

Engineering Statistics Lecture XIV

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1 What if we want $E[g(x)]$?

Spoz that Brad runs a hubcap replacement business: Brad sees a lot of hubcaps laying in a ditch somewhere. Historically, Brad sells 100 hubcaps per month in the winter and doubles to 200 per month in the summer time. 6 months 100/month, 6 months 200/month.

Let X be the number of hubcaps being sold per month, random variable as described above. So, $\mu_X = 150$.

However, if Brad's profit is $100X - \$50$, continue later.

$$E[g(x)] = \int_{-\infty}^{+\infty} g(x)f(x)dx \quad (1)$$

For any PDF $f(x)$ that takes the same parameter as $g(x)$.

2 Joint Probability

Spoz Khan is a manager at Starbucks. He has to fill three different coffees. Spoz we order 4 light brew, five regular brew, and 3 dark roast coffees.

Now: Nick works for Khan, but isn't so detail-oriented. Nick selects 3 boxes at random. What are the chances that 2 of 3 are light roast and that 1 is dark roast?

Well, let's think about this in a different way – There are three or more "random variables" x , y , and z that are the numbers of light brew, regular brew, and dark brew respectively.

If we know the number of light brew and regular brews (2 and 0 respectively), then we know that the number of dark brews is 1.

So:

$$\begin{aligned} P(X = x, Y = y) &= \frac{\binom{4}{x} \binom{5}{y} \binom{3}{3-x-y}}{\binom{12}{3}} \\ P(2l1d) &= \frac{\binom{4}{2} * \binom{5}{0} * \binom{3}{1}}{\binom{4+5+3}{3}} \\ &\rightarrow P(2l1d) = \frac{18}{220} \end{aligned}$$