

ECON221 V26 Quiz 05

Questions

1. (2 points) Let $X \sim \text{Bin}(200, 0.35)$. Fill in the correct information in the blanks so that you can find $\mathbb{P}(X \geq 60)$:

`pbinom(59, 200, 0.35, lower.tail = FALSE)`
The output from R is 0.9416318.

Note: Try calculating this by looking at $P(X \leq 59)$ and using adjusting `pbinom()` appropriately. Make sure you understand why we could do this.

2. ~~(2 points)~~ A food processing company markets a soft cheese spread that is sold in a plastic container with an “easy pour” spout. Because of the spout’s high cost, the company has developed a new, less expensive spout. A study shows that its introduction will increase profits if fewer than 10 percent of the cheese spread’s current purchasers are lost. Suppose that after trying the new spout, 63 out of 1000 randomly selected purchasers say they would stop buying the cheese spread if the new spout were used. What should the company do?

- (a) (1 point) The company assumes that a binomial distribution would be appropriate here. What is the meaning of π in this context? It is the probability that a purchaser will not buy the container with a new spout.
- (b) (2 points) You are tasked to calculate a p-value to help in decision-making. Fill in the blanks to produce the correct p-value:

`pbinom(63, 1000, 0.10, lower.tail = TRUE)`

Note: It is important to define what the probability of success means here.

Note: To do 2(b), you need to be able to articulate what are the ordinary and the out-of-ordinary claims. The ordinary claim is that the new spout will decrease or not affect profits (what is this in terms of π , and why would this be the "ordinary" situation?

For the out-of-ordinary claim, you have to articulate what π would be if profits will increase. (write this down in terms of π). This will give you the direction of the p-value calculation.

To calculate the correct p-value, we look at $P(X \leq 63)$ assuming that the ordinary claim holds.

ECON221 V27 Quiz 05

Questions

1. (2 points) Let $X \sim \text{Bin}(150, 0.8)$. Fill in the correct information in the blanks so that you can find $\mathbb{P}(X \geq 110)$:

`pbinom(109, 150, 0.8, lower.tail = FALSE)`

Note: Try calculating this by looking at $P(X \leq 109)$ and using adjusting `pbinom()` appropriately. Make sure you understand why we could do this.

2. (2 points) Recent medical research has sought to develop drugs that lessen the severity and duration of viral infections. Virol, a relatively new drug, has been shown to provide relief for 70 percent of all patients suffering from viral upper respiratory infections. A major drug company is developing a competing drug called Phanatol. The drug company wishes to investigate whether Phanatol is more effective than Virol. An internal study found that among 300 patients having a viral upper respiratory infection, 77 percent reported that Phanatol provided relief. Should the company roll-out the drug and compete?

- (a) (1 point) The company assumes that a binomial distribution would be appropriate here. What is the meaning of π in this context? It is the probability that Phanatol would provide relief for a patient with an upper respiratory infection.
- (b) (2 points) You are tasked to calculate a p-value to help in decision-making. Fill in the blanks to produce the correct p-value:

`pbinom(230, 300, 0.7, lower.tail = FALSE)`

Note: It is vital that you define properly what the probability of success here means.

Note: To do 2(b), you need to be able to articulate what are the ordinary and the out-of-ordinary claims. The ordinary claim is that the both Phanatol has a lower or equal probability of providing relief for a patient with upper respiratory infection compared to Virol. What is this in terms of π , and why would this be the "ordinary" situation?

For the out-of-ordinary claim, you have to articulate what π would be (write this down in terms of π). This will give you the direction of the p-value calculation.

To calculate the correct p-value, we have to find $P(X \geq 0.77 \cdot 300)$ or $P(X \geq 231)$ under X being a $\text{Bin}(300, 0.7)$ which is the situation under the ordinary claim. It was important to convert 0.77 in terms of counts.