

Chapter 11

PROC CUSUM Statement

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Chapter 11

PROC CUSUM Statement

Overview

The PROC CUSUM statement starts the CUSUM procedure and it identifies input data sets.

After the PROC CUSUM statement, you provide an XCHART statement that specifies the cusum chart you want to create and the variables in the input data set that you want to analyze. For example, the following statements request a one-sided (decision interval) cusum chart:

```
proc cusum data=values;
  xchart weight*lot / scheme = onesided
                    mu0    = 8.100
                    sigma0 = 0.050
                    delta  = 1
                    h      = 2.2
                    k      = 0.5;
run;
```

In this example, the DATA= option specifies an input data set (VALUES) that contains the *process* measurement variable WEIGHT and the *subgroup-variable* LOT. *

You can use options in the PROC CUSUM statement to

- specify input data sets containing variables to be analyzed, parameters for cusum schemes, or annotation information
- specify a graphics catalog for saving graphical output
- specify that charts are to be produced on graphics devices or line printers
- define characters used for features on charts produced on line printers

In addition to the XCHART statement, you can provide BY statements, ID statements, TITLE statements, and FOOTNOTE statements. If you are using a graphics device, you can also provide graphics enhancement statements, such as SYMBOLN statements, which are described in *SAS/GRAPH Software: Reference*.

Note: If you are using the CUSUM procedure for the first time, you should read both this chapter and “Getting Started” on page 362 in Chapter 12, “XCHART Statement.”

*In Release 6.12 and previous releases of SAS/QC software, the keyword GRAPHICS was required in the PROC CUSUM statement to specify that the chart be created with a graphics device. In Version 7, you can specify the LINEPRINTER option to request line printer plots.

Syntax

The syntax for the PROC CUSUM statement is as follows:

PROC CUSUM < *options* >;

The PROC CUSUM statement starts the CUSUM procedure, and it optionally identifies various data sets and requests graphics output. You can specify the following *options* in the PROC CUSUM statement. The marginal notes *Graphics* and *Line Printer* identify options that apply to graphics devices and line printers, respectively.

ANNOTATE=*SAS-data-set*

ANNO=*SAS-data-set*

Graphics

specifies an input data set that contains appropriate annotate variables, as described in *SAS/GRAPH Software: Reference*. The ANNOTATE= option allows you to add features to the cusum chart (for example, labels that explain out-of-control points). The ANNOTATE= data set is used only when the chart is created using a graphics device; it is ignored when the LINEPRINTER option is specified. The data set specified with the ANNOTATE= option in the PROC CUSUM statement is a “global” annotate data set in the sense that the information in this data set is displayed on every chart produced in the current run of the CUSUM procedure.

ANNOTATE2=*SAS-data-set*

ANNO2=*SAS-data-set*

Graphics

specifies an input data set that contains appropriate annotate variables that add features to the trend chart (secondary chart) produced with the TRENDVAR= option in the XCHART statement.

DATA=*SAS-data-set*

names an input data set that contains raw data (measurements) as observations. If the values of the *subgroup-variable* are numeric, you need to sort the data set so that these values are in increasing order (within BY groups). The DATA= data set can contain more than one observation for each value of the *subgroup-variable*.

You cannot use a DATA= data set with a HISTORY= data set. If you do not specify a DATA= or HISTORY= data set, PROC CUSUM uses the most recently created data set as a DATA= data set. For more information, see “DATA= Data Set” on page 406.

FORMCHAR(*index*)=*'string'*

Line Printer

defines characters used for features on charts produced on a line printer, where

index

is a list of numbers ranging from 1 to 17. The list identifies which features are controlled with the *string* characters. By default, *index* is omitted, and the FORMCHAR= option gives a *string* for all 17 features.

string

gives characters for features in *index*. Any character or hexadecimal string can be used.

The features associated with values of *index* are as follows:

Value of <i>index</i>	Description of Character	Chart Feature
1	vertical bar	frame
2	horizontal bar	frame, central line
3	box character (upper left)	frame
4	box character (upper middle)	serifs, tick (horizontal axis)
5	box character (upper right)	frame
6	box character (middle left)	not used
7	box character (middle middle)	serifs
8	box character (middle right)	tick (vertical axis)
9	box character (lower left)	frame
10	box character (lower middle)	serifs
11	box character (lower right)	frame
12	vertical bar	control limits
13	horizontal bar	control limits
14	box character (upper right)	control limits
15	box character (lower left)	control limits
16	box character (lower right)	control limits
17	box character (upper left)	control limits

Not all printers can produce the characters in the preceding list. By default, the form character list specified by the SAS system option `FORMCHAR=` is used; otherwise, the default is `FORMCHAR='|---|+|---|====='`. If you print to a PC screen or if your device supports the ASCII symbol set (1 or 2), the following is recommended:

```
formchar='B3,C4,DA,C2,BF,C3,C5,B4,C0,C1,D9,BA,CD,BB,C8,BC,D9'X
```

Note that you can use the `FORMCHAR=` option to temporarily override the values of the SAS system `FORMCHAR=` option. The values of the SAS system `FORMCHAR=` option are not altered by the `FORMCHAR=` option in the `PROC CUSUM` statement.

GOUT=*graphics-catalog*

specifies the graphics catalog for graphics output from `PROC CUSUM`. This is useful if you want to save the output. The `GOUT=` option is used only when the chart is created using a graphics device; it is ignored when the `LINEPRINTER` option is specified.

Graphics

HISTORY=*SAS-data-set*

HIST=*SAS-data-set*

names an input data set that contains subgroup summary statistics (means, standard deviations, and sample sizes). Typically, this data set is created as an `OUTHISTORY=` data set in a previous run of `PROC CUSUM` or `PROC SHEWHART`, but it can also be created with a SAS summarization procedure such as `PROC MEANS`.

If the values of the *subgroup-variable* are numeric, you need to sort the data set so that these values are in increasing order (within `BY` groups). A `HISTORY=` data set can contain only one observation for each value for the *subgroup-variable*.

You cannot use a `HISTORY=` data set together with a `DATA=` data set. If you do not specify a `HISTORY=` or `DATA=` data set, `PROC CUSUM` uses the most recently created data set as a `DATA=` data set. For more information on `HISTORY=` data sets, see “`HISTORY=` Data Set” on page 408.

LIMITS=SAS-data-set

names an input data set that contains a set of decision interval or V-mask parameters. Each observation in a LIMITS= data set contains the parameters for a *process*.

If you are using Release 6.09 or an earlier release of SAS/QC software, you must specify the options READLIMITS or READINDEX= in the XCHART statement to read the parameters from the LIMITS= data set. In Release 6.10 and later releases, these options are not needed.

For details about the variables needed in a LIMITS= data set, see “LIMITS= Data Set” on page 407. If you do not provide a LIMITS= data set, you must specify the parameters with options in the XCHART statement.

LINEPRINTER

requests that line printer charts be produced. By default, the procedure creates charts for a graphics device.

Input and Output Data Sets

Figure 11.1 summarizes the data sets used with the CUSUM procedure.

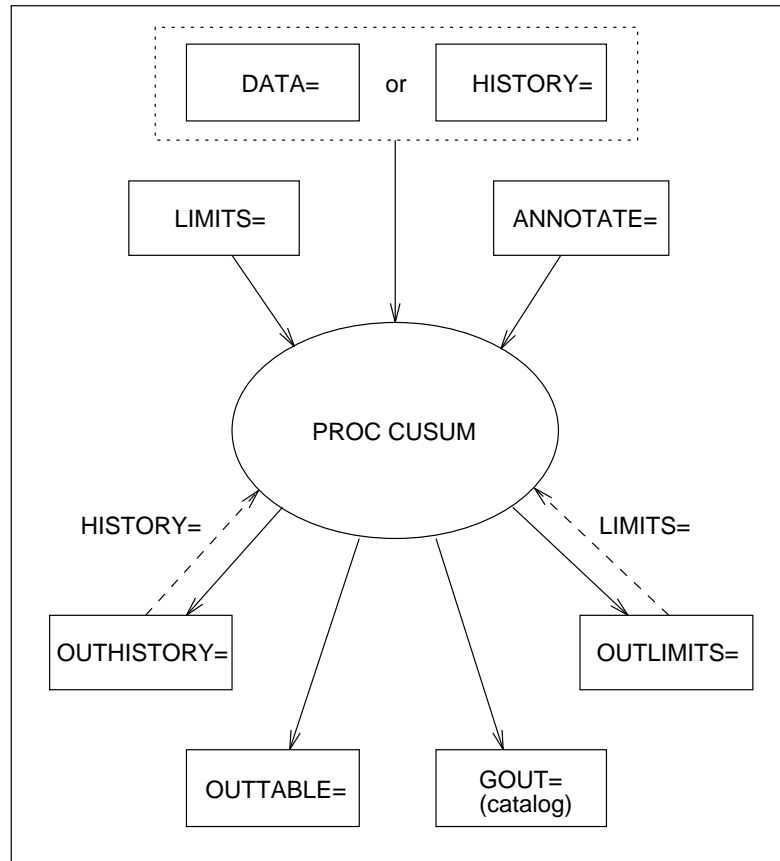


Figure 11.1. Input and Output Data Sets in the CUSUM Procedure

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