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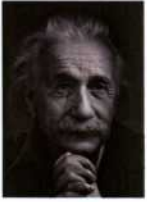
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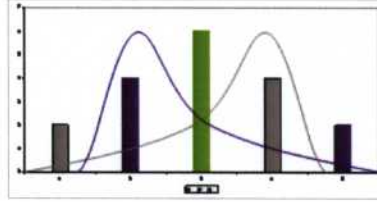
THEIR EXPERIENCE. THEIR LIFE. THEIR
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OCTOBER - DECEMBER 2010



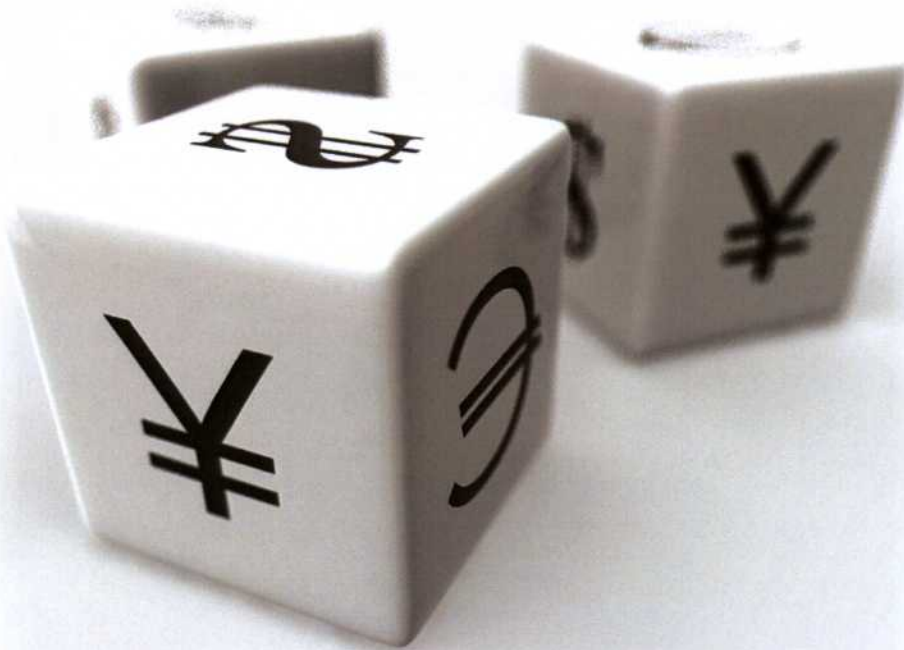
“God does not play dice.”

Albert Einstein



The outcomes of rolling the three dice provide some insight into the way people make investment decisions.

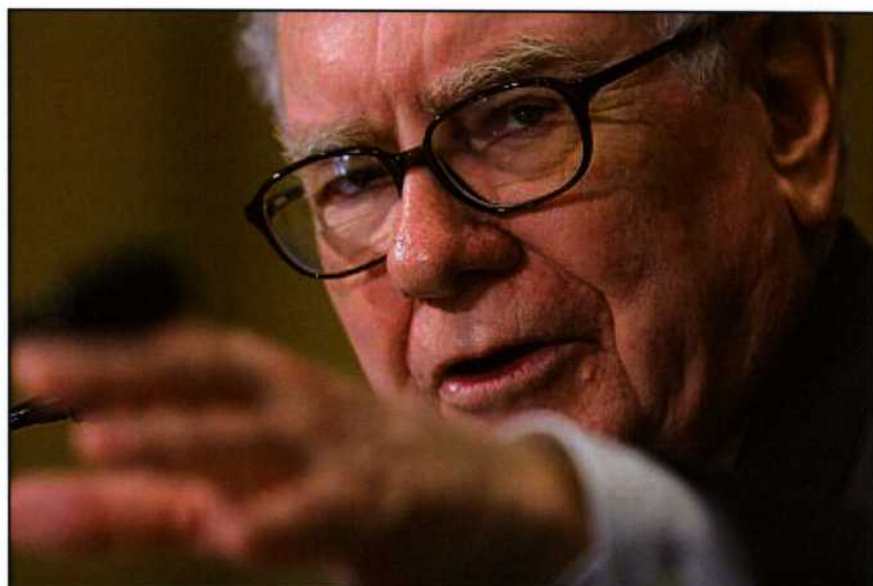
DICING WITH THE DEVIL



Warren Buffett once challenged Bill Gates to a game of dice. Gates immediately became suspicious when he was offered to choose first from a selection of unconventionally numbered dice. After inspection, he demanded that Buffett should choose first. In fact Buffett had tried to trick Gates with a set of “non-transitive dice”, which had the property that whichever die is selected, one of the other dice is more likely to show a higher number, when the two are rolled together.

It is relatively straightforward to number the faces of three six-sided dice A, B and C so that A beats B, B beats C and yet C beats A. In order to develop a feel for this apparent paradox, it is worth pondering how this can be done, before reading on.

Of the many solutions, the following example provides a useful insight. Suppose we mark all the faces of C with the number three. We can beat this with die B, by labelling four faces with the number four and two faces with the number two. Furthermore, we can beat B with die A, by labelling two faces with the number five and four faces with the



number two. But now we find that C beats A.

A beats B five times in every nine. B beats C two thirds of the time. C similarly beats A with a probability of two thirds. Other solutions can be found for three or more dice.

While this may be a mathematical curiosity, it provides some insight into the way people make investment decisions. Rolling C offers no uncertainty, so you could call this a risk free outcome. If you are paid

the amount shown on the upward face of the die, you would have a risk free return of 3.

The outcome of B is negatively skewed: two thirds of the time you beat the risk free rate by a small amount and one third of the time you lose by rather more. This is similar to a hedge fund that goes “short volatility”, by selling options or, for example, by following the carry trade.

Rolling A creates a positively skewed distribution, underperforming two thirds of the time, but experiencing larger gains the rest of the time. This is a bit like buying options or employing strict downside control to go long volatility.

The following diagram plots a histogram for the outcomes of rolling each of the three dice, highlighting the positive skew of

A	B	C
5	4	3
5	4	3
2	4	3
2	4	3
2	1	3
2	1	3

Fig. 1 Table showing the numbering of the faces of the three dice

A and the negative skew of B. Note that the expected return for all three dice is 3.

Now consider an investor holding the risk free asset C, who is considering taking a leveraged investment in hedge fund B. This will look very attractive, as it appears to be consistently beating the risk free return, especially if the track record has not yet encountered one of the rare observations in the negative tail. In contrast, hedge fund A looks very unattractive, because it regularly underperforms the risk free rate and you may have to wait a long time for a strong positive return.

This explains the systematic bias of hedge funds to be short volatility and the relative rarity of long volatility hedge funds. But the question remains, would you prefer to leverage up on a strategy with regular gains and uncontrolled losses (B) or a strategy with limited losses but unpredictable gains (A). In the crisis of 2008, the financial community was systematically biased in favour of



strategies of type B that generate short term gains at the cost of occasional extreme losses.

The paradox arises when comparing A against B. Due to its tight downside control and the opportunity of making significant gains, A outperforms B more often than B outperforms A. And this happens even though the same expected return as the risk free rate and both

have the same volatility.

A number of lessons can be drawn from this example. Although making investment decisions involves more than just counting the number of times one thing outperforms another, this tendency does tend to make an investment more attractive. A track record that only ever outperforms the risk free rate must have been taking risk. The question is when, rather than if, we will see a sharp negative return.

The second observation is that financial returns tend to be asymmetric. This characteristic is missed by investors who rely only on volatility as a risk measure. Option theory is the field of investment theory best suited to understanding and analysing asymmetric returns. This is something well understood by Messrs. Buffett and Gates.

Gavin Francis

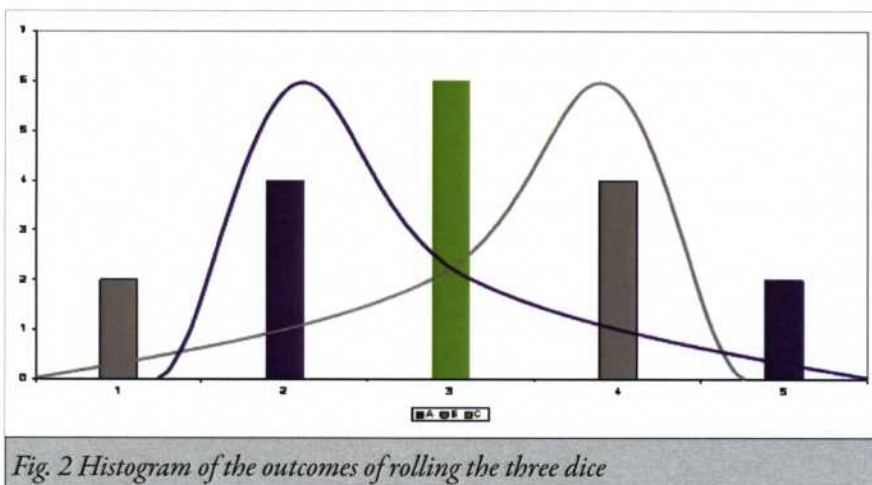


Fig. 2 Histogram of the outcomes of rolling the three dice