Zeckhauser’s Paradox: Solution
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Problem

You are playing Russian Roulette. Your revolver has six chambers. Imagine the following two situations:

1. There is one bullet in the revolver
2. There are four bullets in the revolver

In which situation would you pay more to have one bullet removed?
Zeckhauser’s Paradox: Solution

What most people do..

Most people would pay more to have one bullet removed when there is one bullet in the revolver since it guarantees them life.

However, what would you do when there are six bullets in the colt?

Yet five is not far from six, and four is not far from five...

Better calculate your expected utility!
Let \( D \) stand for death, \( L \) for life, and calibrate your utility function \( u \) by setting \( u(D) = 0 \) and \( u(L) = 1 \).

Think of the maximum you would pay to have the bullet removed in the one bullet case. Let \( A_1 \) be the event that you pay this sum (and survive of course!). The fact that you paid the maximum means that you are indifferent between \( A_1 \) and \( \frac{1}{6}D + \frac{5}{6}L \) (if you had to pay more, you would rather risk dying, and of course you would rather pay less!)
By **EUT** you are indifferent iff the expected utilities of the left and right hand sides are equal, so

\[ u(A_1) = \frac{1}{6} u(D) + \frac{5}{6} u(L) = \frac{5}{6} \]
Similarly, think of the maximum you would pay to have the bullet removed in the four bullet case. Let $A_4$ be the event that you pay this sum (and survive!). The fact that you paid the maximum means that you are indifferent between $\frac{1}{2}D + \frac{1}{2}A_4$ and $\frac{2}{3}D + \frac{1}{3}L$. Again by EUT the expected utilities on the left and right are equal

$$\frac{1}{2}u(D) + \frac{1}{2}u(A_4) = \frac{2}{3}u(D) + \frac{1}{3}u(L)$$

hence

$$u(A_4) = \frac{2}{3}$$
So we have

$$u(A_4) = \frac{2}{3} < \frac{5}{6} = u(A_1)$$

But this means that, since you like money and calculated the utility of $A_4$ as lower than $A_1$, you, as a *rational* person, payed *more* to have one bullet removed in the four than in the one bullet case!
What about the six bullet case?

Calculate $u(A_6)$ yourself!