Chapter 13
INSET Statement

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Overview

The INSET statement allows you to enhance a cusum chart by adding a box or table (referred to as an inset) of summary statistics directly to the graph. A possible application of an inset is to present cusum parameters on the chart rather than displaying them in a legend. An inset can also display arbitrary values provided in a SAS data set.

Note that the INSET statement by itself does not produce a display but must be used in conjunction with an XCHART statement. Insets are not available with line printer output, so the INSET statement is not applicable when the LINEPRINTER option is specified in the PROC CUSUM statement.

You can use options in the INSET statement to

- specify the position of the inset
- specify a header for the inset table
- specify graphical enhancements, such as background colors, text colors, text height, text font, and drop shadows
Part 2. The CAPABILITY Procedure

Getting Started

This section introduces the INSET statement with a basic example showing how it is used. See Chapter 42, “INSET and INSET2 Statements,” in Part 9, “The SHEWHART Procedure,” for a complete description of the INSET statement.

This example is based on the same scenario as the first example in the “Getting Started” section of Chapter 12, “XCHART Statement.”. A machine fills cans with oil additive and a two-sided cusum chart is used to detect shifts from the target mean of 8.100 ounces. The following statements create the data set OIL and request a two-sided cusum chart with an inset:

```sas
data oil;
  label hour = 'Hour';
  input hour @;
  do i=1 to 4;
    input weight @;
    output;
  end;
  drop i;
cards;
  1 8.024 8.135 8.151 8.065
  2 7.971 8.165 8.077 8.157
  3 8.125 8.031 8.198 8.050
  4 8.123 8.107 8.154 8.095
  5 8.068 8.093 8.116 8.128
  6 8.177 8.011 8.102 8.030
  7 8.129 8.060 8.125 8.144
  8 8.072 8.010 8.097 8.153
  9 8.066 8.067 8.055 8.059
 10 8.089 8.064 8.170 8.086
 11 8.058 8.098 8.114 8.156
 12 8.147 8.116 8.116 8.018;
```

```sas
symbol v=dot;
title 'Cusum Chart for Average Weights of Cans';
proc cusum data=oil;
xchart weight*hour /
  mu0 = 8.100 /* target mean */
  sigma0 = 0.050 /* known standard deviation */
  delta = 1 /* shift to be detected */
  alpha = 0.10 /* Type 1 error probability */
  vaxis = -5 to 3
  nolegend;
  label weight='Cumulative Sum';
inset arl0 alpha delta h k mu0 shift sigmas;
run;
```

The resulting cusum chart is shown in Figure 13.1.
Figure 13.1. Two-Sided Cusum Chart with an Inset
The syntax for the INSET statement is as follows:

\[
\text{INSET } \text{keyword-list} < / \text{options}>; 
\]

You can use any number of INSET statements in the CUSUM procedure. Each INSET statement produces a separate inset and must follow an XCHART statement. The inset appears on every panel (page) produced by the last XCHART statement preceding it.

Keywords specify the statistics to be displayed in an inset; options control the inset’s location and appearance. A complete description of the INSET statement syntax is given starting on page 1720 of Part 9, “The SHEWHART Procedure,”. The INSET statement options are identical in the CUSUM and SHEWHART procedures, but the available keywords are different. The keywords available with the CUSUM procedure are listed in Table 13.1 to Table 13.3.

**Table 13.1. Summary Statistics**

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARL0</td>
<td>average run length for zero shift</td>
</tr>
<tr>
<td>ARLDELTA</td>
<td>average run length for shift of δ</td>
</tr>
<tr>
<td>DATA=</td>
<td>arbitrary values from SAS-data-set</td>
</tr>
<tr>
<td>N</td>
<td>nominal subgroup size</td>
</tr>
<tr>
<td>NMIN</td>
<td>minimum subgroup size</td>
</tr>
<tr>
<td>NMAX</td>
<td>maximum subgroup size</td>
</tr>
</tbody>
</table>

**Table 13.2. Parameters for One-Sided (Decision Interval) Cusum Scheme**

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DELTA</td>
<td>shift to be detected as multiple of standard error</td>
</tr>
<tr>
<td>H</td>
<td>decision interval h as a multiple of standard error</td>
</tr>
<tr>
<td>HEADSTART</td>
<td>headstart value S0 as a multiple of standard error</td>
</tr>
<tr>
<td>K</td>
<td>reference value k</td>
</tr>
<tr>
<td>MU0</td>
<td>target mean μ0</td>
</tr>
<tr>
<td>SHIFT</td>
<td>shift to be detected in data units</td>
</tr>
<tr>
<td>STDDEV</td>
<td>estimated or specified process standard deviation</td>
</tr>
</tbody>
</table>

**Table 13.3. Parameters for Two-Sided (V-Mask) Cusum Scheme**

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALPHA</td>
<td>probability of Type 1 error</td>
</tr>
<tr>
<td>BETA</td>
<td>probability of Type 2 error</td>
</tr>
<tr>
<td>H</td>
<td>vertical distance between V-mask origin and upper (or lower) arm</td>
</tr>
<tr>
<td>K</td>
<td>slope of lower arm of V-mask</td>
</tr>
<tr>
<td>SIGMAs</td>
<td>probability of Type 1 error as probability that standard normally distributed variable exceeds a specified value in absolute value</td>
</tr>
</tbody>
</table>