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**Course:** MBA 521 - Hybrid Section (Fall 2020)

**Assignment:** Copy of HW 3 - Sampling & Estimation (Ungraded, Op)

If, based on a sample size of 975, a political candidate finds that 443 people would vote for him in a two-person race, what is the 99% confidence interval for his expected proportion of the vote? Would he be confident of winning based on this poll?

A  $100(1 - \alpha)\%$  confidence interval for the population proportion is given below, where  $\hat{p} = \frac{x}{n}$  is the sample proportion,  $x$  is the number in the sample having the desired characteristic,  $n$  is the sample size, and  $z_{\alpha/2}$  represents the value of a standard normal random variable that has an upper tail probability of  $\alpha/2$ .

$$\hat{p} \pm z_{\alpha/2} \sqrt{\frac{\hat{p}(1 - \hat{p})}{n}}$$

Find  $x$ , the number of people who voted for the political candidate.

$$x = 443$$

Find  $n$ , the sample size.

$$n = 975$$

Find the sample proportion,  $\hat{p}$ , rounding to three decimal places.

$$\begin{aligned} \hat{p} &= \frac{x}{n} \\ &= \frac{443}{975} \\ &= 0.454 \end{aligned}$$

Find  $\alpha$ .

$$\alpha = 0.01$$

The value of  $z_{\alpha/2}$  can be computed using the Excel function given below.

$$\text{NORM.S.INV}(1 - \alpha/2)$$

Evaluate  $z_{0.01/2}$ , rounding to four decimal places.

$$z_{0.01/2} = 2.5758$$

Calculate the lower confidence interval limit,  $\hat{p} - z_{0.01/2} \sqrt{\frac{\hat{p}(1 - \hat{p})}{n}}$ , rounding to four decimal places.

$$0.454 - 2.5758 \cdot \sqrt{\frac{0.454(1 - 0.454)}{975}} = 0.4129$$

Calculate the upper confidence interval limit,  $\hat{p} + z_{0.01/2} \sqrt{\frac{\hat{p}(1 - \hat{p})}{n}}$ , rounding to four decimal places.

$$0.454 + 2.5758 \cdot \sqrt{\frac{0.454(1 - 0.454)}{975}} = 0.4951$$

Thus, a 99% confidence interval for his expected proportion of the vote is [0.4129, 0.4951].

Now determine if he would be confident of winning based on this poll.

If the lower limit is above 50% then the interval provides evidence that the true proportion of voters is more than 50%. If the upper limit is below 50%, then the interval provides evidence that the true proportion of voters is less than 50%. Otherwise the interval contains 50% and the interval does not provide evidence for making a choice.

The lower limit is below 50% and the upper limit is below 50%.

Use this information to conclude if the political candidate should be confident of winning based on this poll.