examples are attached in Appendix A.

NOTES:

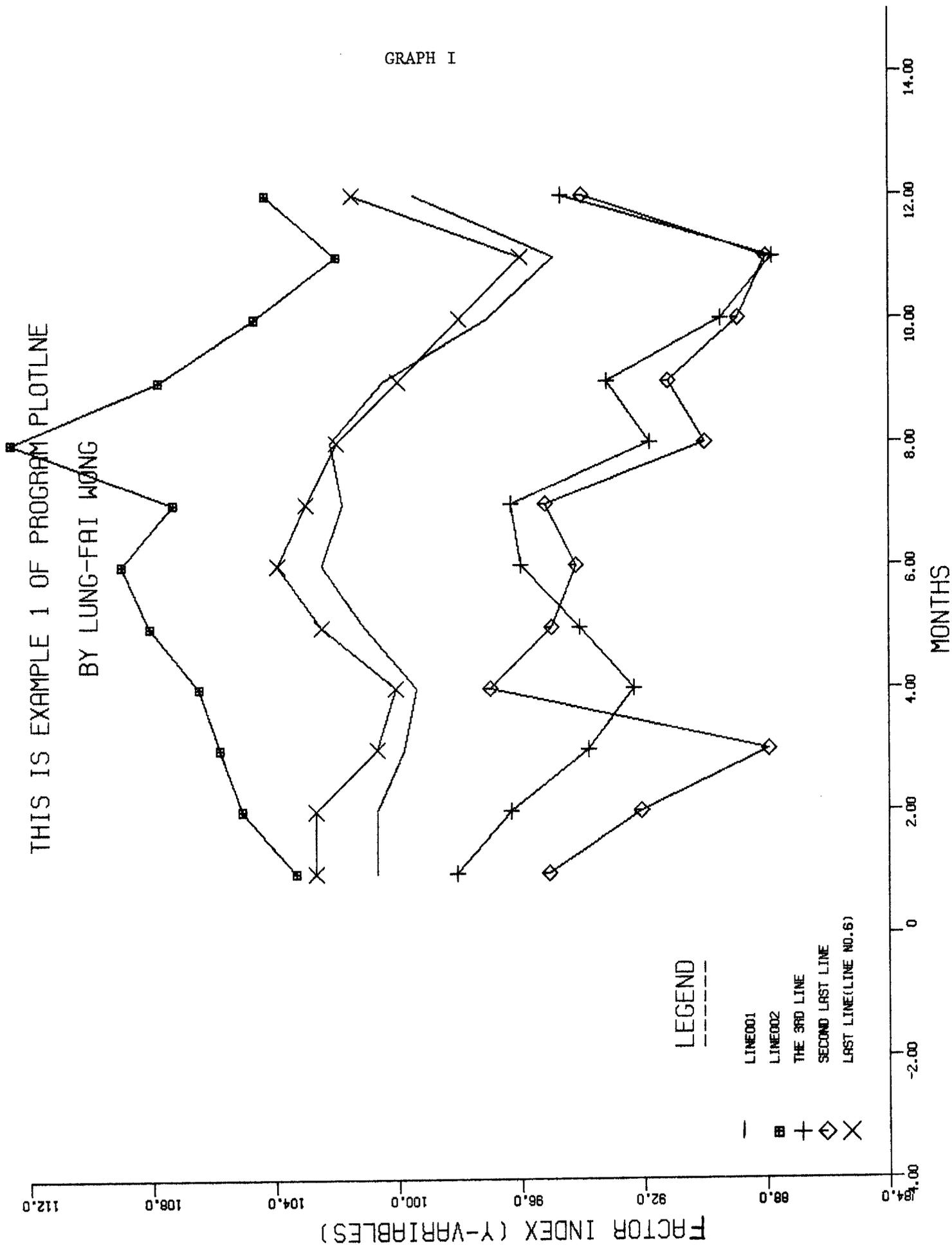
- 1/ All parameters used in this program should be in INTEGER form (right-justified without a decimal point), EXCEPT for the sizes of x-direction and y-direction on 'GRAPH' card.
- 2/ The location of labels are shown in example I and example II. The example I has label inside the graph while example II has label outside (above) the graph.
- 3/ The legend for lines will be drawn outside the graph after the graph had been plotted. In the two examples in Appendix, the legends were cut down from the plotting paper and taped on the graph. Also, the program will automatically draw center symbols for individual lines.  
  
1st line: straight line, no centered symbol  
2nd line: ■  
3rd line: +  
4th line: ◇  
5th line: ×
- 4/ Because the electrostatic plotter machine (varian statos 31) is located in Lauderdale University computer center, all plotting outputs will come out from there. Thus, if user uses TID=xx rather than TID=BC, the graphs will come out from Lauderdale and then be carried to the xx site by University buses, which usually takes one day.

```

FAI,T20.
ACCOUNT,GQM1234,ABCDE.
GET,PLOTLNE/UN=GQM6013.
FETCH(MINNLIB/V=MNF)
PLOTLNE.
ROUTE,PLOTS,DC=PL,TID=BC,BIN=5,DEF.
PLOT31.
  (7-8-9 EOR CARD)
PROB      1      12      1      6      1
(F4.0,5(1X,F5,1))
  1 100.7 103.3 98.1 95.1 102.7 1.
  2 100.7 105.1 96.3 92.1 102.7 2.
  3  99.8 105.8 93.8 87.9 100.7 3.
  4  99.4 106.5 92.3 97.  100.1 4.
  5 101.1 108.1 94.1 95.  102.5 5.
  6 102.5 109.0 96.0 94.2 103.9 6.
  7 101.8 107.3 96.3 95.2 103.  7.
  8 102.2 112.6 9.18 90.  102.  8.
  9 100.5 107.8 93.2 91.2 100.  9.
 10  97.1 104.7 89.5 88.9 98.0 10.
 11  94.9 102.0 87.8 88.0 96.  11.
 12  99.5 104.3 94.7 94.  101.5 12.
GRAPH      5
SELECT     1      2 LINE001
SELECT     1      3 LINE002
SELECT     1      4 THE 3RD LINE
SELECT     1      5 SECOND LAST LINE
SELECT     1      6 LAST LINE(LINE NO.6)
LABEL      THIS IS EXAMPLE 1 OF PROGRAM PLOTLNE
LABEL
LABEL      BY LUNG-FAI WONG
AXIS       MONTHS          FACTOR INDEX (Y-VARIABLES)
  (6-7-8-9 EOF CARD)

```

GRAPH I



## EXAMPLE II

```

FAI,T20.
ACCOUNT,GQM1234,ABCDE.
A,TAPE2=FAIWONG.
R,TAPE2.
GET,PLOTLNE/UN=GQM6013.
FETCH(MINNLIB/V=MNF)
PLOTLNE.
ROUTE,PLOTS,DC=PL,TID=BC,BIN=5,DEF.
PLOT31.
  (7-8-9 EOR CARD)
PROB      2      12      1      7      1
(F4.0,6(1X,F5.1))
GRAPH     2      1      1      1      1      1      9.0  10.5
SELECT    1      2LINE001---DATA FOR 1970
SELECT    7      3LINE002--WITH CENTER SYMBOLS
LABELIST  LINE OF HEADER LABEL--MAX.50 CHAR./LINE
LABEL                                SECOND LINE
LABEL3RD LINE OF LABEL--LABEL ABOVE (OUTSIDE) GRAPH
AXIS      TIME (X-VARIABLES)          PRICE (LABEL FOR Y)
  (6-7-8-9 EOF CARD)

```

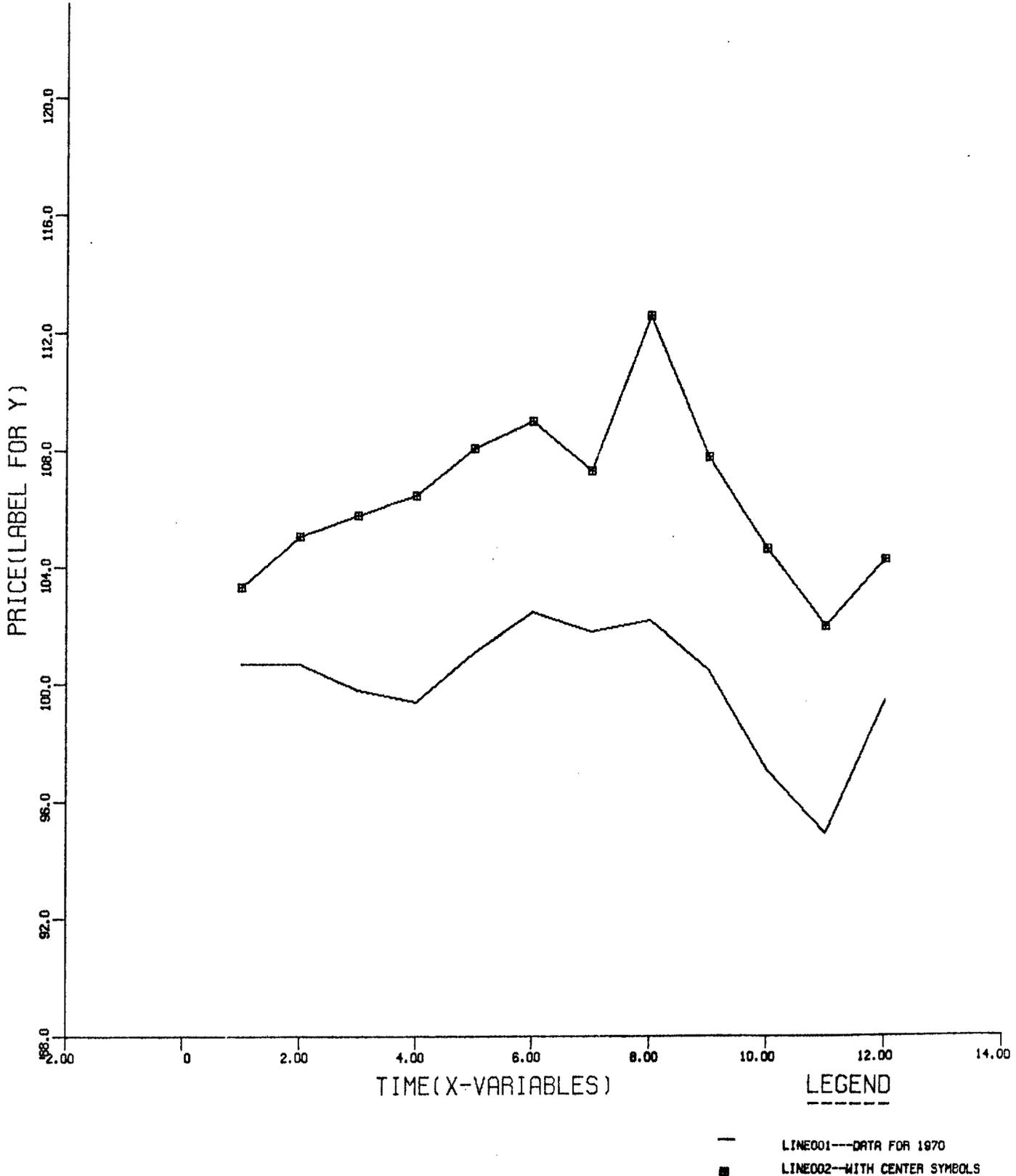
Data in filename FAIWONG

|    |       |       |      |      |       |     |
|----|-------|-------|------|------|-------|-----|
| 12 | 99.5  | 104.3 | 94.7 | 94.  | 101.5 | 12. |
| 1  | 100.7 | 103.3 | 98.1 | 95.1 | 102.7 | 1.  |
| 11 | 94.9  | 102.0 | 87.8 | 88.0 | 96.   | 11. |
| 3  | 99.8  | 105.8 | 93.8 | 87.9 | 100.7 | 3.  |
| 2  | 100.7 | 105.1 | 96.3 | 92.1 | 102.7 | 2.  |
| 10 | 97.1  | 104.7 | 89.5 | 88.9 | 98.0  | 10. |
| 5  | 101.1 | 108.1 | 94.1 | 95.  | 102.5 | 5.  |
| 4  | 99.4  | 106.5 | 92.3 | 97.  | 100.1 | 4.  |
| 7  | 101.8 | 107.3 | 96.3 | 95.2 | 103.  | 7.  |
| 8  | 102.2 | 112.6 | 91.8 | 90.  | 102.  | 8.  |
| 9  | 100.5 | 107.8 | 93.2 | 91.2 | 100.  | 9.  |
| 6  | 102.5 | 109.0 | 96.0 | 94.2 | 103.9 | 6.  |

## GRAPH II

(photocopy reduced from size of 9.0" x 10.5")

1ST LINE OF HEADER LABEL--MAX.50 CHAR./LINE  
 SECOND LINE  
 3RD LINE OF LABEL--LABEL ABOVE (OUTSIDE) GRAPH



PLOTTER PROGRAM

## I. IDENTIFICATION

TITLE: Utility Program for Automatically Scaled Plotting with Overplotting

PROGRAM CALLING NAME: PLOTTER

LANGUAGE: Fortran extended 3.0, Kronos 2.1, CDC Cyber 74

COMPUTER: CDC 6000/7000/Cyber Series Machines

SUBROUTINE REQUIRED: UCC Library Routine SCLPLT

MEMORY REQUIREMENT: 65000

PROGRAMMER: Patricia Y. Tsao and Henry Hwang, Department of Agricultural and Applied Economics

DATE: February 1975

UPDATED: September 1980, by Lung-Fai Wong

## II. GENERAL DESCRIPTION

This program plots one variable against one or more other variables. Any number of graphs can be plotted from a data deck. The user can also have a choice of using sets of data in one run. The number of variables should be less than or equal to 50 and the number of observations should be less than or equal to 400 for each data set. This program uses a fixed graph size (65 lines of 128 characters) and a single sheet of line printer paper.

## III. UTILITY CARDS

## 1. 'PROB' card

Column Description

1-4 PROB

8-10 Option 1. Indicate the exact number of observations to be read from the input device, must be less than or equal to 400, or

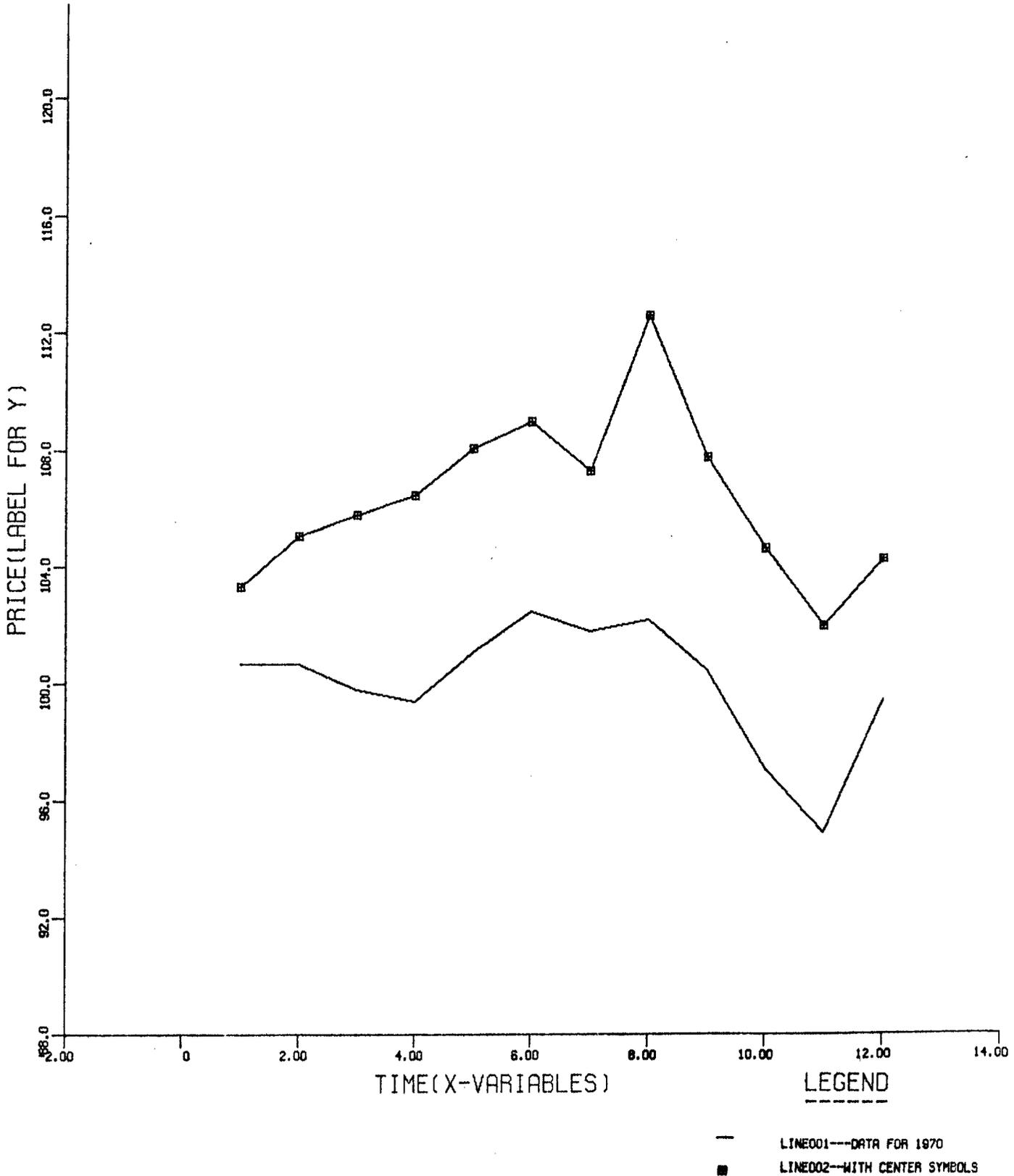
Option 2. Leave this field blank (or zero) and the computer will count the number of observations until it encounters one having a blank (or zero) value for all variables read in. This may be accomplished easily by placing one or more blank cards, whichever makes up a complete observation behind the data.

14-15 Number of variables to be read from the input device, must be less than or equal to 50.

## GRAPH II

(photocopy reduced from size of 9.0" x 10.5")

1ST LINE OF HEADER LABEL--MAX.50 CHAR./LINE  
 SECOND LINE  
 3RD LINE OF LABEL--LABEL ABOVE (OUTSIDE) GRAPH



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## III. UTILITY CARDS

## 1. 'PROB' card

## Column Description

1-4 PROB

8-10 Option 1. Indicate the exact number of observations to be read from the input device, must be less than or equal to 400, or

Option 2. Leave this field blank (or zero) and the computer will count the number of observations until it encounters one having a blank (or zero) value for all variables read in. This may be accomplished easily by placing one or more blank cards, whichever makes up a complete observation behind the data.

14-15 Number of variables to be read from the input device, must be less than or equal to 50,

- 18-20 Number of observations to be printed. This option allows for the printing of the 1st n observations specified. When 999 is specified all records will be printed. Leave this field blank (or zero) if data is not to be listed.
- 25 Number of format cards that follow, must be less than or equal to 9.
- 30 Variable name cards designator  
 0=no variable name cards, names of variables will be initialized as VAR 1, VAR 2, . . . , VAR 50.  
 1=variable name cards follow the FORMAT cards.
- 35 Min-Max values designator  
 0=the computer will check the minimum and maximum values for each variable.  
 1=user should specify both the minimum and maximum values of X-axis and Y-axis on his title cards. (see 7 for details)
- 40 Input device  
 1=cards  
 2=tape (user should declare his tape as TAPE2)
- 41-80 Alphanumeric identification of this data set.

## 2. FORMAT cards

Variables are considered to be indexed, or numbered, by a subscript according to the order in which they are read in from the input device. The data may be read in with the use of any FORMAT allows in FORTRAN, except I format. The format statement must begin with an open parenthesis and end with a closing parenthesis. The number of format cards supplied must correspond to column 25 of the 'PROB' card.

## 3. Variable name cards

Variable name cards are required if it is so designated by column 30 of the 'PROB' card. The function of this card is to allow for the alphanumeric identification of variable besides the normal index number assigned to the variables. Six characters are allowed for each variable name. Column continue by fields of 6 in the following manner:

1-6 11-16 21-26 31-36 41-46 51-56 61-66 71-76

## 4. Data cards

If column 40 of 'PROB' card is 1, the data set will follow variable name cards (or format cards in case no variable name cards are required). If column 40 of 'PROB' card is 2 no data card follows.

## 5. SELECT card

There can be as many SELECT cards as the user wants for each data set. The first variable on the SELECT card is plotted against all the other variables in a graph. The first variable will be plotted along X-axis, and the rest of the variables along Y-axis.

## Column Description

- 1- 6 'SELECT'
- 7- 8 Number of variables appear in this SELECT card, must be less than or equal to 24. Leave 7 blank (or zero) if the number is less than or equal to 9.
- 9-11 The index of 1st variable
- 12-14 The index of 2nd variable
- .
- .
- .
- 78-80 The index of 24th variable

Index means the ORDER in which the variables are read in by the FORMAT card. Index number should be punched right justified.

## 6. HEADING title card

Any character string punched before column 61 will be printed at the top of the graph.

7. Title for the X-axis and min-max values for X-axis if specified on column 35 of the 'PROB' card.

## Column Description

- 1-60 Title for the X-axis
- 61-70 Minimum value for X-axis (optional, format is F10.2)
- 71-80 Maximum value for X-axis (optional, format is F10.2)

If the minimum and maximum values are specified, the axis of graph is scaled within these limits. The values fall outside of these limits will be disregarded for graphing.

## 8. Title for the Y-axis and min-max values for Y-axis if specified on column 35 of the 'PROB' card (see 7 for description)

## 9. Multiple graphing from the data set

More than one graph can be produced by repeating 5, 6, 7, and 8 cards.

## 10. FINISH card

Punch FINISH through column 6. This card informs the computer that the graphing is finished on the data set read in.

## IV. JOB CARDS . . .

## A. Single Data Set from CARD DECK

JOB name, Time.  
 Bincard if not inputting from UNIVAC 1004 or TTY 200.  
 GET,PLOTTER/UN=GQM6013.  
 FETCH,MINNLIB/V=MNF.  
 PLOTTER.

<sup>7</sup><sub>8</sub><sub>9</sub>

UTILITY CARDS (including data set, see Section III)

<sup>6</sup><sub>7</sub><sub>8</sub><sub>9</sub>

B. Multiple Data Sets from CARD DECK

JOB name, Time.  
 Bincard if needed.  
 GET,PLOTTER/UN=GQM6013.  
 FETCH,MINNLIB/V=MNF.  
 PLOTTER.

<sup>7</sup><sub>8</sub><sub>9</sub>

UTILITY CARDS for first data set  
 UTILITY CARDS for second data set

.  
 .  
 .

(as many as data sets for PLOTTER)

<sup>6</sup><sub>7</sub><sub>8</sub><sub>9</sub>

C. Data Set from Tape, Indirect or Direct Permanent File.

JOB name, Time.  
 Bincard if needed.  
 LABEL, TAPE2, ... (if data set from tape)  
 or  
 ATTACH, TAPE2=MYFILE ... (if data set from a DIRECT  
 Permanent File named MYFILE)  
 GET, TAPE2=MYFILE ... (if data set from an INDIRECT  
 Permanent File named MYFILE)

R, TAPE2.  
 GET,PLOTTER/UN=GQM6013.  
 FETCH, MINNLIB/V=MNF.  
 PLOTTER.

<sup>7</sup><sub>8</sub><sub>9</sub>

UTILITY CARDS (without data deck)

<sup>6</sup><sub>7</sub><sub>8</sub><sub>9</sub>

## PLOTTER EXAMPLE

FAI,T40.  
 ACCOUNT,GQM1234,ABCDE.  
 GET,PLOTTER/UN=GQM6013.  
 FETCH,MINNLIB/V=MNF.  
 PLOTTER.  
 COST.

(7-8-9 EOR CARD)

PROB 6 999 1 1 1 PLOTTER TEST --BY FAI

(F4.0,5(1X,F5.1))

| MONTH | LINE01 | LINE02 | LINE03 | LINE04 | LINE05 |
|-------|--------|--------|--------|--------|--------|
| 1     | 100.7  | 103.3  | 98.1   | 95.1   | 102.7  |
| 2     | 100.7  | 105.1  | 96.3   | 92.1   | 102.7  |
| 3     | 99.8   | 105.8  | 93.8   | 87.9   | 100.7  |
| 4     | 99.4   | 106.5  | 92.3   | 97.    | 100.1  |
| 5     | 101.1  | 108.1  | 94.1   | 95.    | 102.5  |
| 6     | 102.5  | 109.0  | 96.0   | 94.2   | 103.9  |
| 7     | 101.8  | 107.3  | 96.3   | 95.2   | 103.   |
| 8     | 102.2  | 112.6  | 91.8   | 90.    | 102.   |
| 9     | 100.5  | 107.8  | 93.2   | 91.2   | 100.   |
| 10    | 97.1   | 104.7  | 89.5   | 88.9   | 98.0   |
| 11    | 94.9   | 102.0  | 87.8   | 88.0   | 96.    |
| 12    | 99.5   | 104.3  | 94.7   | 94.    | 101.5  |

(BLANK CARD)

SELECT 6 1 2 3 4 5 6

TEST FOR PLOTTER

MONTH

PRICE

FINISH

(6-7-8-9 EOF CARD)

PLOTTER GRAPH

(photocopy reduced from size of 14" x 11")

