P CONTROL CHART

PURPOSE
Generates a (binomial) proportion control chart.

DESCRIPTION
A P chart is a data analysis technique for determining if a measurement process has gone out of statistical control. The P chart is sensitive to changes in the proportion of defective items in the measurement process. The "P" in P chart stands for the p (the proportion of successes) of a binomial distribution. The P control chart consists of:

Vertical axis   =   the percentage of defectives for each sub-group;
Horizontal axis   =   the sub-group designation.

A sub-group is frequently a time sequence (e.g., the number of defectives in a daily production run where each day is considered a sub-group). If the times are equally spaced, the horizontal axis variable can be generated as a sequence (e.g., LET X = SEQUENCE 1 1 N where N is the number of sub-groups).

In addition, horizontal lines are drawn at the mean number of defectives and at the upper and lower control limits. The distribution of the number of defective items is assumed to be binomial. This assumption is the basis for the calculating the upper and lower control limits. The control limits are calculated as:

$$LCL = \bar{p} - 3\sqrt{\frac{\bar{p}(1-\bar{p})}{N}}$$ **(EQ 2-16)**

$$UCL = \bar{p} + 3\sqrt{\frac{\bar{p}(1-\bar{p})}{N}}$$ **(EQ 2-17)**

where $\bar{p}$ is the total number of defects divided by the total number of items and N is the number of items in a given sub-group. Note that this means that the control limits can vary with the sub-group. Also, zero serves as a lower bound on the LCL value.

SYNTAX
P CHART <y> <size> <x>   <SUBSET/EXCEPT/FOR qualification>
where <y> is a variable containing the number of defective items in each sub-group;

<size> is a variable containing the sample size for each sub-group;

<x> is a variable containing the sub-group identifier (usually 1, 2, 3, ...);

and where the <SUBSET/EXCEPT/FOR qualification> is optional.

EXAMPLES
P CHART Y SIZE X

NOTE 1
The P CONTROL CHART is similar to the NP CONTROL CHART. The distinction is that the P CONTROL CHART plots the percentage of defectives while the NP CONTROL CHART plots the number of defectives. The NP CONTROL CHART is typically used for equal sample sizes and P CONTROL CHART is typically used for unequal sample sizes.

NOTE 2
The attributes of the 4 traces that make up the P control chart are controlled by the standard LINES, CHARACTERS, SPIKES, and BAR commands. Trace 1 is the response variable, trace 2 is the mean line, and traces 3 and 4 are the upper and lower control limits. Some analysts prefer to draw the response variable as a character or a spike rather than a connected line. The example program demonstrates setting the line attributes (the control lines are drawn as dotted lines).

DEFAULT
None

SYNONYMS
P CHART for P CONTROL CHART

RELATED COMMANDS
U CHART   =   Generates a U control chart.
C CHART   =   Generates a C control chart.

NP CHART	=	Generates a Np control chart.
XBAR CHART	=	Generates a xbar control chart.
R CHART	=	Generates a range control chart.
S CHART	=	Generates a standard deviation control chart.
CHARACTERS	=	Sets the types for plot characters.
LINES	=	Sets the types for plot lines.
SPIKES	=	Sets the on/off switches for plot spikes.
PLOT	=	Generates a data or function plot.

REFERENCE

"Guide to Quality Control," Kaoru Ishikawa, Asian Productivity Organization, 1982 (Chapter 8).

APPLICATIONS

Quality Control

IMPLEMENTATION DATE

88/2

PROGRAM

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SKIP 25
READ CCP.DAT X NUMDEF SIZE
LINES SOLID SOLID DOT DOT
XLIMITS 0 20
XTIC OFFSET 0 1
TITLE AUTOMATIC
Y1LABEL PERCENTAGE OF DEFECTIVES
X1LABEL GROUP-ID
P CONTROL CHART NUMDEF SIZE X
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