Class Notes

this time: probability models for means (measurement error)
next time: statistical models for means

Ken will hold extra office hours to make up for absence yesterday

Relationship between SRS (without replacement) and IID (with replacement)

1. SRS is more informative than IID because there's no point in sampling same element of the pop twice.
2. When n=1, SRS=IID.
3. When n<<N, SRS~IID.
4. The math is easier with IID, but SRS is what usually occurs in the real world.
5. When n<<N, the sample may be SRS, but we will use formulas from IID.

[continuing on Roulette (S)]

\[ M = \frac{-32}{38} = -0.842 \]
\[ \sigma = 5.2 \]
\[ E_{\text{SRS}} = n \mu = (\text{# draws}) \times \text{pop mean} = (100)(-0.52) = -52 \]
\[ SE_{\text{IID}} = \sigma \sqrt{n} = (\text{pop SD}) \sqrt{\text{# draws}} = (5.2)(\sqrt{100}) = 52 \]

- expect to be behind $52 give up take $127

\[ \text{split} \]

\[ 32\% \]

\[ \frac{52}{127} \]

\[ 0.4 \]

\[ 100 - \frac{32}{2} = 84\% \rightarrow \text{single # has best odds of any bet.} \]

"Bold play is optimal," but higher chance of losing $100 or more.
Basic Measurement Error Model

\[ \text{(each individual measurement)} = \text{(exact value)} + \text{(bias)} + \text{(error)} \]

ex:
read 1: \[ 3.7 = 3.8 + 0 - 0.1 \]
read 2: \[ 4.0 = 3.8 + 0 + 0.2 \]

\[ \begin{align*}
\text{Pop} & \quad \text{all possible potassium readings} \\
\text{Sample} & \quad \text{observed readings}
\end{align*} \]

\[ N_{\text{pop}} \quad \text{like IID} \quad \{ y_1, y_2, \ldots, y_n \} \quad N_{\text{sample}} \]

mean(\(\mu\)) = 3.8
var(\(\sigma^2\)) = 0.2

\[ p(\text{mean} = 3.8) = ? \]

\[ 0.5\% = 3.8 \]