

Probabilistically Thinking

The famous 17th century mathematicians Blaise Pascal and Pierre de Fermat made significant advancements in our understanding of probability. Their important work gives us the ability to compute complex probabilities involving games of chance.

One of their conclusions – in what is now referred to as the Gambler’s Ruin Problem – is that if you have a slight edge, you should make many small bets in relation to your overall wealth. This allows you to exploit your inherent advantage while reducing the possibility that a run of bad luck will be ruinous. Investing is about allocating capital for the long-term, but securities prices change hundreds of times per day, leaving some people feeling like they are at a casino. While definitely not the case, let’s follow that line of thinking for a minute.

After examining TSX market data from July 1979 through March 2017, we found that the market advanced on 54% of trading days: a slight edge. This small edge on a daily basis, however, becomes a powerful advantage over longer periods of time. For example, the TSX advanced in 73% of the calendar years between 1924 and 2016. Further extending the time horizon, we see that over rolling five-year periods the TSX advanced 92% of the time, and over 10-year periods, 99% of the time. The worst 10-year period was from 1929 to 1938, which produced an average annual loss of -0.2%, and this included four consecutive years of double digit losses from 1929 to 1932 (-12%, -31%, -33%, -13%)! But the Great Depression was also highly deflationary and the 10-year annualized real return was actually +1.7%¹ per year.

With enough repetitions (e.g. time invested) the chances of success are clearly in an investor’s favour, even though volatility can be psychologically taxing over shorter periods. The key insight here is that with a 54% daily advantage, investors aren’t gamblers at a table, they are actually the house! Investors can really only eliminate their inherent “house edge” by investing with excessive leverage, trying to time the market, or by refusing to participate at all.

While the above provides a way to think about markets in general, we also use probabilistic thinking when conducting securities analysis. Each investment has

a thesis which is a range of outcomes that we believe are plausible if management does a reasonable job of executing its strategy. But we acknowledge that outcomes could be better or worse than expected. We especially try to figure out how an investment could go wrong. We prefer investments in which the upside is significantly greater than the downside. Our hope is that by consistently applying this probabilistic thinking to all investments we make, the law of large numbers will result in a low-stress pattern of returns for our clients.

It’s important to distinguish between the application of probabilistic reasoning to securities analysis and making predictions. A dose of humility is a great defense against making bold predictions that could expose our clients to undue risk. Last fall, some of our clients asked: “how are you changing the portfolio in advance of the US election?” We weren’t doing anything. Not only were most of our predictions wrong about who would win, many of us were also wrong about how markets would react to a Trump victory. It turns out that the human mind isn’t wired to intuitively calculate probabilities, even under ideal conditions. The Birthday Problem is instructive in revealing humanity’s collective shortcomings in estimating probabilities. It goes like this: what is the fewest number of people you need in a room so that there is a 50% chance of at least two people having the same birthday? Astonishingly, the answer is 23. I was first asked this question shortly after completing a degree in mathematics specializing in probability and statistics, and although I have the ability to verify this result (thanks to Pascal and Fermat), my intuition was way off the mark. This demonstrates that when it comes to portfolio construction, we can’t be all in on the base case. Diversification is a helpful way to deal with our potential misperceptions of known risks and to also protect against the even more ambiguous “unknown unknowns”.

Pascal and Fermat were two genius polymaths of their time. If they were investors today we think they would appreciate the applicability of their mathematical inventions, but also quickly realize their limitations. We suspect they would find great value in the mental models they uncovered while studying many other disciplines.

¹ Calculated using figures from the Canadian Institute of Actuaries