STATISTICS FOR DATA SCIENCE

Factors affecting Margin of Errors

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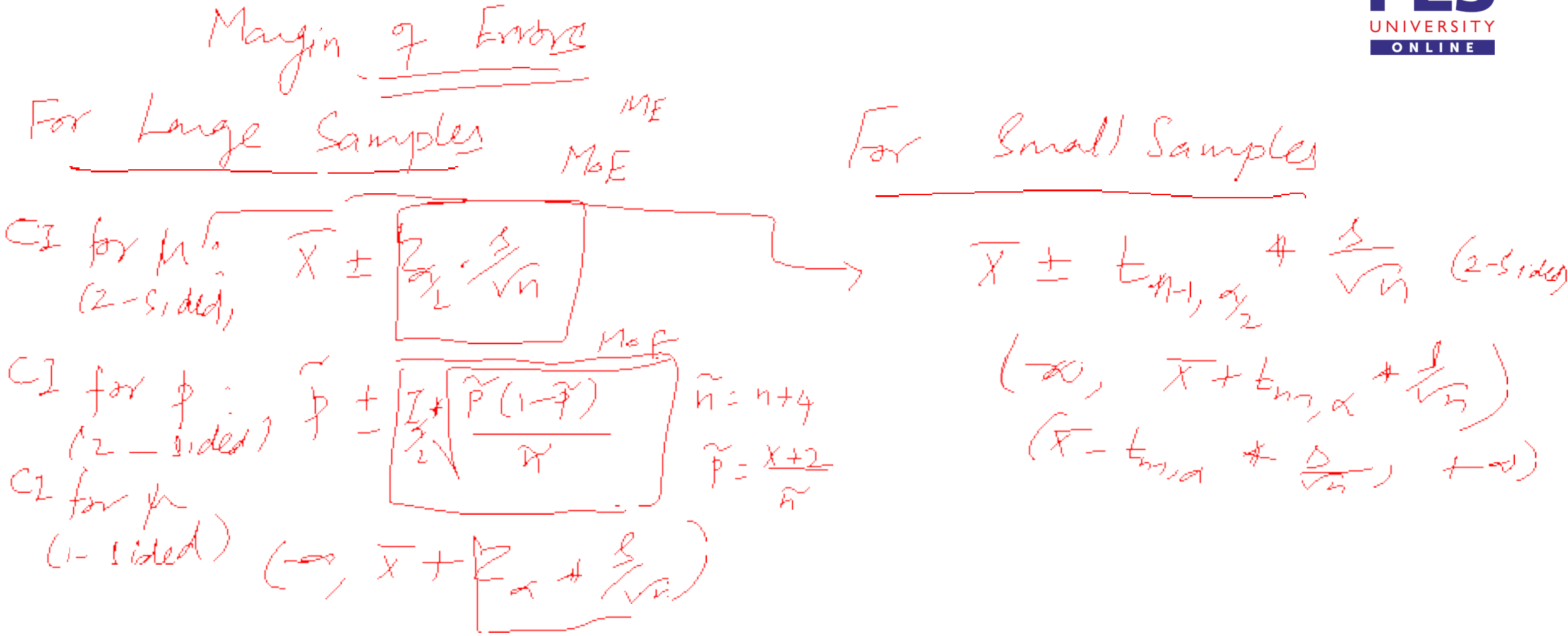

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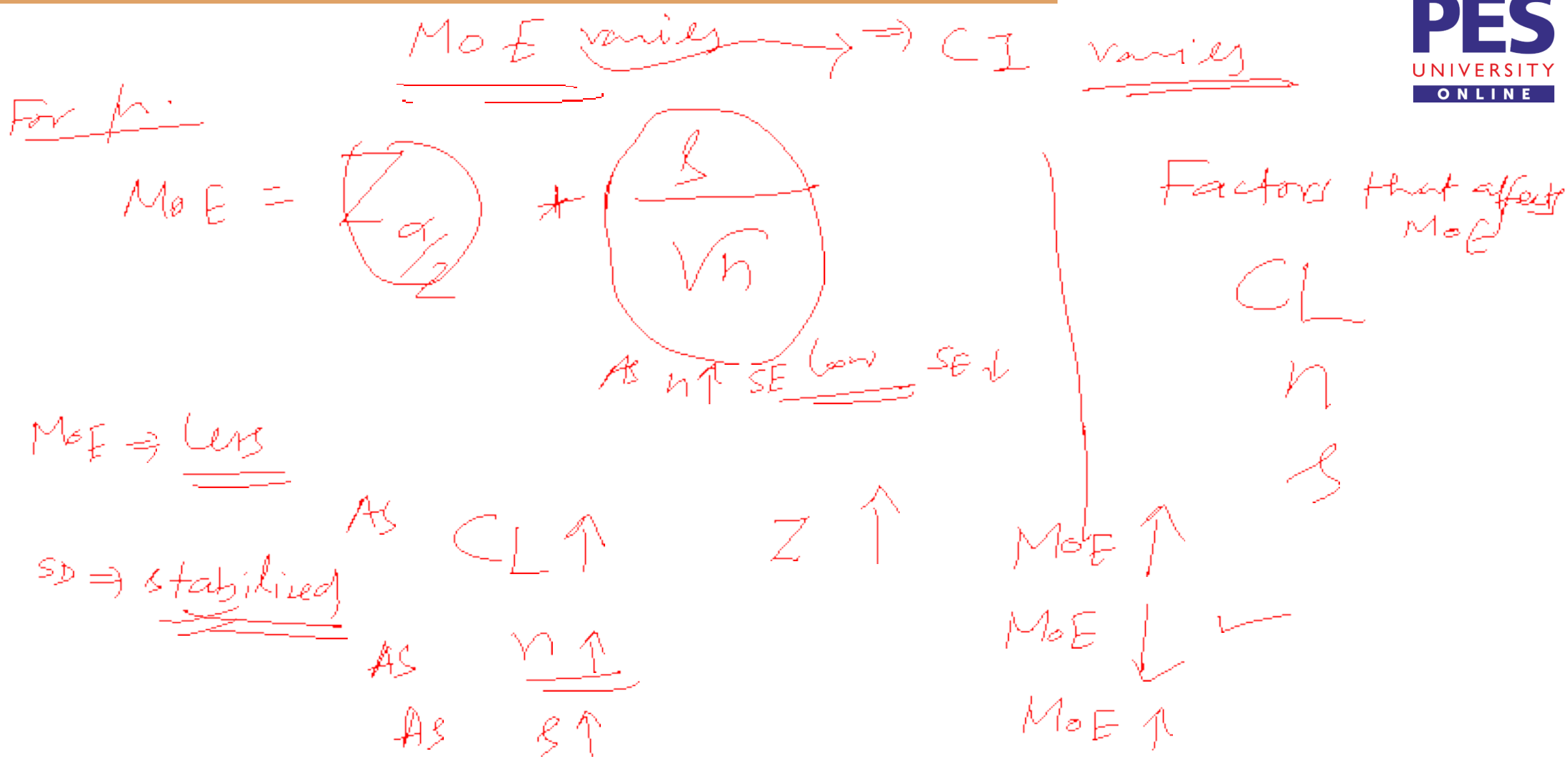

Margin of Errors in Confidence Intervals

$(1-\alpha)*100\%$ Confidence Interval is given by

Large

CI for μ: $\bar{x} \pm MoE$

$\bar{x} \pm Z_{\alpha/2} \cdot \frac{s}{\sqrt{n}}$ (or)

CI for p: $\hat{p} \pm MoE$

$\hat{p} \pm \sqrt{\frac{p(1-p)}{n}}$ (Traditional)

$\tilde{p} \pm \sqrt{\frac{\tilde{p}(1-\tilde{p})}{\tilde{n}}}$ (Modern)

$\tilde{n} = n+4$ $\tilde{p} = \frac{x+2}{\tilde{n}}$

Small

$\bar{x} \pm MoE$

$\bar{x} \pm t_{n-1, \alpha/2} * \frac{s}{\sqrt{n}}$

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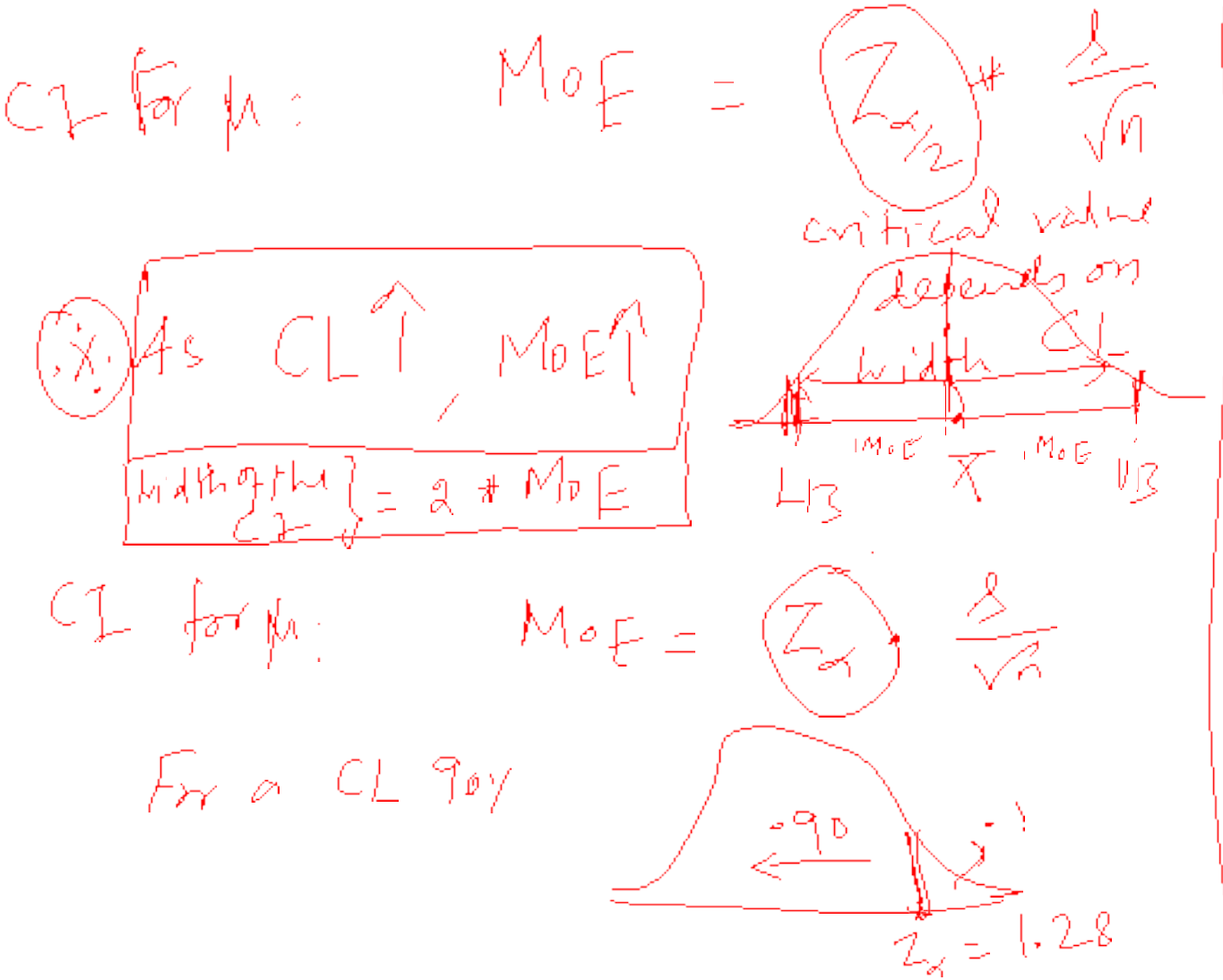

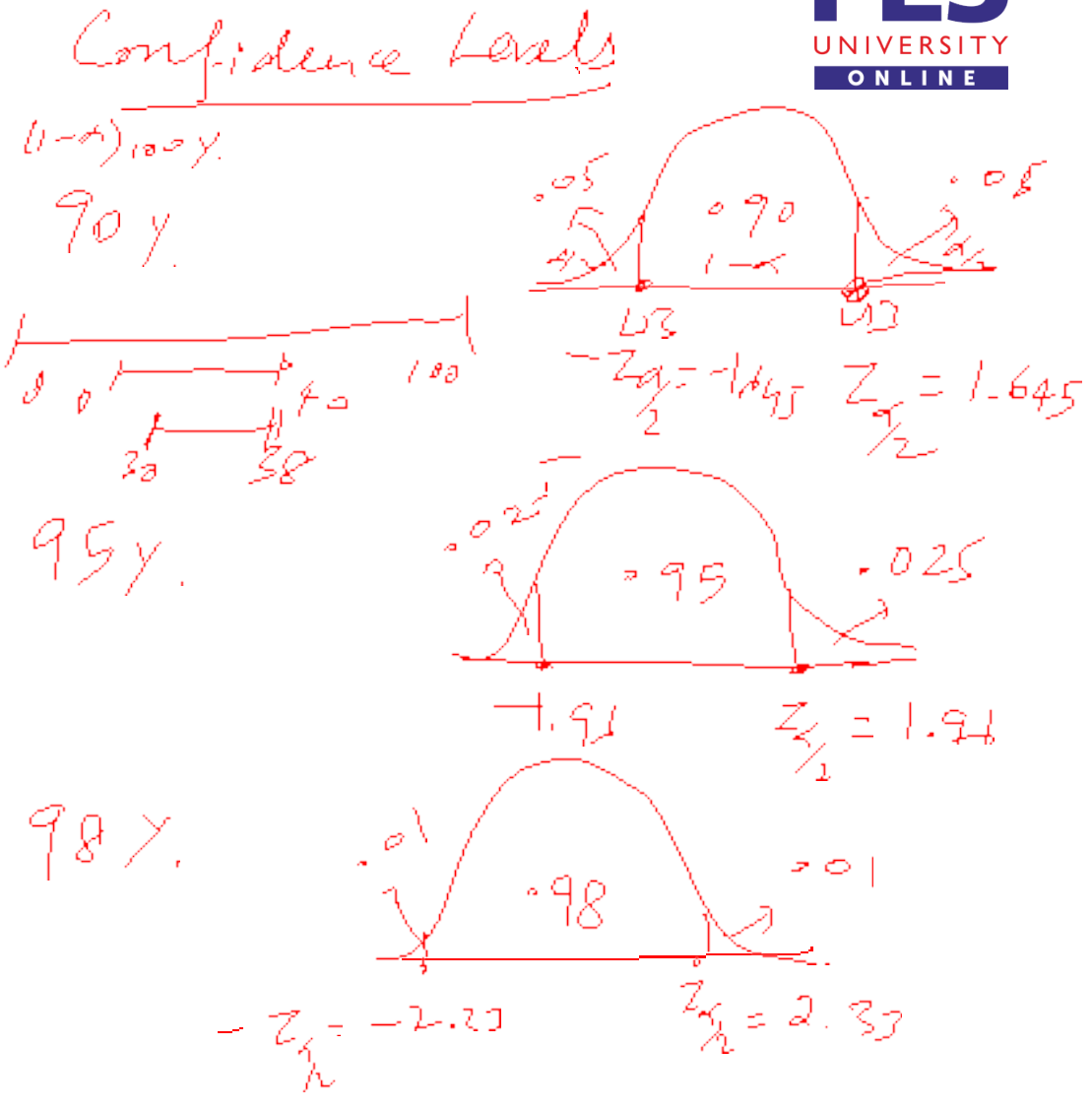

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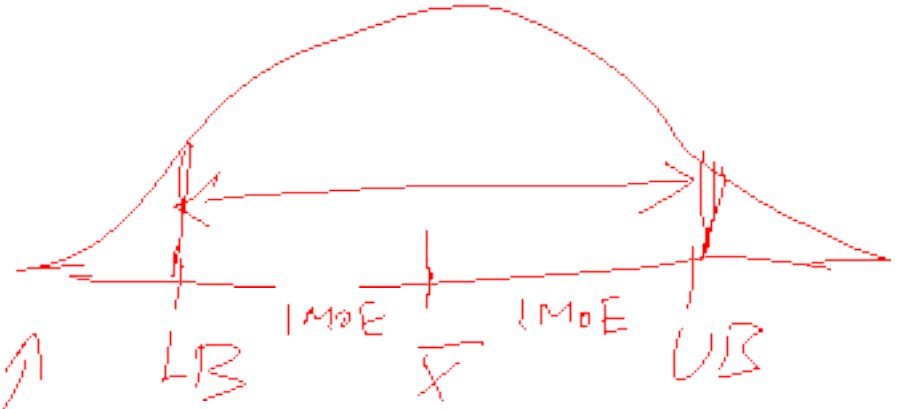
Margin of Errors in Confidence Intervals

Width of the CI } = 2 * MoE



As CL ↑ MoE ↑
CL ⇒ wider

Multiplier depends on CL

95% ⇒ $\frac{1}{\sqrt{}}$

Small $\begin{cases} t_{n-1,\ \alpha/2} \text{ (2-sided)} \\ t_{n-1,\ \alpha} \text{ (1-sided)} \end{cases}$ Large

$\begin{cases} \text{Critical (2-sided) value} \\ \text{(1-sided)} \end{cases}$ $Z_{\alpha/2}$ / Z_α

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$$MoE = z_{\alpha/2} \cdot \frac{s}{\sqrt{n}}$$

As CL ↑ $\Rightarrow z_{\alpha/2}$ ↑ $\Rightarrow$ MoE ↑ $\Rightarrow$ Larger interval

Sample Size

When n ↑, $\frac{s}{\sqrt{n}}$ $\Rightarrow$ decreases $\Rightarrow$ uncertainty of sample ↓

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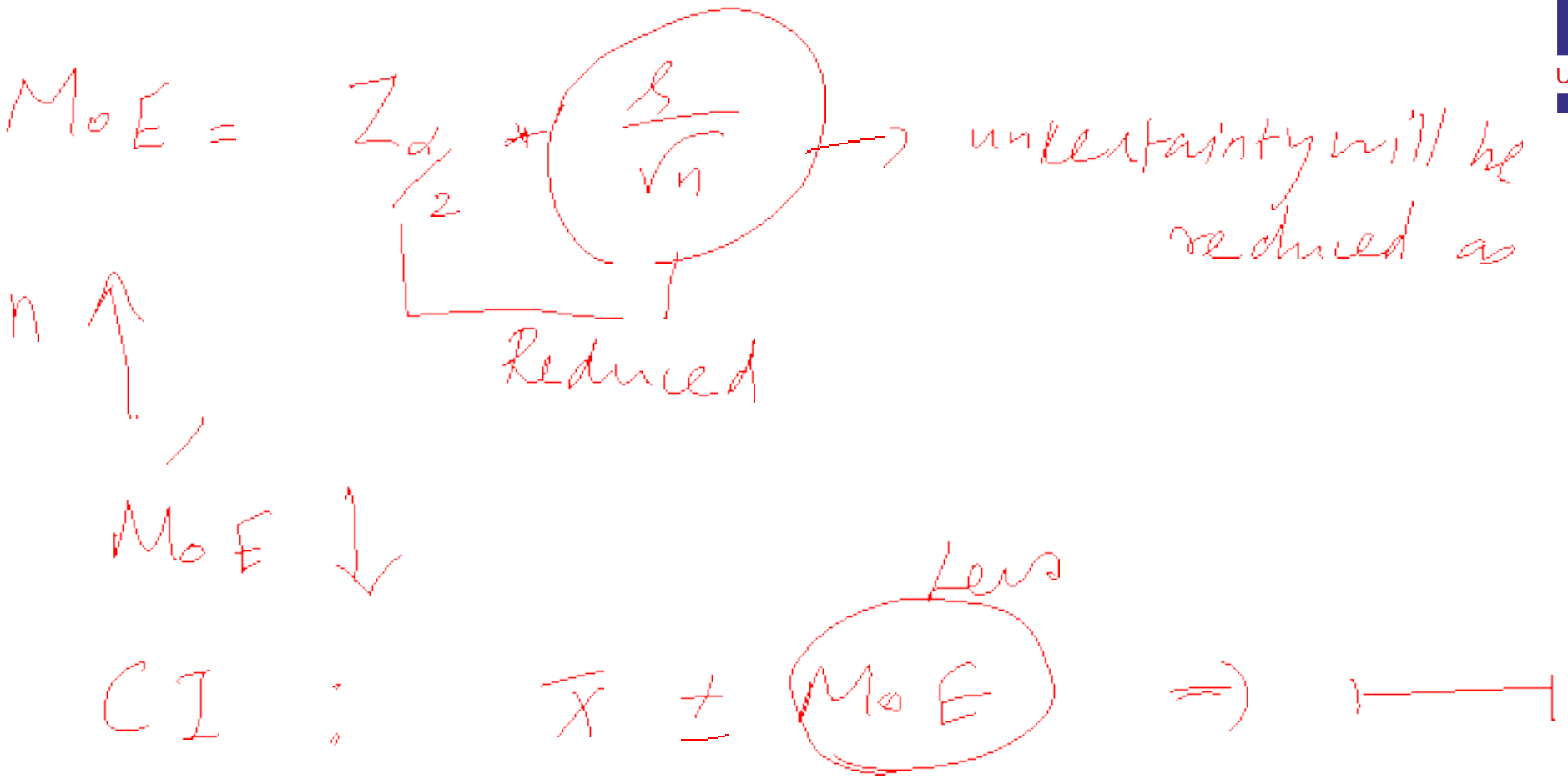
Margin of Errors in Confidence Intervals



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Uncertainty of sample ($\frac{s}{\sqrt{n}}$) ↑

As s ↑

sample S.D ,

$MoE = Z_{\alpha/2} * \frac{s}{\sqrt{n}}$

$\Rightarrow$ MoE ↑

Wider C.I

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As $n \uparrow$, MoE $\downarrow$

$\Rightarrow$ CI will be narrow

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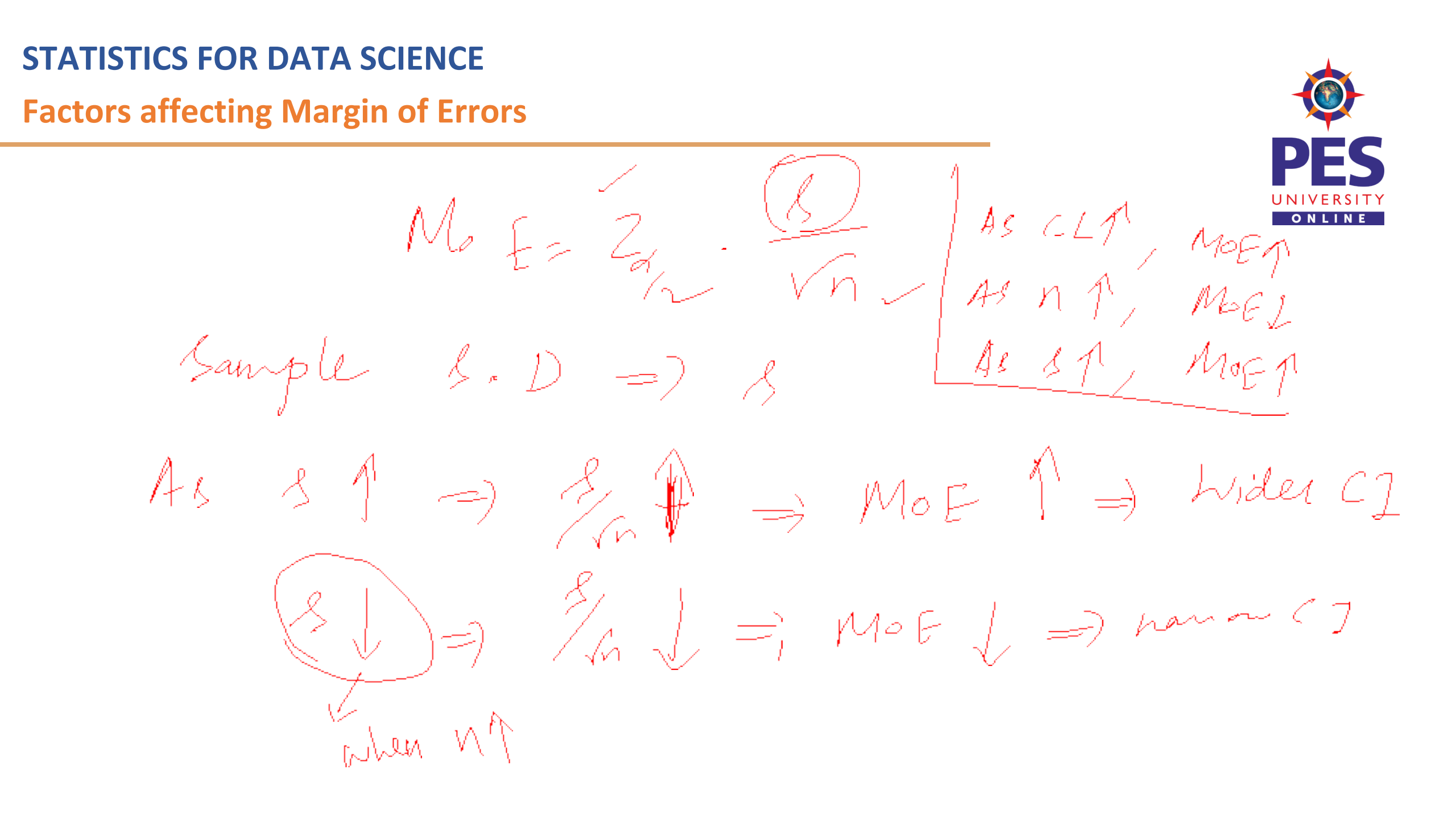

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As CL ↑ MoE ↑ ⇒ Wider CI

As n ↑ MoE ↓ ⇒ Narrow CI

As s ↑ MoE ↑ ⇒ Wider CI

THANK YOU

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