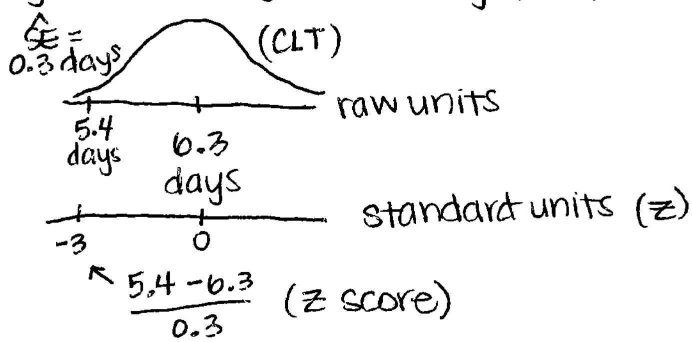
read FPP ch. 27

ID Significance testing

<u>Case Study 12 continued</u>

* put long run SD in model from May 10^{th}
  estimated SD = $\hat{SE}_{IID}(\bar{y}) = S/\sqrt{n} = 3.0/\sqrt{100} = 0.3$ days

* long run histogram of $\bar{y}$ if null is true:



$z = -3$, so what?
→ how unusual is $z = -3$?

<u>Answer:</u>

p(value) = P = chance, if H_0 is true, of getting data as extreme as, or more extreme than, what we got (find by calculating area to the left of 5.4 days under the curve because this is more extreme)

→ how do you know where "more extreme" is?

<u>Answer:</u>

look at the form of the alternative hypothesis:
here alt. is ($\mu < 6.3$) so we look only at $\bar{y} < 5.4$

here we look only at one tail (left) of the normal curve to get P: <u>one-tailed test</u>; here P = 0.15%

<u>Final Step:</u>

if P is small ↔ favor alt. hypothesis
if P is large ↔ favor null hypothesis

12 May 2005

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→ how small is small enough for P?

no general answer (depends on real world consequences of choosing wrong hypothesis)

<u>Conventional answer</u>: (stat. sig. = statistically significant)

$P \le 5\% \leftrightarrow$ "stat. sig."

$P \le 1\% \leftrightarrow$ "highly stat. sig."

So here, result is highly stat. sig. ($P = 0.15\%$) → favor alt. hypothesis (the mean really has gone down).

<u>BUT</u>

you can't tell if flex time <u>caused</u> this decline (might have been due to some other change over time).

<u>Better design</u>:

Compare 2 groups at the same time, one on flex time (treatment), the other not (control).

<u>Case Study 13</u>

* <u>under null</u> model $1 = F$, $\emptyset = M$

pop	sample	imaginary data set
all students at UCB in 1977	the observed students	possible $\hat{p}$'s

pop gender: $N = ?$ BIG, $\begin{bmatrix} 1\text{'s} \\ \vdots \\ \emptyset\text{'s} \end{bmatrix}$ $\xrightarrow[\doteq \text{ like IID}]{\text{actual like SRS}}$ sample gender: $\begin{bmatrix} 1\text{'s} \\ \vdots \\ \emptyset\text{'s} \end{bmatrix}$ $n = 100$ → imaginary data set: $\begin{bmatrix} 46\% \\ 32\% \\ \vdots \end{bmatrix}$ ↑ ∞ ↓

mean $p = 33\%$

SD $\sigma = \sqrt{p(1-p)}$

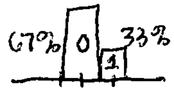
mean $\hat{p} = 46\%$

hypothetical IID → $\begin{bmatrix} 1\text{'s} \\ \vdots \\ \emptyset\text{'s} \end{bmatrix}$ $n = 100$

$\hat{p} = ?$ (ex. 32%)

long run mean $E_{IID}(\hat{p}) = p = 33\%$

Long run SD $SE(\hat{p}) = \sqrt{\frac{p(1-p)}{n}} = 4.7\%$



pop. histogram

Long run histogram of $\hat{p}$ if H_0 true