A Behavioural Perspective on Keynesian Decision Theory

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Abstract: Keynes's theory of probability has been studied intensively in the past few years with much discussion of its relevance to modern economics. This paper examines Keynes's ideas in light of criticisms made by other authors and comes to the conclusion that Keynes's views on rationality are critically flawed. However, it is asserted that this actually allows more freedom for investigation when it is combined with insights from behavioural economics and gives examples where this could be fruitful. One of the side-effects of this is that there is a narrowing of the gap between Keynesian and mainstream behavioural views on decision-making.

During the past twenty years, in mainstream economics, a variety of novel trends have come into prominence amounting to a slow revolution. These include the undertaking of experiments, the increased use of psychological ideas and serious investigation of the concept of bounded rationality. This new area, known as behavioural economics, has been widely studied and has resulted in radical new ideas about how economics should be done. Examples of this new approach can be found in game theory (Camerer 2003), altruistic behaviour (Camerer et al 2003) and intertemporal decision making (Brocas and Carrillo 2004) among many others.

Behavioural economics' main aim is to ground economics on an empirical foundation of facts and regularities rather than *a priori* theorising. Camerer (2003 p. 3) describes it as "an approach to economics which uses psychological regularity to suggest ways to weaken rationality assumptions and extend theory". He also states that behavioural game theory "is about what players *actually* do" in playing games. In general, behavioural economics can be characterised as a distrust of theorising from rationality postulates where any such assumptions should be tested and, ideally, replaced by empirically more meaningful ideas.

The effects on "mainstream" neoclassical economics have been slow but profound. As results from experiments of violations of rationality have become more widely known, there has been a search for ideas to replace traditional economic models. These explanations have increasingly come from psychology and new models have been created and tested using these insights. While initially concentrated in the area of decision theory, there have been increasing applications to finance, industrial economics, health economics and environmental economics among others.

The aim of this paper is to apply this behavioural methodology to Keynes's ideas on probability and decision- making, particularly with reference to Keynes's theory of probability. The paper will argue that Keynes's philosophy is, in fact, very close to the *a priori* style of theorising exemplified by the neoclassical economists and that discussion of choice under fundamental uncertainty would benefit from the methods and ideas introduced by behavioural economists. It is also argued that there is already a large

behavioural literature, which is relevant to Keynes's ideas, that might profitably be exploited in the future.

Keynes's Theory of Probability

Keynes (1973a) saw probability as an element of formal logic in that it acts as a logical relationship between two propositions. This relationship is of implication but, instead of it being the usual one of full implication (as in "Tom is a bachelor therefore Tom is male"), the relationship is that of *partial* implication where one piece of evidence (here denoted "h") gives partial support to a conclusion (denoted "a"). A probability relation would therefore be denoted by the symbol "a/h" stating that h partially implies a. An example of this could be that a is "Tom is a soldier" and h is "Tom is from a military family". Of course, just because Tom is from a military family does not necessarily mean that he is a soldier but it may provide evidence that he is.

This means that probability does not exist in an absolute sense but only holds between two propositions. There is no sense in which the proposition "a" has its own probability. It can only have probability when related to a piece of evidence. Furthermore, this probability relation can vary according to the evidence. "a/g" for example is a different probability from "a/h" or indeed from "b/g". These are all separate and different probabilities.

These probability relations are, furthermore, *objective* in the sense that other logical relations are objective. They are self- evident and can be perceived through logical intuition. Obviously, this does not mean that everyone can perceive them so if one's logical intuition is faulty then one will be unable to do so. In addition, this does not mean that people will converge on the same probabilities for a given conclusion. If they have different evidence then they will end up with different probabilities.

This logical structure for probability means that comparison between probabilities becomes a problem. Not all probabilities can be compared with each other so that we cannot tell (for example) if a/h is greater or less than b/g because both evidence and conclusions are different. Comparisons can be done in some cases where one has a series

of probabilities with the same evidence (a/h, b/h, c/h) or hypotheses with different amounts of evidence (e.g. a/h, a/hg, a/hgj). However, in other cases, comparisons may be impossible. Not only this, but in many cases, even if comparisons are possible, one still cannot produce a numerical probability. A numerical probability is only possible if one can establish that the *principle of indifference* holds between certain alternatives i.e. if two arguments have equal amounts of relevant evidence and there is no evidence to distinguish them as being different then equal probabilities should be given to them.

Being more specific, the idea that probabilities can be "non-numerical" is meant in a very particular way (see Keynes 1973a ch. 15). It specifically means that the probabilities should be measurable on a scale that obeys the axioms of probability. In particular, it should obey the additivity axiom: $P(x \vee y) = P(x) + P(y)$ where x and y are mutually exclusive propositions. It does not refer to whether a meaningful number *per se* can be attached to a probability but as to whether it can be measured on an interval scale. In modern measurement theory (see Krantz et al. 1971), it is perfectly possible to have non-additive measurement scales using numbers to denote different magnitudes.

Another important aspect of Keynes' Theory of probability is his concept of *weight*[1]. Weight is related to the level of confidence one has in the conclusion of a probability relation. This is directly related to the total amount of relevant evidence involved in that probability judgement. This means that the more relevant evidence there is for a probability, whether negative or positive, the greater the weight. Weight influences decisions because a lower weight gives an agent less confidence in a probability and so she is less likely to choose an option with that probability. So, for example, given two options, one with a high weight probabilistic outcome and the other with a low weight probabilistic outcome, if they have both similar consequences and probability levels, then one will tend to choose the high- weight option.

[1] It is noticeable however that Keynes actually spends very little time on weight and it doesn't enter into his main analysis of probability.

Rationality in Keynesian probability

For Keynes, rationality in beliefs derives from one's ability to apply logical intuition correctly. If one can perceive the partial implication between evidence and conclusion then one can be deemed to be rational. Unlike in Bayesian decision theory, the axioms of probability play no part in deciding whether a person is rational or not. For example, in Bayesian decision theory, if a person violates additivity then a Dutch Book can be made against them. This means that a person can be willingly brought into a bet where they will consistently lose. Given that being in a situation where one consistently loses is irrational then violating additivity is also irrational.

However, in Keynes' theory, a violation of additivity has no such effect on rationality. It is perfectly possible for an agent to violate the axioms of probability, have incomplete probability orderings or non-numerical (as defined above) probabilities and still be seen as rational as long as they have correctly intuited the probability relations. Even the principle of indifference is not a rationality requirement but simply a prerequisite for having numerical probabilities. In this sense rationality is looser for Keynes than under Bayesian decision theory. However, there is still the question of how people are supposed to intuit these relations and just how attainable is this version of rationality compared to Bayesianism.

This emphasis on rationality is prominent throughout the Treatise on Probability. Part of the reason for this was that Keynes wished to establish some rules for a logic of scientific induction in which his relation of partial implication would play a significant part. In chapters 18 to 23, for example, Keynes tries to use his probability relations to justify the use of induction in scientific progress. This is done by using analogies as evidence to support generalisations about the world. The two are then linked together using the probability relation with the analogies partially implying the generalisations.

As Gerrard (1994) has pointed out, the rationality expressed in Keynes does have some links with the Rational Expectations school of Lucas (1977) and Muth (1961). In both cases the rational agent is supposed to discover a probability that is objective and one can only be described as rational once one has achieved this. Although in principle the types of probability used by Lucas and Keynes are different in that Lucas requires

agents to obey the axioms of numerical probability, while Keynes requires knowledge of a probability relation, the fact that both require knowledge of an externally given probability reflects similar concerns.

One such concern of interest here is that the rationality theories of Keynes and Lucas have a common methodological aim- to create models of agents that are not reliant on empirical investigation of human psychology. Both Keynes and Lucas base their models of choice on an ideal economic person who is able to divine the "correct" probability. From this an economic theory is built up using these rational choice assumptions. In Keynes' case this meant that not only economic conduct but the process of discovery in science is done in such a way as to be infallible given the evidence available[2]. The strength of Keynes' case for rational conduct and induction would be seriously weakened if the relations of partial implication were not objective or were seriously susceptible to the vagaries of human psychology.

When applying probability to social conduct, Keynes reintroduces the idea of "weight" as described above. Weight, like the principle of indifference, is not a central part of his conception of rationality and only re-emerges in chapter 26 of the Treatise having only previously been discussed in chapter 6. Indeed, Keynes states: "The question appears to me to be highly perplexing and it is difficult to say much that is useful about it. But the degree of completeness of the information upon which a probability is based does seem to be relevant… in making practical decisions." (Keynes 1973a p. 345). In conclusion, weight seems to be something that deserves consideration and is seen to be useful. However, it is not "rational" in the same sense that probability relations are rational. Instead it is pragmatically useful when making choices.

How far one can stretch Keynes' ideas from the Treatise on Probability to the General Theory, especially the famous chapter 12, is a debateable point. Many people have claimed that Keynes' ideas on probability do carry over (Gerrard 2003). Others have claimed to see only partial carry-overs (O'Donnell 1990). In terms of rationality, there is general agreement that Keynes is not applying the same standards of rationality in the two books. O'Donnell (1990), for example, describes the difference as being that

[2] It is also noticeable that Lucas does not assume full information but rather a random sample which is then statistically processed, correctly, to give a best estimate. Lucas therefore also bases probabilities on the available evidence.

between “Strong Rationality” in the Treatise and “Weak Rationality in the “General Theory”. I do not want to adjudicate in this matter except to note that this is a live debate in the literature. As will be explained later, arguably the debate is misconceived.

Criticism of Keynes’s ideas on rationality and the consequences

It is not the intention of this paper to give a comprehensive critique of Keynes’s probability theory. Instead the aim is to elaborate on the consequences of a couple of criticisms of his ideas. The most effective, and commonly quoted, criticism of Keynes’s theory of rationality comes from Ramsey’s (1931) review of the Treatise. The most powerful criticism is the following:

“But let us now return to a more fundamental criticism of Mr Keynes’ views, which is the obvious one that there really do not seem to be any such things as the probability relations he describes. He supposes that, at any rate in certain cases, they can be perceived; but speaking for myself I feel confident that this is not true. I do not perceive them and if I am to be persuaded that they exist it must be by argument; moreover I shrewdly suspect that others do not perceive them either, because they are able to come to so very little agreement as to which one of them relates any two given propositions”

As Gillies (2003) points out, this argument is strong because it is given by someone who was known as a powerful logician in his own right. If he could not see these relations then probably no-one could or they simply do not exist.

Another problem has been highlighted by Cottril (1993). This is the problem that Keynes’s theory of probability relations is in tension with another attractive part of Keynes’s theory- the idea of weight. The problem comes when one realises that two probabilities, call them a/h and a/hg, are actually separate probabilities in themselves. They are logical relations, completely independent of one another. In one case we are looking at the partial implication of a by h while in the other case we are looking at the partial implication of a by the composite proposition hg. Neither is more valid than the

other in the same way that, in an ordinary logical argument, the implication that “Tom is male” from “Tom is a bachelor” is distinct from the implication that “Tom is male” from “Tom is a bachelor and has XY chromosomes”. These are separate, equally logically valid implications and neither is in any sense superior to the other. However, the principle of weight seems to state the opposite: a/hg is superior to a/h because it has more evidence.

To deal with such a tension, one is faced with a choice in that one can abandon one or both arguments. Given that the concept of weight has such appeal and that Ramsey’s critique has such force, it seems that it would be best to abandon Keynes’ notion of probability as a logical relation. With it we will also have to abandon the idea of intuiting an objective probability relation as a criterion of rationality. The question then becomes: what is left of the Keynesian idea of probability and does it matter? How much relevance do Keynes’s ideas have when stripped of the trappings of rationality?

One major loss resulting from the abandonment of the rationality assumption is the normative status of Keynesian probability. If probability cannot be justified by claiming that it is rationally derived then one is left with the problem of how one can persuade people that forming probabilities is the correct way to behave. The straight answer is that one cannot do this using Keynes’s theory. If one’s aim is to justify the use of probability then one will have to use some other theory (such as the frequency theory). However, Keynes’s probability theory was not solely constructed to give a normative theory of probability but also to provide a foundation for his economics through his ideas on conduct and it is these ideas we will focus on.

The main argument of this paper is that this abandoning of rationality actually has a liberating effect in the “Keynesian universe”. This is particularly the case if one takes a behavioural view of the situation. Behaviouralists in mainstream economics have treated the use of rationality assumptions in constructing theories with scepticism as they are often used to avoid empirical investigation of the subject. Similarly, the abandonment of rationality assumptions in Keynes will allow a behavioural investigation of decision-making under fundamental uncertainty.

In order to investigate this, some ground- clearing will need to be done. The first question is what is being investigated now that the logical relations have vanished? The

obvious choice is that Keynesian probability acts as a measure of beliefs (or, specifically, beliefs conditional on evidence). This makes sense because belief is a subjective representation of knowledge and probability can act as a measure of that representation. As such it acts in the same way as any other psychological measure (see Krantz et. al. 1971) but it does not have any implications as to rationality. An agent can assess the probability of a proposition a, given evidence h but this assessment is subjective (and not necessarily rational in the Bayesian sense). The latter argument is in agreement with assessments by Runde (1995) and McCann (2003).

The measure in itself is a complex one with multiple scales to allow for the additive "numerical" probabilities, the ordinal probabilities and those that cannot be ordered. While this is complex, it should be noticed that some mainstream behavioural economists have come to the conclusion that preference orderings can be equally complex. Unlike in expected utility theory, decision weights are not always linear and sometimes even the preference ordering is not complete (see Starmer 1996)[3].

Another advantage of doing this is that Keynesian probability becomes an empirical theory or, at least, has more empirical content than it had before. When it was assumed that probability consisted of rational degrees of belief, this meant that an empirical test of probability relations would be problematic. It could always be claimed that the participants in such a test would not have sufficient logical intuition to perceive the probabilities. If there is no requirement that beliefs be rational in this sense then this opens up the possibility of testing different aspects of how people actually make decisions. This is because Keynes's theory, even without the assumption of rationality, specifies some constraints for actual belief. Once subjects' beliefs are shown not to satisfy these constraints then the theory can be shown to be false.

Two more issues are also eliminated as problems by disposing of the idea of logical intuition. First of all, there is no need to worry about "unknown probabilities" (p. 34 Keynes 1973a,) as this relies on a lack of logical intuition. If this logical intuition doesn't exist then the distinction between known and unknown probabilities becomes redundant. This naturally only applies to Keynes's theory, as we are treating his theory as

[3] It may be objected that a slip has been made here between "preference" and "belief". However, it should be remembered that, under Expected Utility, belief is simply a type of preference over states. Incomplete preferences could therefore involve incomplete belief structures.

descriptive rather than normative. It is still perfectly reasonable to state that there are unknown probabilities with relation, say, to the frequency theory of probability.

Secondly, the distinction between rationality as used in the Treatise and as used in the General Theory becomes redundant. Neither, to use O'Donnell's terms, has "strong rationality" and both have "weak rationality". If one cannot perceive probability relations then strong rationality becomes redundant. However, it should be stated that this rejection of logical intuition is not a wholesale rejection of rationality in general or a claim of general irrationality. It is accepted that people are generally boundedly rational (in the sense of Gigerenzer & Selten 2002). It is also accepted that, normatively, people should make decisions that accord with best scientific and logical practices. However, bounded rationality covers a wide range of possible behaviours involving much non- rational cognition and one cannot *a priori* specify what behaviour will actually happen. This means that decision- making behaviour requires empirical modelling and testing.

Empirical investigation of the Keynesian viewpoint

Given the claims made in the last section, it may be useful to highlight some areas where a behavioural view of Keynes's ideas may be useful. Specifically this section will highlight those areas of empirical research that may be seen as tests of Keynes's ideas or extend ideas first put forward by Keynes. The first area, possibly the most obvious, is that of research into choice under ambiguity where it is argued that Keynes's ideas are closer to the mainstream of economics than one might think. The remaining two areas, concerned with analogy and social proof are fairly new in mainstream economics but are becoming increasingly important. They are included because they seem particularly relevant for Keynes's concerns.

i) Ambiguity and Uncertainty

The obvious first place to look for empirical investigation of Keynesian ideas on choice under uncertainty is in the large experimental literature that has built up on

ambiguity starting with Ellsberg's paper (1961) and continuing ever since (see Dolan and Jones 2004 for a recent example). While it has sometimes been claimed that the two types of non- certain choice are linked (see Brady 1993) this is not obvious (see Gerrard 1995, for an opposing point of view). It is certainly the case that, starting from Ellsberg, most researchers have claimed that their research derives from Keynes.

My own view, first of all, is that fundamental uncertainty in Keynes is connected directly to the concept of weight. The lower the weight of the evidence, the less confidence one has in the information for making a decision and so the greater the uncertainty. This is supported by Keynes's footnote (p. 148 1973b) in the General Theory where uncertainty is explicitly linked to weight. I would not agree with O'Donnell (1990) that incompleteness of belief orderings, for example, is necessarily linked to uncertainty. As Starmer (1996) has demonstrated, it is perfectly possible to have incomplete preference orderings under conditions of risk and certainty. Indeed, it is unclear why incomplete preferences are a cause of fundamental uncertainty as uncertainty relates to the confidence one should attach to one's preferences rather than to whether one has them or not[4]. Likewise, as has been discussed above, it is unclear in a situation where logical intuition of probabilities is impossible how probabilities (in the Keynesian sense) can be unknown. All this would mean, for example, that Gerrard's (2003) characterisation, that uncertainty is two dimensional (with "credence" i.e. weight on one dimension and definiteness of probability on the other), is instead one dimensional with "credence" being the sole measure of uncertainty.

Given this, the link between uncertainty and ambiguity becomes more clear-cut. Suppose ambiguity is defined as a situation where there is insufficient information to clearly distinguish one out of a set of possible probabilities of an outcome. Weight is a measure of the amount of relevant evidence and, in this case, the relevant evidence is that which defines the possible probabilities. Weight, therefore, measures the number of possible probabilities for an outcome. Risk is a situation where there is the maximal

[4] Of course part of the problem here is that O'Donnell (and Gerrard) assumes that probabilities are objective so incompleteness could be the result of a lack of knowledge of these relations. However, as has been mentioned previously, this division between known and unknown probabilities vanishes if one is modelling just beliefs instead.

amount of evidence, while fundamental uncertainty is where there is a minimal amount of evidence. Ambiguity is the situation between these two extremes.

Keynes himself seemed to think that weight was of paramount importance in the Treatise when discussing conduct. His main model of a "decision weight" (which he calls a "conventional coefficient") in the Treatise (Ch. 26 1973a) is given by the following formula:

$$C = 2pw / ((1+q)(1+w)) = 2pw / ((2-p)(1+w))$$

Where p is the probability, q = 1-p is defined as "risk" and w is the weight. C has been traced out in figure 1 (see appendix) for weights w=0.5 and w=0.75. As can be seen, this function varies between 0 when probability is zero and intersects the probability at one when C is less than one. When w approaches 0 then we have a situation when all probabilities are given a similar low value of C under fundamental uncertainty. It can be assumed that middling values of w are those that are in force under situations such as ambiguity.

It should be pointed out that this conventional coefficient, as well as the theory behind it, is obviously not the same as the modern models of ambiguity. This is not surprising given the different conceptualisation of the subject that has emerged in the intervening years. However, we are interested more in the predictions of this model rather than the premises as such. It should also be pointed out that Keynes, in line with his *a priori* theorising, would not necessarily have seen his conventional coefficient as an expression of the empirical relationship between risky and uncertain decision making. Indeed, it would probably be seen as a *recommendation* (based on rational and pragmatic grounds) for making a decision.

Given these qualifications, the predictions of this model can be compared to the predictions of those produced by modern psychologists and behavioural economists. An example of this can be seen in figure 2. The main differences are that, at low likelihoods,

ambiguous events have more impact than the judged probability[5] would warrant while, at certainty, ambiguity valuations are also equal to one. The evidence produced by experiments does seem to confirm the predictions of figure 2 (Tversky & Fox 1995, Tversky & Wakker 1995). Keynes's model does seem to hold for at least middling and higher likelihoods but fails at extreme and particularly at low likelihoods.

Interestingly, if one is comparing decision making weights for risk[6] and uncertainty (as in Hogarth & Einhorn 1990), hence isolating the fundamental uncertainty component, then a different story emerges. Hogarth and Einhorn agree with Keynes that, at certainty, the ambiguity weight/ conventional coefficient is less than one. They also have a similar prediction to Tversky and Fox that ambiguous events will be preferred over risky events at low likelihoods (see figure 3). However, as pointed out by Dolan and Jones (2004), there is actually no evidence for the latter. In fact risky events are consistently either indifferent to or are preferred to ambiguous events. This suggests that Keynes's *qualitative* prediction (p. 345 Keynes 1973a) that low weight generally reduces the attractiveness of uncertain events is correct.

Keynes actually rejected the conventional coefficient model on the valid grounds that it required a numerical (i.e. additive) probability and his probability model only allowed for the measurement of a numerical probability under certain circumstances. However, given his qualitative claim that, if a probability has more weight then it is preferred to one that has less weight, the evidence does support this, even though the specific model may not hold.

ii) Analogy

As was pointed out previously, Keynes spent a lot of time in the Treatise discussing analogy. However, this was done in the context of building up a theory of induction driven by logically intuited probability relations. Denying the existence of these relations effectively destroys Keynes's attempt to rationally justify induction.

[5] In experimental terms, ambiguous events were valued as decision weights by deriving them from certainty equivalent valuations and then deducing the weights. The probabilities were elicited after the experiment.

[6] As opposed to simply judging the levels of probabilities as in the previous paragraph.

Nevertheless, this does not mean that analogy should not be studied in the context of decision- making. As Gentner (2002) points out, analogy is a major reasoning process and so, in any study of human behaviour, analogy should have a central role.

In trying to tie analogy into a theory of induction, Keynes missed one crucial point about analogy- its potential use by individuals in overcoming fundamental uncertainty. When deciding how to choose between options, where there is no pertinent information about the decision in question, agents look to decisions that are similar or analogous to the one they are taking. These decisions allow people to take the same choices in analogous situations without needing any information about those situations.

The base concept used within psychology to analyze analogy is the *representation*. A representation can be seen as a description of a problem situation in the mind of the agent. *Analogical mapping* of one representation to another is the crucial part of the analogical mechanism that consists of matching a familiar situation or a *base* representation with a less familiar situation or a *target* representation. One can then infer how one should behave in the target representation from how one has behaved in the base representation (Gentner 2002).

Analogy is different from similarity in that it requires a *partial* mapping between the elements of the base and target representations. By contrast, similarity requires a full mapping with all elements matching. Analogy, from the point of view of fundamental uncertainty, is more flexible since this means that the target and base representations do not have to be exactly the same. One can come to a conclusion about a target decision problem from another base problem that only has some elements in common. This means that one is not relying on precise repetitions of situations in order to learn about the environment. Instead one can react to a novel situation based on a partial mapping with another situation.

Equally importantly, analogy can act at several levels. Problems of “framing”, for example, can be analyzed in terms of analogy. Quite often framing of problems (for example into gains and losses) is done through memory of previous instances of the problem. These analogues result in problems being framed in a certain way and also result in different choices. In addition to framing effects, there are other factors that could be influenced by analogy. If a problem is ill-defined then analogies can be used in a

different way in order to provide information about consequences or even to define what the options actually are in a given situation (Markman & Moreau 2001).

In economics, to date, the only important use of analogical reasoning has been in deciding how to choose when the choices and consequences are known. In this, subjects use previous problems as base representations when choosing between options (Markman & Moreau 2001). In particular, decision makers will form an analogy between one base decision problem and another target problem and concentrate on those options that hold for both. Then, given a common goal (e.g. to maximise utility), subjects transfer the method used to solve the base decision problem over to the target problem (see Gick & Holyoak 1983).

Examples of this in the mainstream literature are found in Jehiel (2005) and Gilboa and Schmeidler[7] (1995). In both of these cases, however, the idea of analogy used is very limited. In practice the models are more concerned with similarity (i.e. full mapping rather than partial mapping between base and target problems) and do not do much more than assert the existence of an analogical relationship. The mechanics of the analogical relationship are left as a "black box" with analogy/ similarity as givens in the same way as "preference". This lack of interest in the mechanics of analogy may be because it is not seen as a crucial mechanism and so can be modelled with little detail in this manner. However, given the argument for the use of partial mapping in novel situations, there is scope for change in this situation.

One major point related to analogy is that it is not an infallible way of solving a problem. A potential base representation may look plausible but the analogy to a target representation may be very shallow. The effectiveness of an analogy depends on one's ability to see the "deep structure" of a problem. However, there is no guarantee that this will happen. This means that analogies may be irrelevant, misleading or just plain silly. Analogical reasoning often depends on one's own analytical abilities but even these may go wrong, contrary to Keynes's attempts to construct a logic of induction. There is no purely "rational" way of doing it. Nevertheless, if one is attempting to see how people actually behave under uncertainty then analogy is one mechanism that cannot be ignored.

[7] Gilboa and Schmeidler (1995) suggest that their theory could be useful in conditions of fundamental uncertainty.

iii) Social Proof

A final example of how behavioural analysis may extend Keynes's ideas is in his treatment of conventions when analysing long term expectations. A convention, according to Keynes, is an assumption by various members of the marketplace that the current state of affairs will continue except when one has reasons to expect a change. This happens when there is a change in "the state of the news" i.e. when one's knowledge changes. The actual valuation that is maintained by the convention is assumed to be the "outcome of mass psychology of a large number of ignorant individuals". (Keynes 1936 p. 153-154).

Keynes clarified his position on conventions in his Quarterly Journal of Economics (Keynes 1937) reply to critics where he gives three methods by which people can make decisions on investment in an uncertain environment. His third method is what he referred to as a conventional judgment:

"(3) Knowing that our own individual judgment is worthless, we endeavour to fall back on the judgment of the rest of the world which is perhaps better informed. That is, we endeavour to conform with the behaviour of the majority or the average. The psychology of a society of individuals each of whom is endeavouring to copy the others leads to what we may strictly term a conventional judgment."

There has been much debate over Keynes's meaning of the word "convention". Bibow et. al (2003), for example, make a comparison between the notion of convention put forward by Lewis (1969) and that by Keynes noting there are serious differences between the two ideas. Gerrard (2003) and Runde (1995) concentrate on whether conventions can be seen as compatible with the Keynesian view of probability, while O'Donnell (1990) focuses on the idea that conventions are a "weak" form of rationality in the absence of properly formed probabilities for "strong" forms of rationality.

From a behavioural point of view, much of this discussion is not relevant. As has already been stated, Keynes's view of rationality is not plausible and it is better to view his ideas through an empirical lens rather than *a priori* assumptions. Furthermore, the Keynesian account of convention is extremely limited in its scope. The simple reason for

this is that there is no *mechanism* by which individuals in a society can assume the convention[8]. Keynes simply assumes that individuals spontaneously use readily available information to follow the crowd.

What is of more interest here is the fact that there is a simple psychological explanation of this behaviour. This is what is known in social psychology as "The Principle of Social Proof" (Cialdini 1993 p. 95). This principle is fairly straightforward as it states that "we view a behaviour as correct in a given situation to the degree that we see others performing it". This can be seen to operate in a variety of contexts. One example is the use of canned laughter in comedy programmes where people have been shown to laugh more at poor jokes with canned laughter (i.e. other people supposedly laughing) than without. Donations to charitable causes can be increased by the knowledge that other people have contributed. More grimly, it is known that people do not help victims of violence or misfortune if they are in a group and others are not helping. Also, it is well established that rates of suicide go up after a widely publicised suicide in the news. (Cialdini 1993).

Three aspects of this are particularly interesting and relevant for this paper. First of all, numbers matter. As long as a person is in a small group of people then the chances of them acting independently are far greater. If the group is large then independent actions become fewer and fewer. Secondly, one is more likely to conform with members of a group who are similar to oneself. Thirdly, the crucial trigger for this seems to be uncertainty. If we do not know the correct course of action then we are more likely to see what other people are doing and then follow them. This can lead to perverse results: if no-one knows what is happening or what one should do then the results are quite often decisions not to do anything. This situation is known as *pluralistic ignorance*.

The relationship between social proof and Keynes' description of convention is obviously close. However, social proof is a principle that has been established in a variety of contexts using sociological and psychological methods. It has even been tested in some economics experiments (see Bardsley & Sausgruber 2005). There is no claim that this is the result of rational calculation but instead it seems to be a heuristic method by which

[8] Schelling (1960), for example, assumes that people use focal points, Lewis (1969) relies on the self-enforcing properties of Nash equilibrium while Sugden (2004) combines Schelling's focal points with an evolutionary mechanism.

people can gain information about a situation rapidly. However, it can go wrong with sometimes horrifying and seemingly wildly irrational results.

In a Keynesian context the application of this is clear. When making long- term decisions about the future one is faced by fundamental uncertainty. Given this, the principle of social proof states that one should look to see what everyone else is doing. One will in particular look to see what similar types of people to oneself and the bulk of the population are doing. One will then be following a crowd of similar people so, for example, if other business investors are investing more in machines then this encourages a given investor to do it himself. If some people stop investing then other people will stop investing as well. Studies have shown that it only takes a few people to break conformity so change can come quite quickly. In a condition of pluralistic ignorance panics become increasingly likely, leading to possible wild fluctuations in long term expectations.

Conclusion

Keynes's ideas on probability, rationality and uncertainty are tremendously fruitful. Even today, outside the "Post Keynesian" school, his ideas have a wide influence on a surprising range of economists. For example, game theorists study fundamental uncertainty (Dow and Werlang 1994) and experimentalists examine the Keynesian Beauty Contest (Camerer 2003). Because of his wide ranging ideas, Keynes was able to make a profound impact on economics and his ideas still have an effect today. For a long time Keynesian ideas constituted a radical alternative to an economics dominated by Rational Expectations and General Equilibrium theory.

However, to a certain extent, the centre of mainstream economics has started to shift away from the modelling of humans as ultra- rational supercomputers to a more psychologically oriented empirical science. This move has been helped by the movement of psychologists in the opposite direction who have an interest in choice under uncertainty. Concepts such as fundamental uncertainty, confidence in judgement, non-linear decision weights and conventions are no longer unfamiliar. This places Keynes's

ideas in a problematic position. His emphasis on rationality, ironically, puts him in the same boat as the New Classicals who came after him.

This paper has suggested that the only way to deal with the severe difficulties of Keynes's idea of rationality is to dispose of the idea completely. The effect is to treat Keynesian ideas as descriptive ideas on human behaviour and to test them empirically. Ironically, the effect of this is to bring Keynes closer to the mainstream behavioural view. We saw that, stripped of difficulties posed by his logical view of probabilities, one can make some intelligent statements about his conventional coefficient and more qualitative formulations of choice under uncertainty. In the case of analogy, what was originally an inductivist logic of science is transformed into a means of overcoming fundamental uncertainty. Rather than worrying about the rational status of his idea of convention we can see it as an example of social proof in action.

There are undoubted problems with this view in that Keynesian ideas will become less distinctive than before. However, given that allegiance to his ideas on rationality constitute an untenable position, this is inevitable. What is more promising is the idea that the abandonment of Keynesian rationality allows new ideas to flourish and new solutions to emerge for old problems.

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Appendix 1: Figures

Figure 1: Keynesian Conventional Coefficient

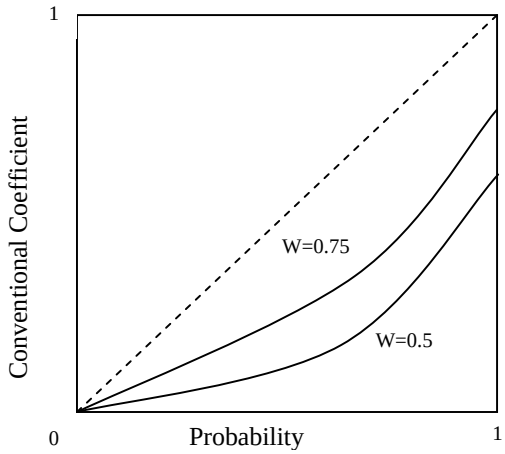

Figure 2: Prospect Theory Function in the domain of gains

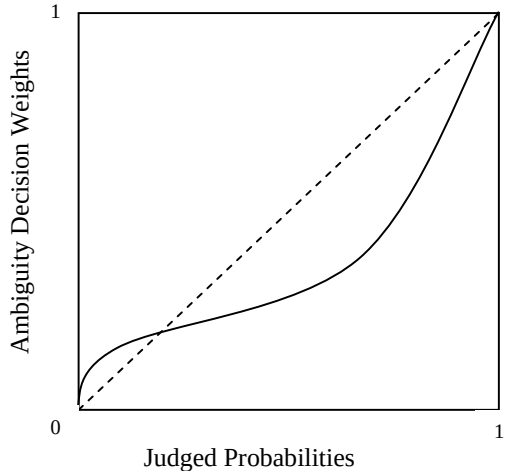

Figure 3: Venture Theory function in the domain of gains