Udacity Intro To Statistics Problem Set 5

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January 22, 2017

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1 Sample Size for Given Margin of Error

What sample size is needed to make the margin of error 5%? To calculate the sample size, we set the formula for computing the plus/minus amount for the margin of error to the desired margin of error:

$$0.05 = 1.96\sqrt{\frac{0.55 \times 0.45}{n}} \tag{1}$$

and solve for n

$$\frac{0.05}{1.96} = \sqrt{\frac{0.55 \times 0.45}{n}} \tag{2}$$

$$\implies \left(\frac{0.05}{1.96}\right)^2 = \frac{0.55 \times 0.45}{n} \tag{3}$$

$$\implies \frac{\left(\frac{0.05}{1.96}\right)^2}{0.55 \times 0.45} = \frac{1}{n} \tag{4}$$

$$\implies \left(\frac{0.05}{1.96}\right)^2 \times 0.55 \times 0.45 = n \tag{5}$$

$$\implies n \approx 381 \tag{6}$$

2 Sensitivity

Solve for n with different values for p: First we solve for n with $p = 0.5$: We can use (1) as a starting point. We substitute 0.5 for 0.55 and 0.45:

$$\left(\frac{0.05}{1.96}\right)^2 \times 0.5 \times 0.5 = n \tag{7}$$

$$\implies n \approx 385 \tag{8}$$

For $p = 0.6$ We substitute 0.6 for 0.55, and 0.4 0.45:

$$\left(\frac{0.05}{1.96}\right)^2 \times 0.6 \times 0.4 = n \tag{9}$$

$$\implies n \approx 369 \tag{10}$$