The Logic of Loss

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Original link

Imagine someone offered you a 1% chance of winning a million dollars. How much would you pay for it? The natural inclination would be to say you break even at 1% of a million, which is $10,000. Even if you could scrape together the cash, this doesn't seem like a very good deal. After all, there's a 99% chance that you'll have just thrown away ten grand.

Where did we go wrong? The problem is that calculating the average value this way only makes sense if you get to take the deal enough times to expect an average result. If you bought a couple thousand of these chances at $9000 each, then you might start to come out ahead. But buying just one doesn't seem very bright.

Of course, the same logic applies to more pedestrian examples of risk. It probably doesn't make sense to invest in just one startup, even if the returns on startups are huge. That's why VCs invest in large numbers of startups; the returns from the wins balance out the flops.

This should seem pretty obvious, but some people seem to forget it a lot. Take the St. Petersburg paradox. Imagine this game: A dollar is placed on the table and a coin is flipped. If the coin comes up heads, the money is doubled and the coin is flipped again. Tails, the game ends and you take the money. How much would you pay to play?

The paradox comes about because the naive answer here is infinite. There's a 50% chance you get a dollar (=fifty cents), a 25% chance you get 2 (another fifty cents), a 12.5% chance you get 4 (again), and so on infinitely. But, naturally, it seems insane to pay a fortune to play this game. Thus the paradox.

Folks seem to be genuinely stumped about this, but it's just the first offer taken to the limit: instead of a 1% chance of making a million, you have an infinitesimal chance of making an infinity. If you got to play the game an infinite number of times, shelling out cash might begin to make sense, but if you only play it once it's not worth much.

Keep that in mind next time someone offers you a game.