

Shewhart Control Charts

U Chart: Formula



U Chart Formula

Data

Month	No. of Incidents (u)	OBD per 1000 (n)
Jan-14	7	1.03338
Feb-14	11	1.01491
Mar-14	10	1.03381
Apr-14	9	0.98779
May-14	12	0.9255
Jun-14	11	0.98215
Jul-14	7	1.04138
Aug-14	10	0.88043
Sep-14	16	0.92131
Oct-14	13	0.942
Nov-14	16	0.9777
Dec-14	10	0.94509
Jan-15	7	1.03325
Feb-15	9	0.94656
Mar-15	11	0.94696
Apr-15	10	1.04652
May-15	9	0.94652
Jun-15	13	0.91236
Jul-15	9	1.13662
Aug-15	11	1.01006
Sep-15	12	0.99656
Oct-15	8	0.91256
Nov-15	10	0.96669
Dec-15	15	0.94665
Total ($\sum u$)		256
Total ($\sum n$)		23.48676

Calculation

$$\begin{aligned} \sum u &= 256 \\ \sum n &= 23.48676 \end{aligned} \quad CL = \bar{u} = \frac{\sum u}{\sum n}$$

$$\frac{\sum u}{\sum n} = \frac{256}{23.48676} = 10.9$$

* Since the OBD per 1000 (n) changes at each subgroup (per row), you will have to calculate the UCL and LCL for each data point. This example will just use the first row where the OBD per 1000 (n) is 1.03338.

$$\begin{aligned} UCL &= \bar{u} + 3\left(\sqrt{\frac{\bar{u}}{n}}\right) \\ &= 10.9 + 3\left(\sqrt{\frac{10.9}{1.03338}}\right) \\ &= 10.9 + 9.74326 \\ &= 20.64326 \text{ (20.6 rounded)} \end{aligned}$$

$$\begin{aligned} LCL &= \bar{u} - 3\left(\sqrt{\frac{\bar{u}}{n}}\right) \\ &= 10.9 - 3\left(\sqrt{\frac{10.9}{1.03338}}\right) \\ &= 10.9 - 9.74326 \\ &= 1.15674 \text{ (1.2 rounded)} \end{aligned}$$

$$CL = 10.9$$

Plot the incidents, CL, UCL and LCL as seen on the chart

Legend + Chart

u = incidents per sub group (per row)

n = OBD per 1000 (per row)

$\sum u$ = sum of incidents

$\sum n$ = sum of OBD

CL = center line (Mean)

UCL = upper control limit ($\bar{u} + 3\left(\sqrt{\frac{\bar{u}}{n}}\right)$)

LCL = lower control limit ($\bar{u} - 3\left(\sqrt{\frac{\bar{u}}{n}}\right)$)

