Choice Under Uncertainty

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Mainstream choice theory is based on a complete map of preferences and fully known income. This is extended into the future by invoking state-contingent preferences. Under these conditions there is only one possible 'choice'. There is perfect knowledge or its stochastic equivalent, and therefore no uncertainty. The exercise of this 'choice' is seen as evidence of rationality. The identification of rationality with perfect knowledge goes back to the Greeks (Vercelli 1991), but the requirement of perfect knowledge flies in the face of rationality in the sense used in everyday life. Perfect knowledge of the present and past is beyond the capacity of any human brain, and the fact that certain knowledge of the future is impossible is acknowledged by all who are rational in the ordinary sense. Although perfect-knowledge rationality is used as the benchmark in mainstream evaluations of theory, to believe that we possess it is irrational in the extreme. Indeed if you were in a situation of certainty, how would you know? (Dow 1995).

The tendency in mainstream economics is to regard any lapse from perfect knowledge as total ignorance and from full-information rationality as irrationality. Uncertainty would leave the decision-maker in paralysis or motivated by pure emotion. Our starting point, by contrast, is the acceptance that we live and make decisions in what Shackle (1972: 68-9) called the 'epistemic interval' between these two extremes: in this interval we have some knowledge of the past and present and some limited ability to imagine and evaluate probable outcomes in an intrinsically uncertain future. In this interval, uncertainty does not paralyse us and our cognitive faculties are still useful to us.

Keynes's attempt to model rigorously the process by which one might prepare decisions under uncertainty (or partial knowledge) was perhaps the first to claim the attention of heterodox economists. He framed his enquiry (Keynes 1921) in terms of evidential propositions, h, and the conclusions, a, which may follow from them with a probability α. Symbolically, $a/h = \alpha$. If $\alpha = 1$, the connection is certain; if $\alpha = 0$, there is no connection. In between, there is some probability that a follows from h which allows decision-makers to make inferences, albeit uncertain ones – to have a 'degree of rational belief' in the results of their actions. Clearly, most of the time this probability cannot be assigned a numerical value; but the probabilities of different conclusions following from their evidential propositions can be ranked under certain circumstances (Keynes 1921: 40-43).

There is scope for varying degrees of confidence in these inferences depending on the weight of argument supporting the belief, i.e. the amount of relevant evidence relative to the amount of relevant ignorance. But the understanding both of the evidence itself and of its relevance is a matter of judgement. Further, being based also on conventional judgement and on psychological factors, judgement is prone to discrete shifts. Keynes referred to a range of conventions to deal with uncertainty, such as assuming that the

past is a better guide to the future than we know to be the case. But other powerful conventions are distinctly social, such as following the market view.

When Shackle turned to the question of decision under uncertainty, he stressed the role of imagination and also of emotion: 'Choice', he said, 'is a business of the whole psyche' (1972, p. 85). First, he chose the opposite benchmark: not the degree of certainty but the extent of doubt, embodied in his concept of 'potential surprise' in contemplating both positive and negative outcomes. His reason was that 'degrees of belief' offered little scope for gradation, whereas surprise allowed for a rich range. He was interested in how one might go about evaluating a single project; therefore Keynes's scheme of comparisons of probability across relations was no use to him. It is also notable that surprise, even imagined surprise, is something that the entrepreneur would *feel*. There is a range of outcomes in the area around a neutral outcome which would occasion no surprise. He then finds a way to derive two points which command the maximum attention. He calls these focus gain and focus loss: the outcomes combining desirability (positively) and surprise (negatively) which represent the maximum reasonable hope of gain and fear of loss. Having standardised these, they are compared to 'gambler indifference curves', and the combination which gives the highest anticipated yield will determine the project selected.

This is quite a rigmarole (explained fully in Shackle 1961), and it is plainly not how any entrepreneur actually thinks – certainly not consciously. Its purpose is to try to make explicit the intuitive processes based on partial knowledge and previous experience in making decisions in an uncertain world. The concept of focus points usefully addresses the need for economy in the use of mental resources when faced with the complexity of such decisions. Shackle's construction dispenses with probability of any kind.

We come to the application of decision under uncertainty in the context of wider theory. This was such an innovation at the time that Hicks (1936) regarded Keynes's *General Theory* (1936) as having introduced a new method, the method of expectations. Yet Keynes's theory of expectations was disregarded in the 1970s when rational expectations theorists introduced their own new method of expectations addressed to the experience at the time of rising inflation. This method focused on agents basing their quantified probabilistic forecasts on the same (closed) models as those generated by economists; there was no scope for surprise. This framework is unable to address decision-making under the uncertainty which necessarily follows from the economic system being open, as Keynes himself had argued (Loasby 1993).

Of the four contexts in which Keynes referred to expectations (investment, output, user cost and liquidity preference), the role of uncertainty is best understood in the case of investment. Keynes sets out a calculation, relying on expected profits over the life of an investment project, to be compared to the rate of interest to assess the project's viability. But he cautions that these expectations are very uncertain, the more so the longer-lived the equipment, and that it would be unlikely for any investment to be undertaken were not entrepreneurs full of 'animal spirits', the spontaneous urge to actions which can override the doubts attached to these calculations. The introduction of temperament does not invalidate the calculations: they are complementary (Dow and Dow 1985).

Having raised the term 'animal spirits', it is worth noting two things about the recent book of that title (Akerlof and Shiller 2010). The first and most important is that they lump together all sorts of responses not covered by traditional full-information maximising under that title (whereas Keynes's use of it was quite precise). The second is that these are all accounted as irrational responses or non-economic preferences. Although the recognition of factors beyond utility maximisation is welcome, there is no idea that they might serve a complementary role in a theory of behaviour which is rational in the ordinary sense of the term. This would entail describing these factors as lying in another dimension from full-knowledge rationality, not as its negation (although there is a hint of this in their use, when discussing confidence, of the expression 'beyond rationality' rather than 'irrationality'). Nuti (2009) goes further: he argues that the factors Akerlof and Shiller place under the umbrella of 'animal spirits' are analysed in economics already under other names.

While Keynes also discussed expectations in relation to output decisions and user cost (Chick 1983, 1992), the expectations formed by the speculators in financial markets, who form part of the analysis of liquidity preference, is of a different order. While there is a social element even to individual entrepreneurs' expectations-formation, social convention is much more powerful in financial markets. Agents are betting on capital gains and losses on securities or equities. This translates into forming expectations not about some fundamental rate of return but likely movements in market sentiment, as these affect changes in equity prices or the rate of interest (the inverse of bond prices). When the market as a whole is in substantial agreement, asset prices can be quite unstable, for stability comes from having traders on both sides of the market: 'Best of all that we should know the future. But if not, … it is important that opinions should differ' (Keynes 1936: 172).

Since, as explained above, expectations in Keynes are substantially conventional and subject to discrete shifts, there is no such thing as a 'true' valuation of assets. Indeed, in a very important, short piece, Townshend (1937) pointed out that all prices are influenced by expectations and speculation. This implication of Keynes's theory of choice under uncertainty is critical for analysis of financial markets. Behavioural finance is currently being developed to explain swings in asset prices away from their 'true' values in terms of various forms of modification to mainstream choice theory to take account of what they deem 'irrational' factors. This work is to be distinguished from the original behavioural economics spearheaded by Simon (1955), whose notion of bounded rationality followed not just from cognitive limitations but also from the open nature of social reality. It is important to note that an absence of true valuations does not leave asset prices completely up in the air, since reason and evidence are generally employed as far as possible in exercising judgement; this is bounded rationality. Nevertheless the ebb and flow of conventional judgement in a creative environment means that market valuations normally fluctuate (see Frydman and Goldberg 2011). In all of this the emotional element in exercising judgement is inescapable. Psychological theory has been used to explain how this can go too far: reason and evidence can be suppressed, allowing full rein to emotion and leading to wilder swings in asset valuation (see Tuckett and Taffler 2008).

Theories of decision-making under uncertainty present a variety of approaches by which one might come to a reasonable estimate of the consequences of projected actions.

But they have in common a connection with the wider society and its conventions, and with the individual's hopes and fears, as integral elements in the decision process.

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