Radical Uncertainty

By John Kay

In much of modern finance and macroeconomics, risk, uncertainty and volatility are given essentially identical meanings. An older usage distinguished these concepts. In a recently published book Radical Uncertainty, Mervyn King and I argue that this elision has led to confusion and policy errors and seek to restore a richer terminology for understanding uncertainty. We describe the implications for decision making in the face of inescapable radical uncertainty.

2021 will mark the centenary of the publication of two books - *A Treatise on Probability* by John Maynard Keynes and *Risk, Uncertainty and Profit* by Frank Knight. For both authors, the distinction between risk and uncertainty was fundamental. Risk could be described probabilistically, but they contended that uncertainties which could not be characterized in this way are pervasive in the world of business and finance. For Knight, 'a measurable uncertainty, or "risk" proper, as we shall use the term, is so far different from an unmeasurable one that it is not in effect an uncertainty at all.'[1] It was these uncertainties which gave opportunities for entrepreneurship and profit.

Keynes, in turn, would write that 'By "uncertain" knowledge, let me explain, I do not mean merely to distinguish what is known for certain from what is only probable. The game of roulette is not subject, in this sense, to uncertainty; nor is the prospect of a Victory bond being drawn. Or, again, the expectation of life is only slightly uncertain. Even the weather is only moderately uncertain. The sense in which I am using the

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[1] Knight (1921) p. 20.

term is that in which the prospect of a European war is uncertain, or the price of copper and the rate of interest twenty years hence, or the obsolescence of a new invention, or the position of private wealth-owners in the social system in 1970. About these matters there is no scientific basis on which to form any calculable probability whatever. We simply do not know'.[2]

Significantly, this latter quotation comes not from Keynes' treatise of 1921 but from his 1937 QJE article which summarised the argument of his General Theory. Uncertainty was a major part of the reason why the equilibrium of classical economics of the time would never be reached. 'If the animal spirits are dimmed and the spontaneous optimism falters, leaving us to depend on nothing but the mathematical expectation, enterprise will fade and die.'[3] This was not, however, an argument which his followers developed and Knightian uncertainty played little role in what was described as Keynesian macroeconomics.

Instead, the decades that followed saw the elimination from economics of this earlier distinction between risk and uncertainty. The Keynes/Knight position had been challenged in the interwar years by Keynes' Cambridge colleague Frank Ramsey and by the Italian Bruno de Finetti, who elaborated the notion of subjective probabilities. Keynes had briefly accepted Ramsey's argument but his policy experience and fresh macroeconomic ideas led him to revert to his earlier position. But in the 1940s, the axiomatic approach to choice under uncertainty, analogous to the axiomatic approach to consumer choice among goods and services, was elaborated by John von Neumann and Oskar Morgenstern and then by the young Milton Friedman in conjunction with the Chicago statistician L J (Jimmie) Savage. The existence of subjective probabilities was deduced from premises which were considered definitive of 'rationality'.

By the 1960s Friedman could write: 'in his seminal work, Frank Knight drew a sharp distinction between risk, as referring to events subject to a known or knowable probability distribution, and uncertainty, as referring to events for which it was not possible to specify numerical probabilities. I've not referred to this distinction because I do not believe it is valid...We may treat people as if they assigned numerical probabilities to every conceivable event.'[4] And twenty years later history was rewritten to explain that Friedman's predecessor as doyen of the Chicago school of economics had not meant what he so clearly said. "The received interpretation of Knight's classic risk-uncertainty distinction – as concerning whether or not agents have subjective probabilities – constitutes a misreading of Knight. On the contrary, Knight shared the modern view that agents can be assumed always to act as if they have subjective probabilities".[5] It is hard to overstate the importance of this claim for the universal applicability of subjective probability on the development of modern economic theory and practice. Decisions under uncertainty could be subsumed within the general theory of rational choice. Without that assumption, modern portfolio theory, the capital asset pricing model, and much of rational expectations based macroeconomics would fall away.

But to see why the assumption that all uncertainty can be characterised probabilistically makes no sense, one need look no further than the present coronavirus crisis. A global pandemic of this kind was not, although many people have described it in this way, a 'black swan' - something which could not have been imagined before it happened, such as the invention of the wheel, or a long tail outcome from a known probability distribution, such as a fair coin falling heads twenty times in a row. We wrote in our book that 'we must expect to be hit by an

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[2] Keynes (1937) pp. 213–14.

[3] Keynes (1936), p. 162.

[4] Friedman (2007) p. 282.

[5] LeRoy and Singell (1987) p. 394.

epidemic of an infectious disease resulting from a virus which does not yet exist'[6] although it causes us no pleasure to see our observation come true so quickly. A pandemic was a widely anticipated event, but it makes no sense to ask, either before or after that event, 'what was the probability that one will break out in Wuhan in December 2019?'

The argument Ramsey put forward, which was elaborated by the scholars above, was that anyone who does not make choices on the basis of a consistent set of personal probabilities is vulnerable to a 'Dutch book' - a series of apparently attractive gambles which, if all accepted, will inevitably leave the taker worse off. As LeRoy and Singell explain, 'to deny the existence of subjective probabilities is to deny that agents are able to choose consistently among lotteries.'[7]

But that is precisely what Keynes and Knight - and us, following them - do deny. Rational people do not bet on most things. The rational response to uncertainty is generally to say 'I don't know'. The authors of *Radical Uncertainty* do not know, or care, which horse will win the 2025 Ascot Gold Cup, and no bookmaker will make a profit out of this ignorance and indifference. Indeed it is rather strange that anyone should try to construct a theory of rational behaviour from observation of gambling behaviour. The people we see in betting shops and casinos are mostly sad individuals, victims of an addictive compulsion or unusually prone to self-delusion. And it is hardly necessary to spell out the multiplicity of reasons why there is no forward market for air tickets to Paris on a day in September 2030 contingent on the weather being fine that weekend.

We believe it is time for a reappraisal of the ways economics describes uncertainty. There is wisdom in crowds, but that wisdom is in the aggregate of collective knowledge rather than the average of individual knowledge. Humans manage uncertainty better if they pool their knowledge of an uncertain future than if they take bets with each other on unpredictable outcomes, and mostly this is how they do manage uncertainty. They think in terms of narratives rather than numerical probabilities, not because they are irrational, but because a narrative approach has proved the best way of managing the ill-specified mysteries that have confronted them over the millennia in which they encountered predators, natural disasters, and other humans with hostile intentions.

Finance treats risk, uncertainty and volatility as if they had identical meanings, but in ordinary language they do not have identical meanings. Risk is negative; no one says 'there is a risk I might win the lottery'. They do not even say there is a risk that they might not win the lottery, because reasonable people do not really expect to win the lottery. They frame their thinking around a 'reference narrative', and risk is an adverse event which might derail that reference narrative.

Uncertainty, on the other hand, is the product of imperfect information and may be the prelude to good or bad outcomes. Buying a ticket for the lottery, investing in a security, visiting a new place, taking up a fresh job offer: all entail uncertainty. Some uncertainty is wholly or partly *resolvable* - by obtaining more or better information. Or when the uncertainty can usefully be characterised probabilistically - where outcomes are known to be the product of some stationary or ergodic process, analysis of the known mathematical properties of that process (the results of a card game) or observations of past data (the frequency of motor accidents) allows the use of an empirically verifiable probability distribution. If the deduced or observed distribution corresponds to some standard statistical distribution, such as the normal, then the variance of that distribution - a measure of volatility - may be a measure of the degree of uncertainty.

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[6] Kay and King (2020), p. 40.
[7] LeRoy and Singell (1987) p. 394.

But these situations, in which probability distributions can be deduced from knowledge of the underlying determinants of outcomes or by observation of a long or extensive historic series of these outcomes, are a minority of those to which probabilistic modelling is today applied. The problem, of course, is that people seek the apparent rigour of mathematical reasoning and the security of quantification in situations where such certainties are simply not available.

Uncertainty which cannot be resolved in one or other of these two ways we describe as *radical* uncertainty. And making up numbers does not help the understanding or management of radical uncertainty. Still less does it help to make up numbers over and over again, as in many 'Monte Carlo' or similar simulations. Different guesstimates of the same thing do not constitute a probability distribution. It is puzzling that many people seem to think they do, and that these techniques are so popular. They may have value in illustrating the range of possible outcomes or identifying key parameters but not in generating probabilities.

The terms probability, likelihood and confidence are also inappropriately used interchangeably. It is likely that Philadelphia is the capital of Pennsylvania - applying the general rule that the capital is one of the principal cities. I am confident that the capital of Pennsylvania is Harrisburg - I looked it up on Wikipedia. The statement 'the probability that Philadelphia is the capital of Pennsylvania is 0.7' is meaningless - it either is the capital or it is not.
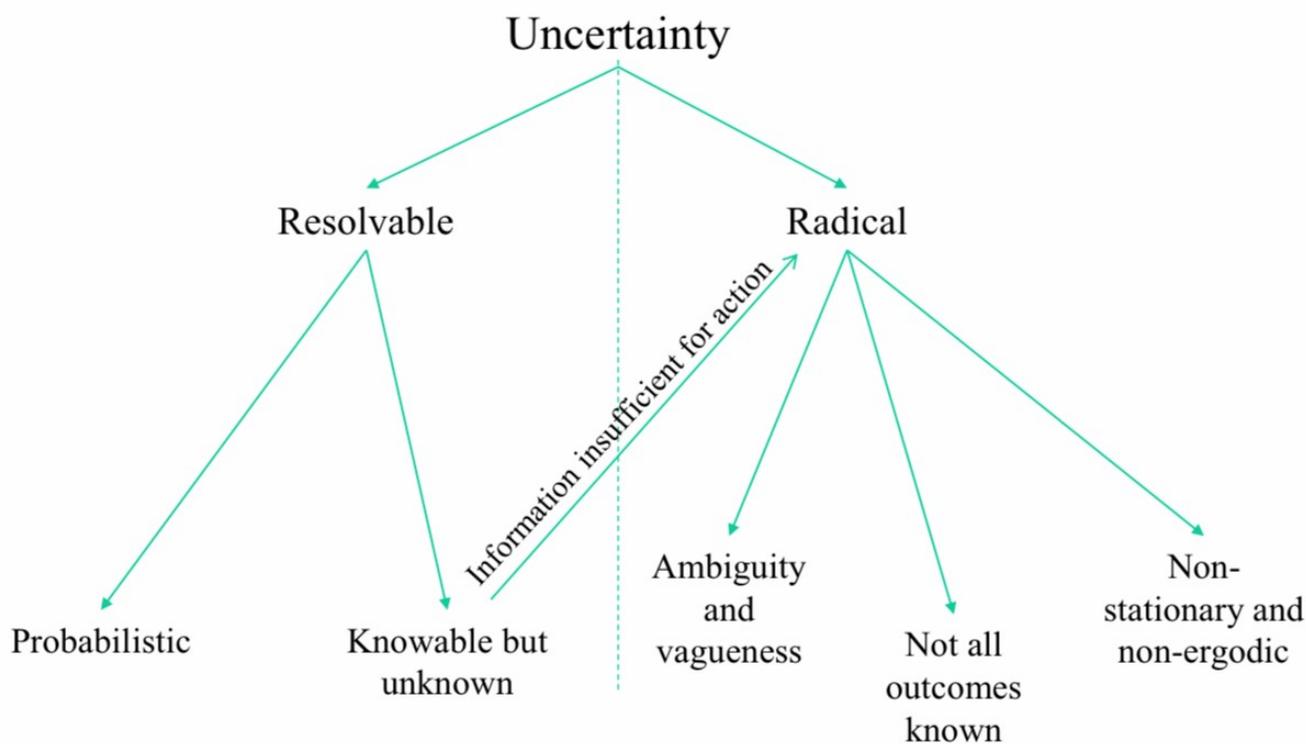
And anyone who takes a bet on a question such as the capital of Pennsylvania is a fool - it is highly likely that the person offering that - or any - bet has better information than you. The reason why people should not act on subjective probabilities in the face of asymmetric information was never better expressed than by Damon Runyon in the lines immortally delivered by Marlon Brando.[8] "Son," the old guy says, "no matter how far you travel, or how smart you get, always remember this: Some day, somewhere," he says, "a guy is going to come to you and show you a nice brand-new deck of cards on which the seal is never broken, and this guy is going to offer to bet you that the jack of spades will jump out of this deck and squirt cider in your ear. But, son," the old guy says, "do not bet him, for as sure as you do you are going to get an ear full of cider." These words should be attached to the screen of every financial market trader.

The likelihood of cider in the ear depends on the context in which the decision under uncertainty is to be made - the rational individual will stand back and ask 'what is going on here?' and the answer will likely be different if the venue is the bar or the boardroom. The question 'what is going on here' sounds banal, but it is not. Abductive reasoning, or inference to best explanation, is how we make sense of an imperfectly understood present and imperfectly known future. Frame a *reference narrative,* a realistic scenario - business strategy, policy trajectory, personal financial plan. Risk is then an imaginable event which threatens to derail the achievement of that scenario. And a sound strategy, policy or plan is one which is robust and resilient to the risks that a radically uncertain future will present.

This strategy, policy or plan will probably not be optimal - radical uncertainty without probabilities means you do not know what is optimal, and probably won't know after the event what would have been optimal. As Herbert Simon emphasised long ago, real decision makers do not optimise but satisfice - they look for outcomes that are good enough.[9]

In a world reeling from covid-19, it should hardly be necessary to reemphasise that controlling risk means establishing that the reference narrative is robust and resilient to unpredicted events. In complex engineering systems, modularity and redundancy are key to the achievement of robustness and resilience. Modularity means that part of the system can fail without necessarily jeopardizing the whole; redundancy provides for greater tolerances than the minimum perceived as necessary. In the decades before the financial crisis, both modularity and redundancy were perceived as indications of inefficiency. Conventional or regulatory requirements that different activities be conducted in separate businesses were removed, and banks returned 'surplus capitals' to shareholders. In the last few months we have seen similar lack of resilience in global supply chains and many aspects of healthcare systems.

The key insight of Knight and Keynes - that uncertainty creates opportunities for entrepreneurship which provide the dynamic of a market economy - is as valid today as a century ago. The conflation of risk and uncertainty has led to the mismanagement of risk and inhibited the embrace of uncertainty. ◼

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[8] Damon Runyon, The Ideyll of Miss Sarah Brown, Colliers Weekly. 1933; Guys and Dolls, 1955.
[9] Simon (1956).

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John Kay is an economist whose career has spanned the academic world, business and finance, and public affairs. He has held chairs at the London Business School, the University of Oxford and the London School of Economics and is a Fellow of St John's College, Oxford, where he began his academic career in 1970. He is a Fellow of the British Academy and of the Royal Society of Edinburgh.

John is a director of several public companies and a contributing editor of the *Financial Times.* He chaired the Review of UK Equity Markets and Long-Term Decision-Making which reported to the Secretary of State for Business, Innovation and Skills in July 2012. He is the author of many books, including *The Truth about Markets* (2003), *The Long and the Short of It* (2009, new revised edition 2016) and *Obliquity* (2010). Other People's Money was published by Profile Books and (in North America) by PublicAffairs in September 2015, was a book of the year for Bloomberg, *The Economist* and the *Financial Times,* winner of the Saltire Literary Prize for non-fiction, and was short-listed for the Orwell Prize for political writing. His latest book, *Radical Uncertainty,* jointly written with Mervyn King, was published in March 2020. His next book, *Greed is Dead*, co-authored with Paul Collier, will be published in July 2020.

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