Managing Money And Tossing Coins

By Harry Satanove

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Suppose you are interviewing a prospective investment management firm that claims great skill in selecting asset mix. It has chosen the correct asset mix in four out of the past six years. Great results – but how do you know if the success is from skill or luck? A basic knowledge of the laws of chance can help you make this assessment.

Try this at your next pension plan table, tossing coins to choose their asset mix for this year and for each of the following five years. (Heads they favour stocks, and tails they favour bonds.) If the chances of stocks and bonds are equally likely to be the winning asset class in any given year, the distribution of the managers' winners for the six years will look like *Graph 2*, which is simply *Graph 1* with different labels.

Graph 2 can be interpreted easily: 34 per cent of the time (the total of the red bars – 23 per cent + nine per cent + two per cent) an investment manager tossing coins to make the asset mix decision will do well, being right at least four times out of six. (Similarly, 34 per cent of the time the coin-tossing investment manager will do poorly.)

Skill Or Luck?

Now that you are armed with the mathematics, you aren't so sure about your prospective investment manager. You now know that 34 per cent of the time an investment manager could have the correct asset mix correct in at least four out of six years, just by tossing coins. Mathematics says an outcome that can be achieved more than five per cent of the time purely by chance can't be attributed to either skill or chance. Only when the probability of a successful outcome (the red part of the graph) by pure luck is less than five per cent can you attribute that outcome to skill. If a coin-tossing an investment manager in six tries can have a successful outcome (get into the red zone) 34 per cent of the time (such as four successful decisions out of six) more than five per cent of the time by pure luck, you can't judge the success of **ANY** investment manager with the same favourable result to have

Graph 1

Distribution of Winning Tosses

Number of winning tosses (out of 6)
Red indicates winners
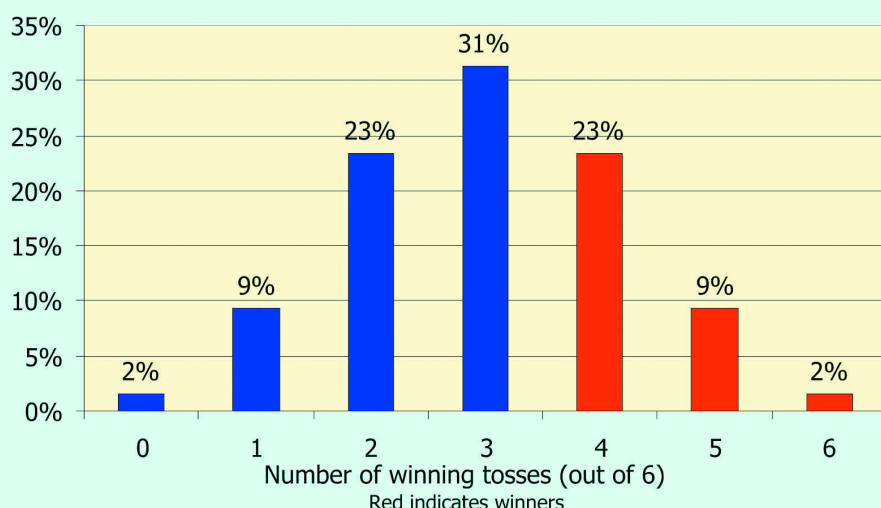
investment committee meeting: Ask everyone to take out a coin and flip it six times, scoring one for each 'heads' toss. Then write down everyone's scores. You will have a series of numbers from zero to six – probably with several threes, some twos and fours and maybe some zeros, ones, fives, and sixes. If you have a large enough investment committee, the distribution of winning tosses will look something like *Graph 1.* Although the mathematical theory says that three winners out of six is the most likely and the most common outcome, mathematical theory also says that any outcome between zero and six tosses is possible, with the distribution in *Graph 1.*

What If Investment Managers Tossed Coins?

Now consider this: All of the investment managers in Canada are sitting around a

Graph 2

Distribution of Successful Decisions
(from tossing coins)

Number of successful decisions (out of 6)
Red indicates winners
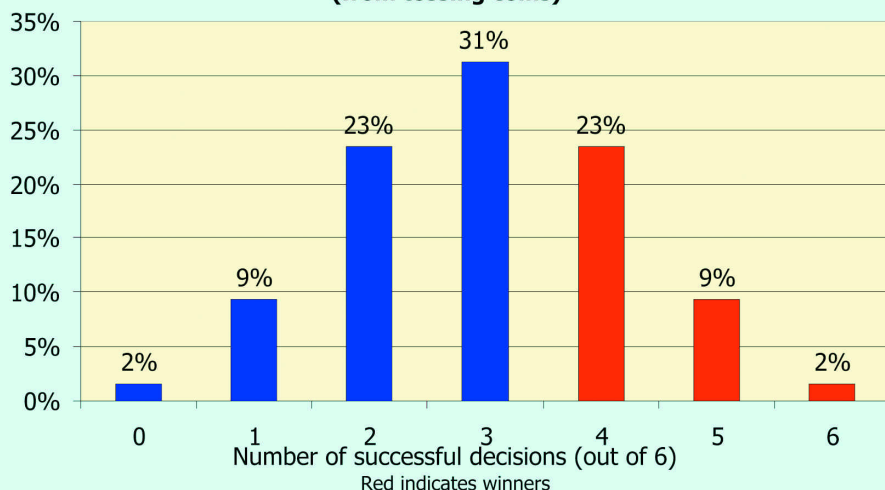
Graph 3

Distribution of Successful Decisions
(less skilled manager)

Number of successful decisions (out of 6)
Red indicates winners
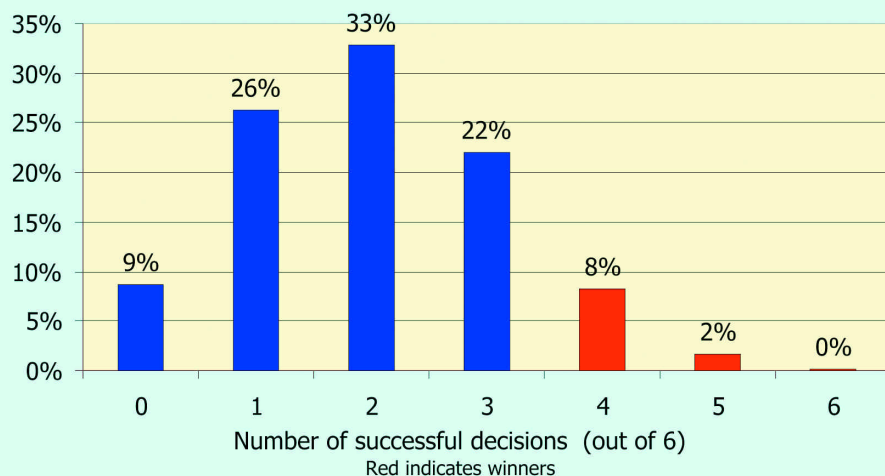
been from skill, based on the outcome in only six decisions, because you can't distinguish the skilful manager from the lucky coin-tossing investment managers.

But there is worse news. Even an investment manager with less than average skills can have a string of good luck. Suppose a number of less-skilled investment managers, capable of making the correct decision only one-third of the time, made their choice between stocks and bonds for the next six years. If you tabulated their results, you would get a graph similar to *Graph 3*. Although the mathematics predicts the average investment manager in this group will be correct only two times out of six, mathematics also says that there will be a range of results. *Graph 3* shows that even a less skilled manager will make four correct decisions out of six at least 10 per cent of the time (eight per cent plus two per cent). And that is bad news when you try to assess skill because the prospective investment manager with four out of six correct decisions, boasting about its skills, could in fact be a less-skilled investment manager with a string of good results, all within the normal bounds of the mathematical theory.

Implications For Evaluating Investment Managers

The mathematical theory has some important implications in assessing current or prospective investment managers. Pension plan investment committees must often evaluate the performance of investment managers on just a few years of results. In some cases, an investment manager may have performed better than their benchmarks. In others, the investment manager performed worse. How do you know if good performance was a result of skill or from good luck? How do you know if poor performance was a result of a lack of skill or from bad luck?

If you don't have enough results to come to a mathematically sound conclusion, one solution is to wait a little longer to assess the investment manager's results. With more decisions, it is more difficult for a coin-tossing or less skilful investment manager to be consistently successful.

Graph 4

Distribution of Successful Decisions
(tossing coins)

Number of successful decisions (out of 100)
Red indicates winners
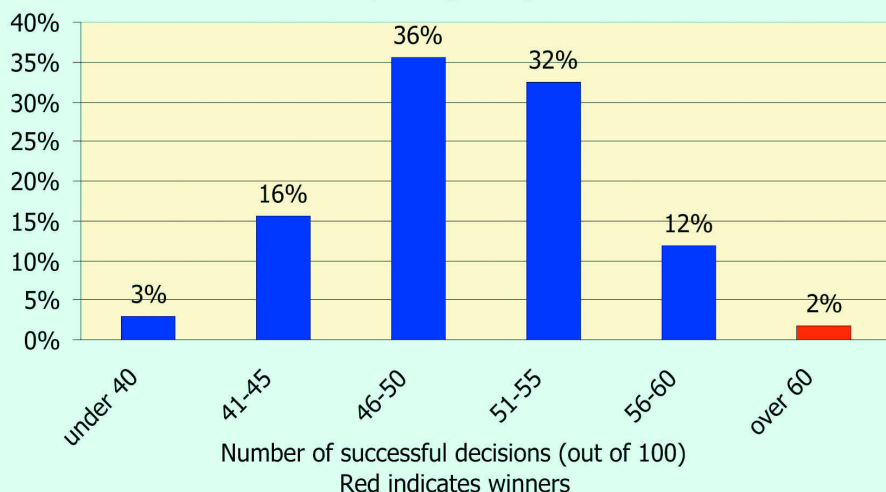
Graph 4 shows the expected distribution for investment managers tossing coins 100 times. It shows that if a manager has made 60 correct decisions out of 100, the successful result can be attributed to skill – a coin-tossing investment manager will make 60 or more successful decisions out of 100 only about two per cent of the time, which is less than the five per cent threshold. Being right at least 60 times out of a 100 requires skill.

Unfortunately, the problem with waiting to assess a larger number of decisions is that if the investment manager is truly less skilled, poor future performance could sig-

nificantly affect the pension plan. Investment consultants often recommend analysis of the investment manager's decisions, a review of their portfolio, comparison of their actual management with their stated investment style, and review of the investment management team for early warning signs of possible poor future results, before poor results emerge.
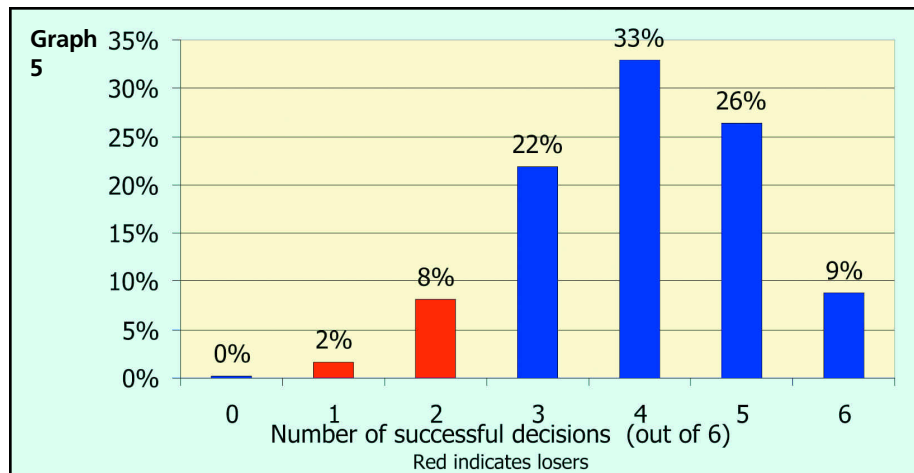
A second implication of the theory is that even a skilled investment manager can deliver poor results over the short term. The most successful investment managers are rarely right more than two out of three times. (It would be unreasonable to expect an investment manager to be right 100 per cent of the time). So in making six decisions, a skilled investment manager would, on average, be right four times. But even for skilled investment managers there is a range of results, dictated by the mathematics, as shown in *Graph 5* – there is a 10 per cent (two per cent plus eight per cent) chance such a manager could make only two right decisions out of six. So should you fire an investment manager who has delivered just two good results out of six? You shouldn't because you simply can't distinguish this investment manager's results from the results of a pack of coin-tossers, based on

just six investment decisions.

A third implication of the mathematical theory is that 'single-decision' investment decisions have a higher risk. An investment manager who purchases 50 stocks for a fund doesn't expect all 50 stocks to do well. If 20 do well, 10 do poorly and 20 are average, the investment manager should have an above-average result – the greater number of successful decisions should offset the negative impact of the smaller number of unsuccessful decisions. But there are no balancing opportunities for 'single decisions' such as changing the asset mix or replacing long-term bonds with short-term bonds – the decision is either right or it is wrong. Because the result of a normally successful investment manager can be wrong, with a significant impact, these decisions are risky. A pension plan should have specific risk control measures for undiversifiable single decisions.

There is very little that is certain in the investment world – other than that skilful investment management can have a profound effect on the success of a pension plan. A basic knowledge of the laws of chance is very useful to pension plan trustees and committees not only for managing risk, but for providing an objective perspective in assessing investment managers. ■

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Graph 5

Number of successful decisions (out of 6)
Red indicates losers