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This is Part 3 in our series about position sizing. Click on the links to read Part 1 and Part 2.

Investors talk incessantly about what investment they think is a good buy. But rarely do investors discuss how much of any given investment to buy. But this second question is vitally important. While much of Wall Street does not think robustly about this question, gamblers certainly have and we can learn something important from their insights.

If you are presented with a bet, you can calculate your expected winnings (the amount you'll earn on average each time you bet) by multiplying the probability of winning times the amount won per bet and then subtracting the probability of losing times the amount lost per bet.

Let's say I offer you two different bets:

There is a bag of 100 marbles. One is red and 99 are green. For every dollar you bet, if you pick a green marble I'll pay you $1.02. If you pick red you lose your dollar. The expected return works out to you earning *on average* $1 every time you bet. Basically 99 times you'll earn 102% and once you'll lose 100%. So for every bet you make you will earn a 100% return on average.

There is a bag of 100 marbles. 99 are red and one is green. For every dollar you bet, if you pick a green marble I'll pay you $199. If you pick red you lose your dollar. The expected return works out to you earning *on average* $1 every time you bet. Basically 99 times you'll lose 100% and once you'll earn 19,900%. So for every bet you make you will earn a 100% return on average.

The expected return of the two bets is the same. Therefore, in theory, you should be indifferent between the two bets, especially if you're allowed to make the bet over and over again so that the long term probabilities play out.

But what if instead you had to bet your life savings on one of these two options? Most everyone would pick bet #1. This is because if you bet everything and lose, you won't get a chance to bet again (because you'll be broke). You'll never get to the long term. In other words, when deciding which bet to make, you only really care about the expected return. But if you are trying to decide *how much to bet*, you also need to take into account the likelihood of winning.

Now anyone using common sense can understand that you should bet more on option #1 than on option #2. But exactly how much should you bet on each? Or if you are managing a portfolio of stocks and you find two stocks that each have 100% expected return in your opinion, but different likelihoods of working out successfully, how much of your portfolio should you invest in each situation?

Fascinatingly, in situations such as the bag of marbles example where both the exact odds of winning and the exact payoff is known in advance, there is an exact answer. Known as the Kelly Criterion, the formula was discovered by a Bell Labs researcher in 1956 and used by his friend Ed Thorp as part of blackjack gambling system that was so successful the Las Vegas casinos banned Thorp and were forced to change the rules of blackjack. Thorp then went on to become an extremely successful investor deploying many of the same concepts. You can read this amazing story in the book Fortune's Formula.

But to deploy the Kelly Criterion to calculate the exact amount of your portfolio you should invest in a given stock, you must know the exact amount you will earn if you are "right", the amount you will lose if you are "wrong" and the probability of each happening. Unfortunately, this information in unknowable when it comes to investing in stocks. But that doesn't mean the Kelly Criterion is worthless to investors. It simply means that the formula itself (described here) is not applicable, but the concept that the key drivers of position size should be expected return and probability of success is still valid.

Interestingly, almost every Wall Street research report will address the expected return portion of the equation. "We think this stock can get to $100 over the next 12-months," "our price target for the stock is $75,"we think the stock can double over the next three years." But while these types of forecasts are part of every discussion of every investment opportunity, the standard stock research report makes no mention of the probability of success. For that matter, despite the industry generating an extraordinary volume of research on which stocks to buy, the literature on how much of each stock to buy is unbelievable thin. Yet how much of a stock to buy is a decision that needs to be made every single time any investor makes an investment.

How likely an investment is to pay off at or better than your estimate of its expected return must be a key input to position sizing. But estimating this probability is difficult and the best process varies depending on your investment strategy and in particular your time horizon.

For a short term oriented investment strategy in which an investor makes investments based on known catalysts such as the probability that a biotech company will have a new drug approved, most of the attributes of the company can be ignored and the investor can focus on the specifics of the catalyst in question. But for a long term oriented strategy in which an investor makes investments based on their assessment that a particular company is superior to competitors in its ability to generate cash flow, the catalysts are mostly unknown and so the probability of success must be estimated based on an assessment of the company itself.

The Kelly Criterion fails as a useful formula to calculate portfolio position size in long term investment strategies because half the equation (expected return) can only be estimated and the other half (probability of success) cannot even be estimated with any precision. But as long as we can simply rank investment opportunities and differentiate between those that are more likely to succeed vs those that are less likely to succeed, we can use the key insight of the Kelly Criterion to decide which investment opportunities deserve more of our capital and which deserve less.

In the next post in this series, we'll explain how we go about ranking the probability of success for companies in our long term oriented investment strategy and how this process drives our position sizing process.