Risk: An uncommon deviation

To paraphrase Benjamin Franklin, the only certainties are death and taxes, but that hasn’t stopped financial analysts trying to bring mathematical certainty into the uncertain world of investing. SCOTT DONALD looks at the theory and practice of risk.

Generations of financial analysts have believed that an investment’s risk can be measured by calculating the standard deviation of its returns. We can thank Harry Markowitz for that. Employing the mathematics of probability for the slippery notion of risk was an insight worthy of the Nobel Prize he received. At first, even his doctoral examiners were unsure how to view his contribution; was it finance or was it applied mathematics? Of course history has now shown that it profoundly changed the mindset of finance academics and hence the direction of finance theory.

The big problem is that few, if any, real world investors naturally think in terms of standard deviations when they think about risk. And, the research suggests they are way off even when they do.1 (Mostly they underestimate the range of likely outcomes.)

Consulting a dictionary doesn’t help much either. Under “risk” will appear something like:

“Risk: … 1 Hazard, danger; exposure to mischance or peril. 2 The chance or hazard of commercial loss.”2

No mention of standard deviations. Did Markowitz get it wrong, then?

Orthodox finance literature accepts that the assumption of a normal distribution (central to interpreting the standard deviation of a data set)3 is only an approximation.4 There is also a credible literature proposing asymmetric versions of the standard deviation, such as semi-variance and downside risk. In fact, Markowitz himself recognised the simplification he was proposing.5 In a pre-computer world, calculating the variance of a portfolio containing 20 securities took some hours even with the simplification.

But what if something more fundamental is involved? Surprisingly, Donald Rumsfeld, US Secretary of Defense, provided a neat description when briefing journalists on the state of US intelligence in Iraq in 2004: “There are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns – the ones we don’t know we don’t know.”

By all accounts this didn’t help his audience to understand his point. But he is on to something – something that economists prior to Markowitz understood well, but which has seen little light since 1952. In the early decades of the 20th century, both John Maynard Keynes6 and Professor Frank
Knight\textsuperscript{7} incorporated elements into their theories of probability to accommodate precisely what Rumsfeld was striving to explain. Well-behaved variation in outcomes can usually be modelled mathematically if one has the training and some imagination. What catches you out is the out-of-model outcome: the thing you not only cannot predict, you do not expect. Put another way, the risk that can be modelled mathematically is only part of the risk.

Most people know this to be true. It makes them wary of financial planners, consultants and funds salespeople who try to convince them that risk can be proxied by this fancy-sounding mathematical measure, the standard deviation.

More insidiously, though, the “standard deviation equals risk” simplification underpins other calculations which have the appearance of technical rigour. Common examples relied on by professionals (who should know better) are the Sharpe ratios so popular in hedge fund presentations, the VaR models beloved of risk managers and the Beta calculations used in cost of capital calculations for infrastructure and private equity projects. Even if the professionals using these measures sidestep the solecism of equating past variations in returns (as measured by calculating a standard deviation of those returns) with the forward-looking, probabilistic risk that Markowitz was talking about, they are still making a heroic (and possibly fatal) statement about the range of outcomes they want to consider in their analysis.\textsuperscript{8}

Most of the time it doesn’t matter; performance outcomes stay within the realms of a normal distribution. But that’s the point. Investors in unlisted property trusts in 1991 could look back on several decades of property market and unit trust returns to gain an appreciation of the variation in returns they might expect. The freeze on redemptions imposed on unlisted property trusts by the Australian Securities and Investment Commission, the regulator of the day, would not have been part of that picture and could not be modelled. The drastic action taken by ASIC was aimed at containing the risk that the managers of the trusts would be unable to liquidate the trusts’ investments (mostly direct holdings of property) in an orderly manner to meet a growing number of redemptions.

Similarly, the management of LTCM, notwithstanding their Nobel prizes and state of the art analytics, also foundered on a risk they hadn’t modelled: catastrophic illiquidity. Only concerted action by various regulators averted a severe liquidity crunch. Nor is illiquidity the only rogue risk.

Gapping risk reared its head most spectacularly in the stockmarket crash of October 1987. When market prices move smoothly and more or less continuously, portfolio insurance and derivatives option prices behave tamely. But when prices jump, for whatever reason, the models on which they are built break down. Like liquidity in the case of LTCM, it was only after the fact that the assumption – that market prices would move continuously – was revealed.

Credit risk is potentially another rogue risk. The step nature of credit ratings and the discontinuity caused by default and/ or insolvency, make for a potentially bumpy ride for individual securities. Buying portfolios of credits diversifies some of the idiosyncratic risk, but close examination of the historical record reveals an episodic nature quite at variance with conventional probability analysis. Certain industries during certain periods account for a disproportionate number of credit events, a phenomenon that most credit analysts, content to rely on averages, ignore. Private equity and property investments, with their smoothed valuations punctuated by discrete pricing events, are similarly difficult to model using standard deviation as a measure of risk.

Articles criticising MPT and the CAPM abound. That is not the point of this piece. Keynes’ and Knight’s insight is that there exists a rogue risk no matter which model is used and no matter how good the model. Markowitz’ brilliant simplification, which heralded a new age in finance theory, eclipsed that deeper truth.

Nor is this article a Luddite reaction to the use of statistics in investment.\textsuperscript{9} Keynes and Knight were themselves both formidable statisticians, after all. Rather, the article is an appeal not to be seduced by the apparent precision of a mathematical calculation and fail to take seriously the less defined and potentially vaguer possibilities that are not modelled. As Keynes is purported to have said, “It is better to be vaguely right than precisely wrong.”\textsuperscript{10}

So what to do about it?

One response is obvious. “If you can’t stand the heat, get out of the kitchen,” as the aphorism goes. Don’t invest. Don’t take risks. Don’t make forecasts. But that is hardly realistic in today’s world of finance capitalism.

Common sense suggests paying attention to the traditional risk models as a starting point. Their commercial and academic sponsors are working hard to improve them and the models do elicit valuable insights about the drivers of an investment strategy. But it is important to go further.

Obviously, avoid black boxes if you want manage risk. There is no way to protect your interests inside a black box. Purchasers of hedge funds and hedge fund of funds, many of whom ignore this admonition, do so at their financial peril. As I wrote in an earlier piece, ignorance may be bliss, but it is not a reliable way to make money.\textsuperscript{11}

Next, be wary of averages and statistics dependent on them. Those summary statistics may not describe the distribution of potential outcomes at all well. The apocryphal economist with his feet in the refrigerator and his head in the hearth may on average be comfortably warm but, placed in that position, few sensible beings would describe their experience that way. Moreover, few statistics in economics are truly stationary because the underlying reality is seldom at rest. Regime shifts happen and they unsettle the firmest of econometric foundations. And then, of course, there is always survivorship bias, data mining and other statistical impurities.

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Next, diversify. Pay attention to correlation coefficients, covariance matrices and other statistical analyses by all means, but also assess the actual financial exposure to any one issuer, economic happening or institutional structure. It is necessary to understand thoroughly the flow of funds through investment markets to do this but that research, rather than understanding ever more complex trading strategies and econometric techniques, will reward the effort.

And finally, challenge those whose professional training encourages them to equate risk and standard deviation. Neither Keynes nor Knight was awarded a Nobel prize, but they knew something about risk that many modern theorists have unfortunately forgotten. Risk in the real world includes a set of situations and outcomes that no model can ever capture and no statistic can ever express. Ignore that possibility at your peril. Perhaps it is one of the few certainties in investment.

Notes
3. You can calculate the standard deviation of any set of numbers, normally distributed or not. It is only when you come to interpret the value calculated that the normality of the distribution is important.
6. Treatise on Probability (1921), Ch 24, especially part 8. In fact, probability and uncertainty received much attention in the 1920s as the intellectual revolution surrounding quantum physics took hold.
7. Risk, Uncertainty and Profit (1924). Knight referred to the unmodelled risk as “uncertainty”, as distinct from “risk” which could be quantified using traditional notions of probability.
8. This is not to underestimate the frequency with which the solecism is repeated. It appears unrecognised even in apparently credible reference works. See for instance David L. Scott, Wall Street Words: An A to Z Guide to Investment Terms for Today’s Investor, “Risk – The variability of returns from an investment. The greater the variability (in dividend fluctuation or security price, for example), the greater the risk.”
10. Actually this quote is more notable in its repetition than its authenticity. Despite concerted efforts to establish a definitive source, there is no recorded evidence of J. M. Keynes ever actually saying this. But it sounds like the kind of thing he would have said.