The Philosophy of Keynes's Economics

Probability, uncertainty and convention

Edited by Jochen Runde and Sohei Mizuhara

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10 No faith, no conversion

The evolution of Keynes's ideas on uncertainty under the influence of Johannes von Kries

Guido Fioretti

Introduction

Keynes precipitated a revolution in economics, a deep and lasting one that is still ongoing. Like all intellectual revolutions, it did not arise out of a rehashing of old ideas. On the contrary, Keynes's revolution was a product of his genuine curiosity about the most diverse fields of scientific research. Novelty, in science as much as in technology, arises out of the combination of previously isolated ideas.

An important aspect of the story of the development of Keynes's ideas was his discovery of Johannes von Kries, a German logician and neurophysiologist who came to the idea that probabilities are in general non-comparable and non-numerical. Keynes was quite open about this source of inspiration but, at the time he was writing *A Treatise on Probability*, attempted to accommodate von Kries's non-numerical probabilities into an unsuitable philosophical framework, one which he later rejected.

Going back to von Kries is extremely useful when attempting to clarify the concept of non-numerical probability in *A Treatise on Probability* (CWVIII), as well as the continuities and discontinuities between the *Treatise* and *The General Theory of Employment, Interest and Money* (CWVII). The next section illustrates von Kries's vision, and the section after that examines how it was received by Keynes. The penultimate section attempts to distinguish what Keynes might have changed between 1921 and 1936 from what stayed unchanged. Finally, an attempt is made to distinguish what parts of his theory Keynes might have changed during this same period.

Johannes von Kries

Unlike most students of probability, who tend to be philosophers or mathematicians, von Kries was a practical scientist. He was a doctor, a professor of physiology at the University of Freiburg, who pioneered laboratory experiments on the nervous system and its connections with motor and sensory organs (von Kries 1901, 1923, 1925). And also unlike

most students of probability theory, who think of probability in connection with games of chance, von Kries's interests in probability theory were associated with measuring the effectiveness of new drugs. Here our physician realised that, unlike those who were throwing dice and assumed that a die has six identical faces, his problem was that of defining the set of possible events.

How can we say that a drug has been effective against a certain disease? Can we say that a drug has been effective even if patients die ten days after taking it, or if in healing one disease it induces another? Should we categorise all variants of a disease under a single label, or should we distinguish them as separate? And how do we establish boundaries between diseases that share common symptoms?

Von Kries realised that there exists a kind of cognitive uncertainty in the process of the classification of empirical facts into 'events'. In 1886, he published a treatise on probability that had considerable resonance in German-speaking countries (von Kries 1886). In subsequent years, he published several papers of a more philosophical character (von Kries 1888, 1892, 1899) and, finally, a treatise on logic (von Kries 1916). This was followed by works on Goethe (von Kries 1924a) and Kant (von Kries 1924b) that linked his logic to the cornerstones of German culture.

There is no space, and possibly no need, to repeat the analysis of von Kries's philosophy that I have already published elsewhere (Fioretti 2001). What is important to bear in mind is that his first book (von Kries 1886) already contained a fundamental intuition, namely that probability judgments are based on analogies with past situations that can never be exactly the same as the one at hand. Thus, comparing qualitatively different settings impairs the possibility of numerical evaluation, just as pears cannot be summed with apples. Of course, in the case of games of chance, outcomes are reasonably invariant over time so that numerical comparisons and calculations are possible. But this is not a general case. In general, symptoms are never exactly the same, just as investment opportunities are never exactly the same.

Von Kries did concede that, for practical purposes, individuals may eventually produce a numerical evaluation of non-numerical probabilities; however, since such an evaluation is necessarily subjective, he considered it to be of little practical help. This subjective numerical evaluation would later be called a 'subjective probability' by Ramsey (1978) and De Finetti (1931), who added the idea of *forcing* individuals to express a numerical value. Had von Kries been confronted with contemporary subjective probability theory, he would likely have questioned the usefulness of translating non-numerical probabilities into numerical values, if their subjective character prevents us from knowing whether these values are correct.

Keynes made several references to von Kries in *A Treatise on Probability*, and even more in its initial version submitted as a fellowship

dissertation at King's College, Cambridge (Keynes 1907, 1908). However, on the specific issue of the 'weight of the arguments' that support probability relations, Keynes referred to two articles by Meinong (1890) and Nitsche (1892). While both of these papers are reviews of von Kries's first book, both offer original ideas too.

Meinong wrote a favourable review in which he tried to express von Kries's ideas in terms of the usual setting of throwing dice. Von Kries's problem, he argued, arises if you are throwing an object that looks approximately like a die. If you are going to throw a broken die, or an otherwise irregular die, then the extent to which you can apply the usual assumption of equiprobable outcomes depends on how similar the broken die is to a regular die. However, he pointed out that judgments of similarity are necessarily subjective, and that qualitative features of the broken die are not easily measured by some objective magnitude.

Meinong accordingly proposed a second measure of uncertainty, besides probability. This second magnitude was intended to measure the extent of subjective evaluation that it is necessary to carry out in order to transform a non-numerical probability into a numerical one. In the terms of Meinong's example, this second magnitude would be a subjective evaluation of how similar a specific broken die is to an ideal, regular one.

Unlike Meinong's review, Nitsche's was critical in orientation. In fact, Nitsche did not even refer directly to von Kries's work but rather to Meinong's interpretation of it. Nitsche rejected Meinong's example of 'an object that looks approximately like a die' on the grounds that, in order to see how different this object is from a regular die, it is sufficient to throw it often enough and see how often each face comes up. In this way, von Kries's concern with novel situations and cognitive issues was forgotten and similarity judgments reduced to probability measurement.

Nitsche did retain Meinong's idea of a second magnitude in order to describe uncertainty, but he identified this magnitude with the dimension of the sample upon which probability is calculated. Simply put, the more often a die is thrown, the better one can ascertain how similar it is to an ideal, regular die.

Thus, one may reasonably ask *why* Keynes mentioned Nitsche as a source of inspiration. For Nitsche was an absolutely marginal figure, a scholar devoid of any originality whose acceptance of a second magnitude for measuring uncertainty actually had nothing to do with the idea of non-numerical, non-comparable probabilities.

The answer lies in the particular philosophical framework in which Keynes cast von Kries's work. As we shall see in the subsequent section, this led Keynes to express his notion of the 'weight of argument' in terms that include the traditional notion of sample size.

John Maynard Keynes

As a young man in Cambridge, Keynes was fascinated by Moore's neo-Platonist philosophy. His *A Treatise on Probability* reflects this neo-Platonic attitude, treating probabilities as objective entities that can be known by means of intuition, just like Platonic ideas.

Not necessarily linked to neo-Platonism, but necessary in order to enquire about probabilities that are conceived as objective entities, is Keynes's assumption of atomism. Throughout *A Treatise on Probability*, Keynes assumed that any manifestation of reality arises out of the combination of atomic components whose number may be infinite, but whose variety is finite. This assumption has important consequences for Keynes's ideas on analogy and induction, the mental processes that underlie von Kries's non-comparable and non-numerical probabilities.

Given the assumption of a finite number of qualities, Keynes could then proceed to treat analogy in terms of collecting instances that share common qualities. On this assumption, there is neither scope nor need to classify objects into mental categories that may differ among individuals. Rather, recognising an object means to identify certain of its qualities, while drawing an analogy between two objects means to identify a certain set of qualities that are common to both of them (CWVIII: 248). For instance, one may draw an analogy among water birds that are big and white, calling them 'swans'.

Induction, according to Keynes, arises out of a repetition of slightly different instances and the recognition of the analogies among them (*ibid.*: 242). Keynes distinguished between two types of induction. The first is what he called *universal induction*, where, for example, from observing a series of white swans one draws the conclusion that 'all swans are white' (*ibid.*: 244). The second is what he called *statistical induction*, or *inductive correlation*, where, for instance, from observing many white swans and some black swans one draws the conclusion that 'most swans are white' (*ibid.*: 245).

Keynes claimed that statistical induction yields probabilistic judgments, but he did not claim that universal induction yields certainty. On the contrary, universal inductions may also come in degrees of probability, depending on the number of instances that share common qualities, such as the number of swans that have been observed – in other words, depending on sample size (*ibid.*: 244).

In both cases, Keynes maintained that probabilities originating from different inductions may not be comparable with one another. This happens when the conditions and conclusions of one induction cannot be included in those of another. For instance, the probabilities of two inductions such as 'all swans are white' and 'all swans have a colour' can be compared with one another because 'being white' is a quality that is included in 'having a colour'. In contrast, the probabilities of 'all swans

are white' and 'all swans are beaked' cannot be compared because 'being white' and 'having a beak' are non-comparable qualities.

Besides being non-comparable, probabilities can be non-numerical. This may happen because, although the number of qualities has been supposed to be finite, we may not know what they are. We may fear, for instance, that our inductions about swans may turn out to be wrong because of instances that we were not able to conceive of, such as unknown or novel subspecies. To the extent that qualitatively novel instances may appear, probabilities are not numerical. However, according to Keynes, finiteness of possible qualities permits constraining non-numerical probabilities within numerical lower and upper bounds (*ibid.*: 288).

Keynes's assumption of a limited variety of empirical experiences, to be obtained through the combination of a finite number of qualities, suggests the conclusion that the arguments that support probability statements are: (1) how many different qualities constitute the available instances; and (2) the number of instances of each different combination of qualities. In terms of the probability, say, of extracting a ball of a certain colour from an urn, the above issues correspond to: (1) how many different colours can be found in the urn; and (2) how many balls of each colour the urn contains.

Given Keynes's neo-Platonic vision of probability judgments, his notion of the 'weight of argument' must entail both issues. Weight is not the same as Meinong's second uncertainty magnitude because it includes sample size, and it is not the same as Nitsche's sample size because it includes the evaluation of qualitative differences. Keynesian 'weight' includes both aspects, as Runde (1990) has already recognised.

On the whole, it appears that Keynes did understand von Kries's ideas, but that he transposed them into an alien, misleading philosophical framework. Keynes, at least at the time he was writing *A Treatise on Probability*, was a neo-Platonist who conceived of probabilities as real objects apprehended via pure intuition. Von Kries, on the contrary, considered probability relations as the outcome of mental processes. While both of them were purporting to advance a logical view of probability relations, they had opposing ideas about where probability relations came from.

History has proved von Kries to be right, not Keynes. The enormous development of cognitive sciences in recent decades has shown that many aspects of human cognition can be understood, and that von Kries's ideas were well ahead of their time. However, Keynes's probability theory stands to show how much can be done without enquiring as to what happens in an individual's mind.

Continuities and discontinuities

Does *A Treatise on Probability* provide the eventual microeconomic foundations of *The General Theory of Employment, Interest and Money*, or did Keynes

change his mind at some point in time between his earlier work and his practical activity as an economist? This is a much debated issue, one that is worth revisiting in the light of von Kries's influence upon Keynes. The ensuing discussion focuses mainly on Carabelli (1988), a representative of the camp that stresses the continuities in Keynes's thought between the two works, and Bateman (1996), a representative of the camp that stresses the differences between the young and the mature Keynes.

Bateman (1996) relates the evolution of Keynes's ideas to the rhetorical tools he eventually used in order to support them, first within academic debates and later in the wider arena of public discussions on economic policies. Concerning the genesis of *A Treatise on Probability*, Bateman tells a convincing story that centres on the Apostles, an exclusive society that Keynes joined in Cambridge.

Although the Apostles were committed proponents of Moore's neo-Platonism, they did not share Moore's acceptance of established rules of moral conduct. Many years later, Keynes would comment:

> We entirely repudiated a personal liability on us to obey general rules. We claimed the right to judge every individual case on its merits, and the wisdom, experience and self-control to do so successfully. This was a very important part of our faith, violently and aggressively held, and for the outer world it was our most obvious and dangerous characteristic.
>
> (CWXb: 38)

Moore based his argument for following general rules of conduct on the grounds that those rules yield good results most of the time. This was a probabilistic argument, based on a frequentist idea of probability. By defining neo-Platonic probabilities that can be grasped by an act of intuition, Keynes opened the way for single individuals to bypass rules of conduct in order to pursue the higher ideals that they have been able to understand. Sometimes some people are better than average at understanding what it is right to do. Thus, they should not be prevented from doing it.

Once it is assumed that probability relations are objective entities waiting to be grasped by those who are capable of doing so, atomism is a necessary assumption in order to provide a theory of induction. By assuming that reality is the combination of a finite number of qualities, Keynes was able to move induction away from the human mind towards an objective reality of atoms and molecules. Keynes retained von Kries's idea of non-numerical, non comparable probabilities, but he transposed them from the realm of mental processes to a supposedly objective neo-Platonic world.

This attitude changed. In 'My early beliefs' (CWXb), Keynes openly rejected the neo-Platonism of his youth, and the mature Keynes was

much concerned with conventions and rules of conduct. Furthermore, his stand on atomism appears to have changed as well, between the original publication of the *Treatise* in 1921 and an essay on Edgeworth that he wrote in 1926:

> The physicists of the nineteenth century have reduced matter to the collisions and arrangements of particles, between which the ultimate qualitative differences are very few; and the Mendelian biologists are deriving the various qualities of men from the collisions and arrangements of chromosomes. In both cases the analogy with the perfect game of chance is really present; and the validity of some current modes of inference may depend on the assumption that it is to material of this kind that we are applying them. Here, though I have complained sometimes at their want of logic, I am in fundamental sympathy with the deep underlying conceptions of the statistical theory of the day. If the contemporary doctrines of biology and physics remain tenable, we may have a remarkable, if undeserved, justification of some of the methods of the traditional calculus of probabilities.
>
> (CWVIII: 468)

> The atomic hypothesis which has worked so splendidly in physics breaks down in psychics. We are faced at every turn with the problems of organic unity, of discreteness, of discontinuity – the whole is not equal to the sum of the parts, comparisons of quantity fail us, small changes produce large effects, the assumptions of a uniform and homogeneous continuum are not satisfied. Thus the results of Mathematical Psychics turn out to be derivative, not fundamental, indexes, not measurements, first approximations at the best; and fallible indexes, dubious approximations at that, with much doubt added as to what, if anything, they are indexes or approximations of.
>
> (CWXe: 262)

The interpretation of the above passages is to some extent controversial, because one can imagine that Keynes ascribed atomism to the natural sciences and organicism to the human sciences, or that he relegated organicism to individuals and considered societies as atomistic, or, finally, that Keynes wrote *A Treatise on Probability* with the purpose of working out an assumption that he did not actually believe (see Gerrard (1992) for a review). However, the most widespread impression is that, not only regarding neo-Platonism but as far as atomism is concerned as well, Keynes did change his mind between *A Treatise on Probability* and *The General Theory*.

Nonetheless, those who stress a fundamental continuity between *A Treatise on Probability* and *The General Theory* do have some good arguments. However, continuity must be sought at a deeper level of analysis.

First, one may observe that if in 1936 Keynes thought that *A Treatise on Probability* was completely wrong, then he would not have referred to it in a footnote of *The General Theory* in order to explain what he meant by 'very uncertain' (CWVII: 148). The fact that he did so suggests that, at least for certain purposes, he felt that *A Treatise on Probability* was still good.

In fact, the view expressed in *A Treatise on Probability* did allow non-numerical probabilities and, conceivably, hoarding and preference for liquidity when a numerical evaluation of prospective returns is not possible. According to the *Treatise*, numerical evaluation of probabilities is not possible when decision-makers do not have enough information about the qualities that constitute the possibilities that they envisage. Modern 'New Keynesians' know that many Keynesian results, including under-employment equilibria, may be reached by simply assuming imperfect information. Thus, the view expressed in *A Treatise on Probability* is actually not at odds with *The General Theory*. However, it is not sufficient in order to explain all of it, particularly not the fundamental concept of 'animal spirits'.

Secondly, and more importantly, Keynes never accepted the idea that *all* human reasoning is akin to logical calculus. Carabelli (1988: Ch. 8) argues convincingly that, throughout *A Treatise on Probability* and its previous versions (Keynes 1907, 1908, CWVIII), Keynes rejected the idea that algorithmic logic, as expressed by Russell and the early Wittgenstein, could in any sense represent the way in which humans think.

Keynes did not accept this idea as a young man, when he imagined that human beings apprehend probability relations by means of intuition. Neo-Platonism was, for him, a possible alternative to the calculating rationality of marginalists. Even when Keynes stressed how far he had moved from his 'early beliefs', he stressed that he was happy that he had grown up with them: 'we were amongst the first of our generation, perhaps alone amongst our generation, to escape from the Benthamite tradition' (CWXb).

With equal determination, the mature Keynes continued to reject the idea that human reasoning is akin to formal logic. Even in the famous passage where he accepted the idea that probabilities are subjective 'degrees of belief', he pleaded for a 'human logic' as distinct from the formal logic upon which probability calculus rests:

> Ramsey argues, as against the view I had put forward, that probability is concerned not with objective relations between propositions but (in

> some sense) with degrees of belief, and he succeeds in showing that the calculus of probabilities simply amounts to a set of rules for ensuring that the system of degrees of belief which we hold shall be a *consistent* system. Thus the calculus of probabilities belongs to formal logic. But the basis of our degrees of belief – or the *a priori* probabilities, as they used to be called – is part of our human outfit, perhaps given us merely by natural selection, analogous to our perceptions and our memories rather than to formal logic. So far I yield to Ramsey – I think he is right. But in attempting to distinguish 'rational' degrees of belief from belief in general he was not yet, I think, quite successful. It is not getting to the bottom of the principle of induction merely to say that it is a useful mental habit. Yet in attempting to distinguish a 'human' logic from formal logic on the one hand and descriptive psychology on the other, Ramsey may have been pointing the way to the next field of study when formal logic has been put into good order and its highly limited scope properly defined.
>
> (CWXa: 338–9)

Keynes's consistent opposition to the application of formal logic to human reasoning does not mean that he had a perfectly developed idea of the way in which the human mind actually works. So of course, there was no theory for him to remain consistent with here. As a young man, he thought that neo-Platonism was a viable alternative. As a mature man, he rejected neo-Platonism and pleaded for a logic to explain what psychology, at that time, merely described.

Keynes should not be regarded as a religious prophet. His story is neither that of a man who received Illumination and spent his life propagating Truth, nor is it a story of conversions and abjurations of previous creeds. Rather, Keynes was a serious scientist, one who followed one basic thread throughout his life. This thread consisted of refusing the idea that human beings think and act according to the prescriptions of formal logic, the probability calculus and utility maximisation. In his search for an alternative kind of logic, he approached and rejected many views but, in retrospect, we can say that he never came so close to the goal as when he met von Kries.

Von Kries was very much ahead of his time. He was a forerunner of *Gestalt* psychology, one who understood the operating principles of mental categories in a way that only began to surface in the cognitive sciences in the 1980s (Barsalou 1987; Lakoff 1987; Hampton 1993). On the contrary, formal logic gave rise to the Artificial Intelligence research programme of the 1950s and 1960s, now abandoned as a faithful account of the way the human mind actually works but still valuable for modelling certain features of high-level, conscious thinking.

Thus, Keynes was right. But he would have been even more so had he not distorted von Kries by imposing on him Moore's neo-Platonism.

Keynes after von Kries

Studying von Kries undoubtedly helps us to understand Keynes's seemingly awkward statements concerning non-numerical probabilities. Furthermore, it throws light on current models of 'fundamental' uncertainty (Fioretti 1998). However, von Kries is also a good starting point for improving on Keynes's thought, both with respect to individual as well as to collective behaviour.

Keynesian scholars have rightly emphasised the importance of 'animal spirits' for Keynes's economics. Animal spirits give rise to patterns of individual behaviour that appear 'irrational' if one looks upon them from the perspective of formal logic, the probability calculus and utility maximisation (Dow and Dow 1985; Winslow 1993a). Interestingly, Keynes's account of basic will is consistent with Freud's psychoanalysis, with which he is likely to have been acquainted (Winslow 1986b, 1992).

But following von Kries, animal spirits, just like any human motivator, could be understood in terms of idiosyncratic mental categories and causal maps. Ultimately, von Kries may act as a link between Keynesian economists and cognitive scientists. The cognitive sciences have undergone impressive developments since the 'connectionist revolution' of the 1980s, and these may yield a basis for a true microfoundation of Keynes's economics.

Prospects for improving our understanding of collective behaviour are even more exciting. Von Kries's account of the formation of probability judgments rests upon structures of information and cognitive processes of information classification, which represent a proper framework for investigating the possibilities for unemployment equilibria under alternative institutional arrangements. Keynes scholars have already hinted at opportunities for understanding conventions in terms of common knowledge and self-organisation (Dupuy 1989b), Wittgenstein's later views on 'language-games' (Davis 1996) and Hayek's concern with social constructs (Lawson 1996). Much more could be achieved by applying connectionist models to social interaction.

Note

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