Real-Life Case Study: Common Probability Distributions

Consider this a real-life case study. As you solve for the answer, inevitably, you will need to deal with numbers. As an investment practitioner, remember the counting concepts we discussed in this lesson to calculate the probability of success.

Question:

You are examining the record of an investment newsletter writer who claims a 70 percent success rate in making investment recommendations that are profitable over a one-year time horizon. You have the one-year record of the newsletter's seven most recent recommendations. Four of those recommendations were profitable. If all the recommendations are independent and the newsletter writer's skill is as claimed, what is the probability of observing four or fewer profitable recommendations out of seven in total?

Hint:

The formula used is:

$$\frac{n!}{(n-x)! * x!} * p^x * (1-p)^{n-x}$$

n: number of newsletters
x: number of profitable recommendations
p: probability (0.7)

Answer:

The observed success rate is 4/7 = 0.571, or 57.1 percent. The probability of four or fewer successes is $F(4) = p(4) + p(3) + p(2) + p(1) + p(0)$, where $p(4)$, $p(3)$, $p(2)$, $p(1)$, and $p(0)$ are respectively the probabilities of 4, 3, 2, 1, and 0 successes, according to the binomial distribution with $n = 7$ and $p = 0.70$. We have

$p(4) = (7!/4!3!)(0.70^4)(0.30^3) = 35(0.006483) = 0.226895$

$p(3) = (7!/3!4!)(0.70^3)(0.30^4) = 35(0.002778) = 0.097241$

$p(2) = (7!/2!5!)(0.70^2)(0.30^5) = 21(0.001191) = 0.025005$

$p(1) = (7!/1!6!)(0.70^1)(0.30^6) = 7(0.000510) = 0.003572$

$p(0) = (7!/0!7!)(0.70^0)(0.30^7) = 1(0.000219) = 0.000219$

Summing all these probabilities, you conclude that $F(4) = 0.226895 + 0.097241 + 0.025005 + 0.003572 + 0.000219 = 0.352931$, or 35.3 percent.

Source: Richard A. DeFusco, Dennis W. McLeavey, Jerald E. Pinto, and David E. Runkle, "Common Probability Distributions" in *Quantitative Methods* (Charlottesville, VA: CFA Institute 2019).