## *Cusum charts*

These are used to monitor the output of a system and compare that to the expected output. This is most often used in quality control, or production control analysis, but it's in the syllabus so lets make up a fictional circumstance where it might be useful in H&S. We need something that happens frequently for cusum to be useful to us.

The scenario – The amount spent on repairs to tools is reported monthly.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Repair costs (£1000)	10	9.8	10	10.2	9.9	10.5	10.4	10.5	10.6	11.1	10.5	10.1
Ave	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3
Deviation	-0.3	-0.5	-0.3	-0.1	-0.4	0.2	0.1	0.2	0.3	0.8	0.2	-0.2
Cusum	-0.3	-0.8	-1.1	-1.2	-1.6	-1.4	-1.3	-1.1	-0.8	0	0.2	0

To calculate cumulative sums, you add up all the deviations to that point, or you can just add the latest deviation to the previous cusum result.

Lets have that on a chart
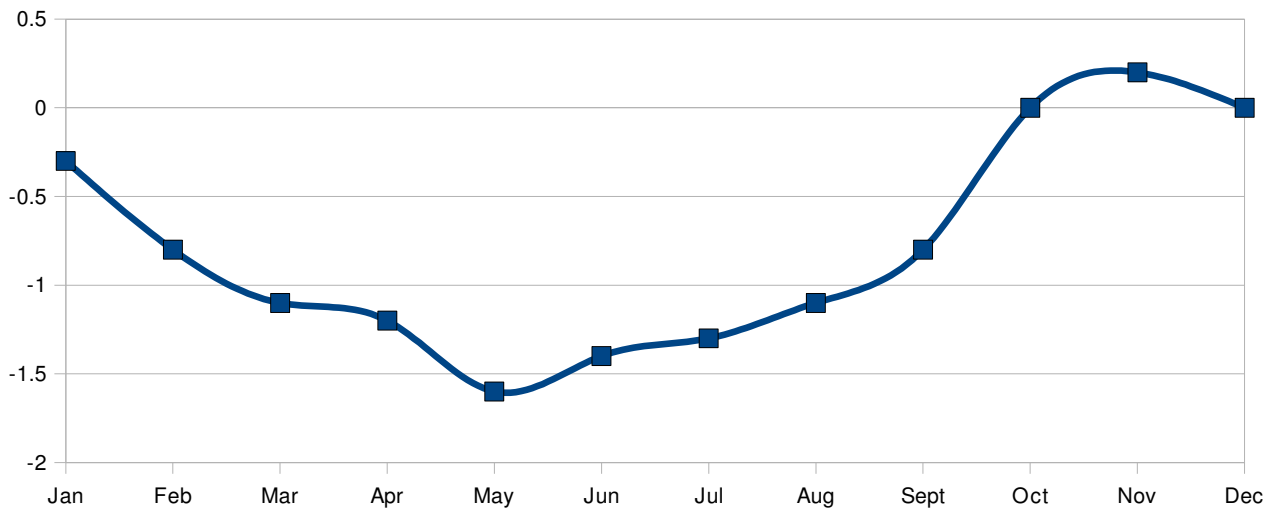
So what can be seen from this chart that we wouldn't see with other types of analysis. The spend on tools maintenance in the period up to may was consistently below the average, however the spend in the second half of the year was consistently above the average . This might indicate that tools are broken less in the first half of the year (maybe business is quieter) or more worryingly it might indicate that in the first half of the year tools were not being properly maintained.

How does one interpret a CUSUM chart?

Suppose that during a period of time the values are all above average. The amounts added to the cumulative sum will be positive and the sum will steadily increase.

A segment of the CUSUM chart with an upward slope indicates a period where the values tend to be above average. Likewise a segment with a downward slope indicates a period of time where the values tend to be below the average.