(1)

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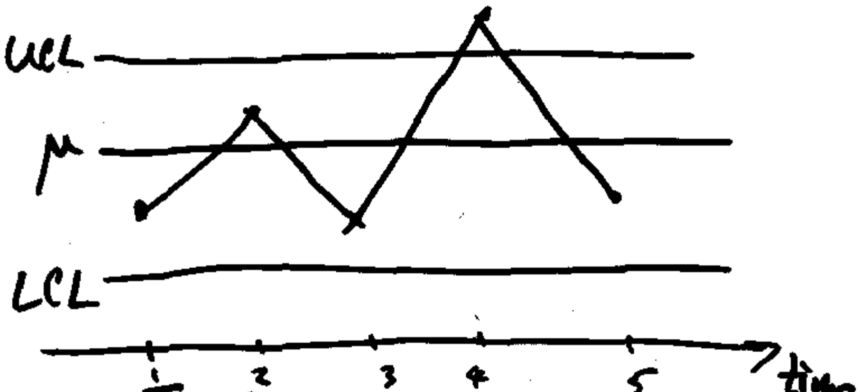
5-27

Chapter 17
Control Charts



$\bar{X}$ chart

Each time period, take a sample of n items & compute $\bar{x}$ + plot on chart

(2)

Simplest case: μ and σ are known.

Then $UCL = \mu + c\frac{\sigma}{\sqrt{n}}$

$LCL = \mu - c\frac{\sigma}{\sqrt{n}}$

For any n, $E(\bar{x}) = \mu$

and $V(\bar{x}) = \frac{\sigma^2}{n}$, so

std. dev. of $\bar{x}$ is $\frac{\sigma}{\sqrt{n}}$

If n is sufficiently large, then Central Limit Thm says $\bar{x}$ will behave normally.

③

If $c = 1.96$, then 95% of the values of $\bar{x}$ will be between UCL and LCL

If $c = 3$, then 99.7% ...

More realistic: μ and σ are unknown

① Make sure that the process is in control

② Take k samples of size n each

④

③ For each sample, compute $\bar{x}_i$

and s_i or R_i

sample std. dev. — sample range

④ Estimate μ and σ by

$$\hat{\mu} = \bar{\bar{x}} = \frac{1}{k}\sum_{i=1}^{k} \bar{x}_i$$

and

$$\hat{\sigma} = \frac{\bar{R}}{d_2}$$

$\bar{R} = \frac{1}{k}\sum_{i=1}^{k} R_i$

d_2 ← table A.23

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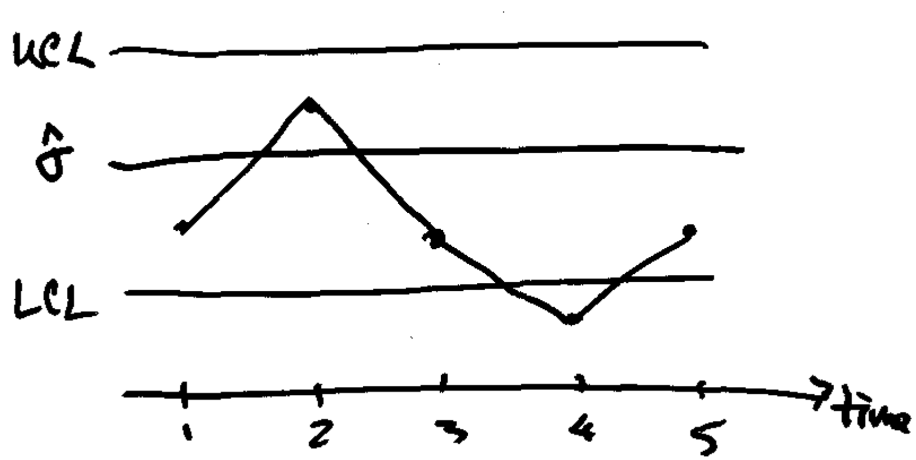
Then $UCL = \hat{\mu} + c\,\frac{\hat{\sigma}}{\sqrt{n}}$

$LCL = \hat{\mu} - c\,\frac{\hat{\sigma}}{\sqrt{n}}$

Control charts for sample variation



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At each time period, take a sample of n items + compute $\hat{\sigma}_i$

Realistic setting: σ is unknown.

Centerline $\hat{\sigma} = \frac{\bar{R}}{d_2} d_3$ ← from A.23

$UCL = \bar{R} D_4$

$LCL = \bar{R} D_3$

Plot $\hat{\sigma}_i = \frac{R_i}{d_2}$

Review (material since midterm) ⑦

Regression
- find the coefficients & write the model
- ANOVA & F test
- R^2, correlation

ANOVA
- F test
- Post hoc analysis

χ^2 tests
- hypotheses
- Post hoc analysis

Nonparametric Tests ⑧

- Signed rank
- Rank sum
- Kruskal-Wallis

HW#9 due 6/3

p. 680 # 16.12

p. 686 # 16.19, 16.21