



AP[®] Statistics 2003 Sample Student Responses

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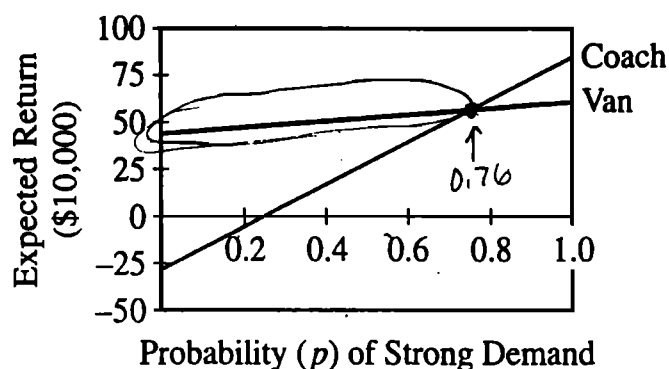
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A



- (a) The value of p for which the expected annual return for the vans is equal to the expected annual return for the coaches is 0.76. If the probability of strong demand is less than this value, which decision, running coaches or running vans, will provide the greater expected return? Justify your answer.

If the probability of strong demand is less than 0.76, running vans will provide the greater expected return. On the graph, for $0 \leq p < 0.76$, the expected returns for the vans is greater than that for the coaches, shown by the higher y -values (the expected returns) on the van equation.

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- (b) There are several thousand markets similar to Lonestar's market across the country. A random sample of 100 of these markets reveals that the demand for an airport shuttle is strong in 65 of them and the demand in the remaining 35 is weak. Using the results of this sample, construct and interpret a 95 percent confidence interval for the proportion of similar markets that will experience a strong demand.

$$CI = 95\% \quad n = 100 \quad \begin{array}{l} \text{strong} = 65 \\ 0.65 \end{array} \quad \begin{array}{l} \text{weak} = 35 \\ 0.35 \end{array}$$

Assumptions:

$$p \pm z^* \left(\sqrt{\frac{p(1-p)}{n}} \right)$$

$$0.65 \pm 1.95996 \left(\sqrt{\frac{.65(.35)}{100}} \right)$$

$$0.65 \pm 0.0935$$

$$(0.5565, 0.7435)$$

1) simple random sample ✓

$$2) np \geq 10 \rightarrow 100(.65) \geq 10$$

$$65 \geq 10 \checkmark$$

$$nq \geq 10 \rightarrow 100(.35) \geq 10$$

$$35 \geq 10 \checkmark$$

3) population is normal

or population > 10n

sev. thous. > 10(100)

sev. thous. > 1000 ✓

We are 95% confident that the proportion of similar markets that will experience a strong demand falls between 0.5565 and 0.7435.

Therefore, I will use proportions with z procedures.

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- (c) The president of Blue Shell has decided to use vans for the new route. Using the results of the analysis in parts (a) and (b), write a few sentences to justify this decision.

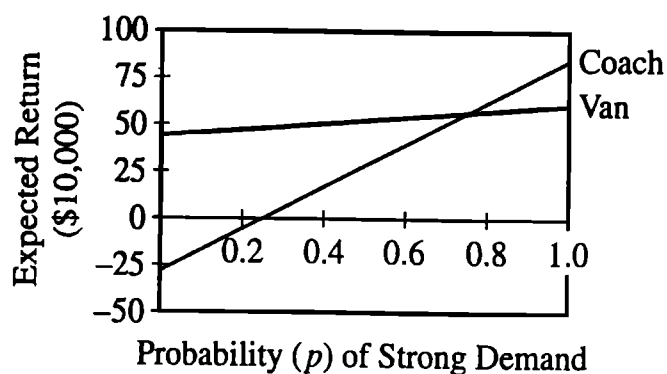
If the probability of Lovestar having a strong demand is greater than 0.76, the shuttles would be the more profitable decision. However, using data from 100 similar markets, a 95% confidence interval estimates that Lovestar's probability of a strong demand falls between 0.5565 and 0.7435; 0.76 is not even within this interval. Therefore, it is reasonable to conclude that Lovestar's demand will be less than 0.76, making the vans the more profitable decision.

- (d) After looking at the interval in part (b) and considering possible annual returns, the vice president of Blue Shell believes that the president has made an incorrect decision in choosing to use vans. Explain how this conflicting position could be supported.

The confidence interval estimates with data from 100 similar markets that between 55.65% and 74.35% of new markets comparable to Lovestar will experience a strong demand, making shuttles more profitable in these areas. Since over half, perhaps almost three-fourths, of similar markets have the demand for shuttles, it is reasonable to go with the odds that Lovestar will have this demand as well and decide to use shuttles for the new route.

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B



- (a) The value of p for which the expected annual return for the vans is equal to the expected annual return for the coaches is 0.76. If the probability of strong demand is less than this value, which decision, running coaches or running vans, will provide the greater expected return? Justify your answer.

Running vans will provide the greater expected return. On the graph at any point to the left of the intersection the probability of strong demand is less than 0.76 and throughout the interval from $0 < p < 0.76$ the expected return for the van is higher than that of the coach, therefore vans should be used.

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- (b) There are several thousand markets similar to Lonestar's market across the country. A random sample of 100 of these markets reveals that the demand for an airport shuttle is strong in 65 of them and the demand in the remaining 35 is weak. Using the results of this sample, construct and interpret a 95 percent confidence interval for the proportion of similar markets that will experience a strong demand.

parameter of interest p the mean proportion of markets in which the demand for an airport shuttle is strong.

One proportion Z-interval

$$\hat{p} = \frac{65}{100} = .65$$

$$n\hat{p} \geq 10 \quad n(1-\hat{p}) \geq 10$$

$$(100)(.65) \geq 10 \quad (100)(.35) \geq 10$$

Assume SRS

$$65 \geq 10 \checkmark \quad 35 \geq 10 \checkmark$$

pop > 10 sample size \checkmark $SS=100$, population is several thousand which is greater than $10(100) = 1000$

$$CI = \hat{p} \pm z^* SE$$

$$CI = .65 \pm 1.96 \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$CI = .65 \pm 1.96 \sqrt{\frac{(.65)(.35)}{100}}$$

$$CI = (.5565, .74348)$$

The 95% confidence interval for the proportion p of markets with strong demand is $(.5565, .7435)$

I am 95% confident that the true proportion p of markets with strong demand is between .5565 and .7435.

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- (c) The president of Blue Shell has decided to use vans for the new route. Using the results of the analysis in parts (a) and (b), write a few sentences to justify this decision.

The president is 95% confident that the proportion of markets with strong demand is between .5565 and .7435, and all of the values between .5565 and .7435 will result in a higher expected return through the use of vans.

The graph of expected returns supports the choice of vans because the expected returns are higher for vans between the proportions .5565 and .7435.

- (d) After looking at the interval in part (b) and considering possible annual returns, the vice president of Blue Shell believes that the president has made an incorrect decision in choosing to use vans. Explain how this conflicting position could be supported.

Since the vice president is 95% confident that the proportion of markets with strong demand is between .5565 and .7435 there is a good chance that the market in his area will have strong demand. If there is strong demand, the coaches make \$840,000 compared to the \$610,000 the vans would make. The vice president sees that there is a good chance that there will be strong demand and he knows that with strong demand coaches are more profitable. This is a more risky endeavor but the maximum benefit is greater.

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