The concept of degrees of uncertainty in Keynes, Shackle, and Davidson

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Abstract

The aim of this piece is to discuss in what extent one can find – in the works of Shackle and Davidson – an understanding of uncertainty capable of both comprehend the concept of probable knowledge and admit the existence of degrees of 'true uncertainty'. Sharing the opinion of other scholars (Runde, 1990; Dow, 1995, and Dequech, 1997), we think that it is possible to find this definition of uncertainty in Keynes's works, and so make a point to the understanding of uncertainty as a concept feasible to be graded. Moreover, we claim that this concept is not incompatible with the understanding of the social reality as a nonergodic process. To sustain this claim, we will discuss Davidson's and Shackle's views and show that in their writings there are some elements that support our main point.

Palavras-chave
incerteza, Shackle, conhecimento.
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Resumo

O objetivo deste trabalho é discutir em que medida é possível encontrar, nos trabalhos de Davidson e Shackle, o entendimento da incerteza como um conceito que compreende a existência, tanto de conhecimento provável, quanto de graus de incerteza fundamental. Partilhando a opinião de outros autores (Runde, 1990; Dow, 1995; Dequech, 1997), acreditamos ser possível encontrar esta definição de incerteza nos trabalhos de Keynes e, desta forma, afirmar que é possível definir incerteza fundamental como um conceito que admite graus de diferenciação. Além disto, afirmamos que tal conceito não é incompatível com o entendimento da realidade, enquanto um processo não-ergódico. Para sustentar este argumento, discutimos as visões de Shackle e Davidson e mostramos que existem em seus escritos elementos para apoiar a nossa posição.

1_ Introduction

The aim of this piece is to discuss in what extent one can find – in the works of Shackle and Davidson – an understanding of uncertainty capable of both comprehend the concept of probable knowledge and admit the existence of degrees of "true uncertainty". Sharing the opinion of other scholars (Runde, 1990; Dow, 1995; and Dequech, 1997), we think that it is possible to find this definition of uncertainty in Keynes's works, and so make a point to the understanding of uncertainty as a concept feasible to be graded. Moreover, we claim that this concept is not incompatible with the understanding of the social reality as a nonergodic process. To sustain this claim, we will discuss Davidson's and Shackle's views and show that in their writings there are some elements that support our main point.

2_ Degrees of Keynesian uncertainty

During the last decade, some authors have argued that it is possible to develop a concept of degrees of uncertainty in a Keynesian sense. These authors (Runde, 1990; Dow, 1996; Dequech, 1997; Crocco, 1998; and 2000) based their contributions on Keynes's theory of probability (Keynes, CW. VIII), especially on the definition of *weight of argument*.

Keynes's main concern in discussing probability is to show that one can act rationally in situations where complete certainty about the future is absent. In these situations, one should look not only at the probability relation[1] but also at the size of the evidence – evidential spread – that support this probability. Here, Keynes brings into discussion the concept of weight of argument.

Weight will be defined as the *degree of completeness of the information set on which a probability is based*.[2] According to Runde (1991, p. 281), this is expressed, as:

[1] For Keynes, probability is about logical relations between sets of propositions, premisses and conclusions. Let the conclusions be the set of propositions *a*, and the set of premisses, *h*. If a knowledge of *h* justifies a rational belief in *a* of some degree, one can say that there is a probability relation between *a* and *h*. This relation can be written as: *a*/*h*. For a thorough discussion of Keynes's theory on probability, see Lawson (1985), Carabelli (1988) and O'Donnell (1989) among others.

[2] Runde (1991) argues that three definitions of weight can be found in the *Treatise*. In this paper, we have adopted the one that, according to the author's views, is more comprehensive. For a discussion of the three concepts, see Runde (1991).

$$V\frac{a}{h} = \frac{K_r}{K_r + I_r}$$

where: K_r is the relevant knowledge and;
I_r is the relevant ignorance.

Two aspects deserve more attention. The first one is related to the meaning of "relevant ignorance." As insightfully pointed out by Runde (1991), it is always possible to know, or at least identify, the factors that affect our probability relation, and about which one is ignorant. Secondly, due to the role of relevant ignorance, an increase in the amount of evidence does not necessary implies an increase in the weight. New evidence could decrease the weight if it implies the increase of relevant ignorance. A new piece of evidence can show that our previous relevant knowledge was wrong – decreasing the weight – albeit, simultaneously, the knowledge of relevant ignorance is increasing.

Finally, it is well known that Keynes assumes a direct relationship between weight and *confidence* in using the probability estimate as a guide to conduct. From the discussion above, it is possible to see that the definition of weight as a *degree of completeness of information* is much more appropriate to the understanding of this relationship. Confidence can either decrease or increase, for the reason that new evidence can increase the relevant ignorance or knowledge.

The concept of weight of argument has been used to demonstrate that Keynesian uncertainty admits of degrees. In this discussion, the weight of argument is viewed as a measure of the degree of uncertainty. As it was shown above, the concept of weight as a *degree of completeness of information* appears to be the best one to capture the role of *ignorance* in the assessment of confidence in the probability relation. As a consequence of this approach, a *complete* absence of probable knowledge should be interpreted as the extreme case of uncertainty. If it is impossible to establish a probability relation, whatever the reason – nonexistence of probability or lack of skill to determine or identify it –, it is also impossible the existence of any *confidence*. Thus, this situation could be interpreted as an extreme case not only for uncertainty but also for *confidence*.

From this extreme position, one can move to situations where uncertainty prevails due to low weight of argument, which implies low *confidence*. Therefore, there is a *qualitative* change in uncertainty: from a situation in which a probability relation does not exist to a situation in which a probability relation exists but the weight is low. Moreover, as the weight of argument is increasing, confidence follows in the same direction and uncertainty decreases. In this approach, a probable knowledge is taken into account as a guide to conduct, and the degree of reliability of this probable knowledge – the *confidence* it merits – determines the *degree of uncertainty* that exists in a specific situation. So the concept of weight allows the understanding of uncertainty as a relative concept.

In the Keynesian literature about uncertainty, there are numerous references to the concept of "nonergodicity" to justify an interpretation of uncertainty as a rigid concept that cannot be graded (Davidson, 1982-1983, 1993, 1995). Shackle's discussion about crucial decisions or unique experiments has been widely used to justify the nonergodicity of the economic environment. In the next section, we will show that the existence of degrees of uncertainty does not contradict an understanding of the world as a nonergodic system. Indeed, we will show that, even in Shackle's and Davidson's writings, it is possible to find elements supporting this argument.

3_ Degrees of uncertainty and crucial decisions

The concept of knowledge for Shackle is fundamental to the understanding of his work. For Shackle, knowledge is directly related to certainty. Where there is knowledge, there must be certainty. This position is expressed in many passages, as for example:

> *Knowledge would not deserve that name if it gave us several conflicting accounts and answered our question 'What will follow if I do this'? in more than one way. [...] Knowledge must consist in a statement which is unique* (Shackle, 1970, p. 106).

If knowledge means certainty, where there is uncertainty there is no knowledge. These situations will appear, according to Shackle, in circumstances

where crucial, nonempty decisions apply. An empty decision is the mere account of a formal solution to a formal problem. It is a situation in which a person has a complete and certain knowledge about all possible choices and all possible outcomes of each choice. It is a mechanical and inevitable action (Shackle, 1959, p. 291).

When one looks at Shackle's definition of "decision", one realises that empty decisions are not true "decisions" in his account. He argues for an understanding of "decision" as a commitment to the first step in an action of choosing among a plurality of rival and mutually exclusive hypotheses about which it is impossible to know the relevant consequences (Shackle, 1958, p. 35). Obviously, this is far from a situation of complete knowledge and deterministic actions as in the case of empty decisions.

By contrast, the crucial, (nonempty) decision implies the impossibility of repetition of the decision process

> *because its very performance destroys forever the conditions in which it was undertaken, which form an essential part of it* (Shackle, 1970, p. 109).

It is a unique decision that brings new information "which agents will need to take into account in the future courses of action" (Andrade, 1997, p. 13). Some examples of crucial decisions are investment, accumulation of wealth, and finance. In Shackle's view, when crucial decisions such as these are made, there is no knowledge.

If a decision is a process of commitment by the decision maker with an action-scheme whose outcome is unknown, the question that should be raised is about the process in which such a decision is made. Here, Shackle introduces his concept of expectation. According to him, the decision maker is concerned with the consequences of his choice in the future. As the outcome is not known beforehand, he has to resort to imagination to figure what will be the possible outcomes. It is the enjoyment or satisfaction provided by these outcomes that will guide the choice of the decision-maker. However, Shackle argues that there is a distinction between free or pure imagination and what he calls expectations. In Shackle's words:

> *There are of course pleasures to be had from mere day-dreaming, but they are of a different sort from those of expectation. These latter*

> *we may call enjoyment by anticipation. When we speak of what the decision-maker can visualise, we mean what he can anticipate, that is what he can imagine without a sense of unrealism* (Shackle, 1958, p. 42).[3]

Nevertheless, based in this concept of expectations, how are decisions made? This question brings into account another important contribution of Shackle, that is, his concept of potential surprise. The latter can be explained as follows.

> *Between a feeling of certainty that a given event will happen (or some particular answer to a given question turn out to be the truth), and a feeling of certainty that it will not, there seems to be a continuous range of different levels at which our* degree of belief *can stand* (Shackle, 1943, p. 101).

This degree of belief is measured by an operation by which the decision -maker asks himself how much "intensity of shock or surprise" he

> *would feel if, without there having been any change in the knowledge available to him on which he based his belief in it, he were to learn that this belief is mistaken … The measure so obtained is what we may call the potential surprise associated … with a given hypothesis* (Shackle, 1943, p. 101).

So, there is a direct relationship between the degree of belief in one possible outcome and its potential surprise value. The higher the degree of belief, the higher the potential surprise. It is clear that the concept of potential surprise is directly related to novelty. What makes the degree of potential surprise differ among different hypotheses is the possibility of emergence of new and special factors, of which there is no evidence at the present for the decision-maker. Thus surprise means that the individual's structure of expectations either contains a misjudgement or has been incomplete.

To conclude our discussion of Shackle's approach to the decision process, it is necessary to bring into the framework the concept of the attention-arresting power of the hypotheses. The impossibility of feeling certain about one future outcome – meaning the impossibility of feeling that a particular unique result will be attained in the future – does not imply that the decision maker does not desire a

[3] Elsewhere, Shackle uses this limitation to the imagination of the decision maker to define "decision" as a "choice in face of bounded uncertainty" (Shackle, 1959, p. 293).

> *unique focus for his imagination, that is to say, that he will not centre his hopes on one particular level of success* (Shackle, 1943, p. 103).

The real incentive for choosing an action is the enjoyment of anticipating a high level of success (attention-arresting power).[4] The intensity of enjoyment is a decreasing function of the degree of potential surprise and increasing function of the outcome.

The combination of the potential surprise and the attention-arresting power, produces what Shackle calls focus-values. These will be the best (focus-gain) and the worst (focus-loss) outcomes that concern the decision maker. Comparing these focus-values, he will assess the attractiveness of his course of action in a comparison with others. They provide a clear-cut and simple basis of comparison between different alternative and exclusive courses of action.

4_ Davidson's nonergodicity approach

The technical definition of ergodicity classifies a system as ergodic if the stochastic process is such that time and space averages will coincide for infinite realisations.[5] If the realisations of a stochastic process are infinite in number, space and time averages tend to converge. As a consequence, if the process is ergodic, the data obtained from past realisations can provide a useful (safe) guide to decisions about the future (Davidson, 1982-1983, p. 185). Thus economic systems governed by an ergodic process show timeless (ahistoric) and immutable relationships. Accordingly, if the averages do not tend to converge, the system is classified as nonergodic.

The concept of ergodicity is used by Davidson (1995) to classify theories in economics. He argues that economic theories could be classified into two groups according to their understanding of the process that governs reality:

i. immutable reality, meaning the theories which assume that the world works as an ergodic system and;
ii. mutable reality, where a world is conceived as a nonergodic system. This taxonomy implies different ontologies.

Those theories classified in the first group admit, implicitly or explicitly, that reliable information can always be supplied by the present and the past. They differ regarding how much, if any, reliable information about the

[4] The similarity between this concept and the concept of *animal spirits* in Keynes is clear.

[5] In Davidson's words: "Space averages refer to a fixed time point and are formed as averages over the universe of realisations … Time averages … refer to a fixed realisation and are formed as averages over an indefinite time space" (Davidson, 1982-1983, p. 185).

immutable reality can be obtained by agents in the short run. According to this criterion, ergodic theories can be subclassified into two types: those which claim that in the short run, "the future is known or at least knowable"; and those which claim that

> *in the short run, the future is not completely known due to some limitation in human information processing and computing power* (Davidson, 1995, p. 109).

Thus the main difference is epistemological. For the first subgroup, there is no uncertainty, while for the second subgroup uncertainty is due to a failure in the acquisition of information. In both cases, uncertainty is epistemological, not ontological.[6]

Using the concept of ergodic systems, Davidson defines uncertainty, in both the short and long run, as the absence of governing ergodic processes. What the above theories claim as uncertainty is, in fact, risk. If reality is immutable (ergodic), then the matter is to find a way to collect information from past events and make them available to the decision maker. Moreover, if the environment is ergodic, all possible future outcomes are known in advance. However, he correctly claims that, in economic life, this kind of situation is very rare, and important economic events operate in a nonergodic reality.

One of the main factors that makes economic events nonergodic is Shackle's crucial, (nonempty) decision. As shown before, crucial, (nonempty) decisions are unique in that they cannot be repeated. Uncertainty applies to situations of nonergodicity, and in these cases, no data can be used as a reliable guide to the future.

> *Decision-makers in these situations believe that no relevant information exists today that can be used as a basis for scientifically predicting future events* (Davidson, 1993, p. 430).

Nonergodic theories are:

_ Keynes's General Theory;
_ post-Keynesian monetary theory;
_ the post-1974 writings of Sir John Hicks and;
_ G. L. S. Shackle's crucial experiment analysis.

[6] Davidson classifies the following theories as ergodic: Type 1 – Classical perfect certainty models; actuarial certainty equivalents, such as rational expectations model; New Classical models; and some New Keynesian theories. Type 2 – Simon's bounded rationality; Savage's expected utility theory; New Keynesian models such as asymmetric information and co-ordination failure theories; and Austrian theory.

The concept of nonergodicity is used by Davidson to strongly deny any kind of degree of uncertainty. Knowledge, for Davidson, is defined as the inverse of uncertainty.[7] Nonergodic processes are, in Davidson's account, those situations where there is uncertainty; where such situations predominate, knowledge is completely absent and uncertainty, absolute. As there is no place for more or less knowledge in these cases, Davidson concludes that there is no case for more or less uncertainty.

The agent's behaviour is described as follows: first, decision makers have to recognise what kind of environment they are dealing with.

> *The problem facing every economic decision maker is to guess whether (a) the phenomenon involved is currently being governed by distribution functions which are sufficiently time invariant as to be presumed ergodic – at least for the relevant future or; (b) nonergodic circumstances are involved* (Davidson 1987, p. 148).

If the latter is the case, sensible economic agents

> *try to form sensible expectations which rely on the existence of social institutions that have evolved (*e. g. *contracts and money) to permit humans to cope with the unknowable* (Davidson, 1993, p. 149).

Questions arising from the above view are: how can sensible agents be defined? Is it proper to define knowledge in such a dualistic way?

5_ A critique of Shackle's unknowledge and Davidson's approaches

As we have seen above, Davidson's approach is founded on Shackle's concept of crucial decisions to justify the existence of nonergodicity in economic life. What will be argued here does not deny the existence of crucial decisions as one of the determinants of nonergodicity, but rather it claims that it is possible to find, in Shackle's work elements to justify the existence of degrees of uncertainty, and then to show that the latter is compatible with nonergodicity. To do this, it is necessary to scrutinise the concept of knowledge used by Shackle to demonstrate that it is in itself contradictory to the concept of potential surprise. By revising this concept of knowledge, and thus by making it conform to the concept of potential surprise, it is possible to argue

[7] He is very explicit about this matter: "Once technical definitions of the concept of *uncertainty* and its inverse, *knowledge*, …" and "knowledge's inverse, the concept of uncertainty *regarding real world future events*…" (Davidson, 1987, p. 147).

in favour of the existence of degrees of uncertainty. Finally, we return to Davidson's work to demonstrate that it is also possible to accept the concepts of crucial decision and nonergodicity together with the idea of degrees of uncertainty.

An assessment of Shackle's view must start with the recognition of his most important contribution, which is the concept of crucial decision. It is fundamental for the understanding of the effects of uncertainty in the decision process. As shown before, it implies that

> *the person concerned cannot exclude from his mind the possibility that the very act of performing the experiment may destroy forever the circumstances in which the choice is made*
> (Shackle, 1990 [1956], p. 6).

It is a creative action.

However, two points in Shackle's framework deserve further comments. First, as pointed out by Andrade (1997, p. 15), there is an "extreme form of methodological individualism underlying his subjectivism". The individual appears to behave and to reason as if he is alone in the world. The social relations that he is involved in do not affect his choices, and these are performed only by taking into consideration what is in the mind of the economic agent.

Second, Shackle has a very restricted and contradictory concept of knowledge. He has a dualistic[8] approach: "Where there is knowledge there is not uncertainty", and accordingly where there is no knowledge there is uncertainty. Therefore, knowledge is only conceivable in situations of complete certainty.

However, when he defines expectations, he imposes limits on the imagination process that the decision maker goes through to anticipate some possible outcomes. He explicitly says that expectation is "what he (the decision maker) can imagine without a sense of unrealism". Yet, to define what is possible or not in this sense implies the acknowledgement that the decision maker must have some knowledge about what is unrealistic and what is not.

This definition of "expectation" contradicts his definition of knowledge, as shown above. The main point here is that Shackle differentiates between imagination and knowledge. Although he argues that an individual – when making his expectations, must constrain his images in two ways –

> *making them in the first place compatible with the individual's beliefs*

[8] According to Dow (1996, p. 16), "Dualism is the propensity to classify concepts, statements and events according to duals, belonging to only one of two all-encompassing mutually-exclusive categories with fixed meanings: true or false, logical or illogical, positive or normative, fact or opinion, and so on."

> *about the nature of things and about human nature, so that they represent something that seems to him possible in abstract* (Shackle, 1959, p. 288).

And in the second place trying to anticipate what possible transformation could happen in future,[9] he does not accept an individual's belief as a kind of knowledge.

However, how can a decision maker define what can be possible or not in a situation of complete lack of knowledge? As Shackle said in his article of 1959, one can only avoid a choice in the face of chaos and anarchy if one has some knowledge about what is possible or not.[10]

Indeed, Shackle uses the expression *bounded uncertainty* to define decision. Here, again, when he uses the adjective bounded to qualify uncertainty, he contradicts his definition of uncertainty as unknowledge. If between a situation of certainty, which means knowledge, and a situation of uncertainty meaning unknowledge, there is a situation of *bounded* uncertainty, then this latter must imply *bounded* or partial knowledge.

Moreover, the discussion of potential surprise reveals this contradiction. To construct the potential surprise curve, one has to measure the intensity of shock or surprise of an unexpected outcome. In doing so, one has to *imagine* the hypothetical outcomes and compare them in terms of*surprise*. This should be done, using Shackle's words,

> *without there having been any change in the knowledge available to him on which he based his belief in it* (1943, p. 101).

Nevertheless, if knowledge for Shackle means, as shown before, "a statement which is unique" – *i. e.* certainty – there is only one possible outcome and any other should be regarded as impossible. From this point of view, there is no basis to ascribe different degrees of surprise to impossible outcomes. Thus, the construction of the potential surprise curve must imply a concept of knowledge that does not denote certainty. This conclusion could be reinforced with the analysis of the concept of *attention-arresting power*. Remember that, according to Shackle, the real incentive for choosing an action is the *enjoyment of anticipating* a high level of success. Two factors are the determinants of the intensity of enjoyment: the degree of potential surprise (inversely related) and the

[9] "…attaching then to named future dates and restricting them to such transformations of his existing situation as seem to him possible in the time-span between 'now' and 'then'" (Shackle, 1959, p. 288).

[10] In Shackle's words: … for a man who thought that any act could have any sequel whatever, and that there was no possibility of excluding *anything* as incapable of following from any stated course of action, would believe any one act just as eligible, just as wise and efficient, as any other … (Shackle, 1959, p. 293).

expected outcome (positively related). As one can see, this enjoyment is related to factors that necessarily involve some kind of knowledge. In the same sense as the discussion about the degree of potential surprise, the determination of expected outcome *must* imply the existence of degrees of uncertainty.

To conclude, the contradiction between Shackle's concept of knowledge and his potential surprise curve can be eliminated if one replaces the concept of knowledge as certainty with the concept of probable knowledge that appears in Keynes's Treatise. In doing so, one must admit that Shackle's work is compatible with the concept of degrees of uncertainty.

Very similar conclusions can be derived from an assessment of Davidson's contributions. As noted before, Davidson's approach is grounded on Shackle's works to sustain his concepts of nonergodicity and absence of knowledge, as defining features of uncertainty. Two aspects will be analysed here: the sources of ergodicity and their implication for the knowledge possessed by the decision maker and the concept of knowledge used by Davidson. Let us look at the first aspect.

Davidson claims that an important element that makes the economic world nonergodic is the role played by technical change. In his words,

> *To restrict entrepreneurship to robot decision-making via Bayes' theorem, …, is to provide a descriptive analogy of modern real world economies which ignores the role of the Schumpeterian entrepreneur – the creator of technological revolutions and change* (Davidson, 1982-1983, p. 193).

However, as we have shown elsewhere (Crocco, 1999, 2000), while innovation guarantees the nonergodicity of the world, it does not necessarily imply complete ignorance about patterns of technical change. The concepts of technological paradigms and technological trajectories developed by the Evolutionary/Institutionalist approach to technical change (Dosi, 1982) can be used to show that, at any moment in time, there is always a technological paradigm that determines the features of innovative activity for every sector of the economy, *imposing a selective, precise and ordered pattern of technological change*. The pattern of technical change will be disorderly only in situations

characterised by a shift in the technological paradigm.

It must be made clear that what has been claimed here is not that the outcome of the innovative process can be perfectly forecast, but rather that there is an ordered pattern of change originating from the introduction of an innovation. This feature of innovative activity allows the emergence of a kind of knowledge that is not complete or certain, but that can be used to guide the decision maker. In other words, there is a probable knowledge in the innovative activity that is not contradictory of the nonergodicity feature of this activity.

The second aspect to be analysed is Davidson's definition of knowledge. We think that the above discussion shows that, in order to restrict uncertainty to unknowledge, it is necessary to use a narrow definition of knowledge. If one understands imagination as a process in which previous knowledge is employed, one must be open to conceive that uncertainty and knowledge can exist in gradations.

It is interesting to take a look at the debate between Davidson and Runde (1993), as it reveals a contradiction in Davidson's approach which is similar to the contradiction in Shackle's approach. Runde (1993) argues that Davidson has two positions when he discusses uncertainty: official and unofficial. The main point of the official position is the relationship between knowledge and ergodicity. Ergodicity is a precondition for the existence of knowledge, and as ergodicity is a feature of some aspects of the world, it is an ontological precondition. In Runde's words:

> *Davidson's official position thus consists of an epistemological dichotomy between knowledge and uncertainty and a corresponding ontological opposition between ergodic and nonergodic processes*
> (Runde, 1993, p. 384).

The consequence of this concept of knowledge is that the dualistic approach, knowledge on the one side and uncertainty on the other, does not give space for *sensible expectations*. This dichotomy implies that either expectations exist because one has knowledge (ergodic systems), or no expectations can be asserted as no knowledge exists. *Sensible expectations*, as

claimed by Runde, must imply a third category, which is (fallible) probable knowledge.[11]

Davidson's reply is not sufficient to invalidate Runde's point. Davidson denies that he accepts empirical regularities as criteria for science. His denial of the prevalence of ergodic processes is used to justify his nonacceptance of this approach. Indeed, he argues that empirical realism:

> *...is neither a necessary or a sufficient condition for 'science'. The primary goal of science is to explain. If one can also predict on the basis of 'empirical regularities', then that is icing on the scientific cake. Scientists, however, should 'know' in what areas they cannot search for past empirical regularities to predict the future. In these nonergodic areas of economic science, human beings can and should develop 'certain important (institutional) factors which somewhat mitigate in practice the effect of our ignorance of the future'* (Davidson, 1993, p. 431).

However, from the quotation above, it is possible to see that Davidson stopped halfway. The logical consequence of the acceptance that economic science and human beings can and do develop institutions is that some kind of knowledge must be derived from the development of institutions. Likewise, as institutions exist to deal with nonergodic situations, some kind of knowledge could exist in nonergodic processes.

Davidson's account of the process of sensible expectations formation is also problematic. Davidson argues that the decision maker makes two sequential steps to form expectations. The first one is to guess whether a specific event is ergodic. After that, if the guess (belief) is that the event is nonergodic, the agent looks for the

[11] According to Runde:... "by treating knowledge as one pole of a simple opposition it becomes impossible to distinguish between the epistemological status of different kinds of knowledge. I would go along with Davidson on the kind of truth and certainty guaranteed by sound *a priori* reasoning, for example, and ignore the question of whether or not the standard axioms of logic and rules of inference are themselves not to some extent arbitrary. But our knowledge of the 'facts' of science or history is a different thing entirely, resting as it does on a shaky base of observation, perception, and inference. By adopting a conception of relative or probable knowledge, Davidson could accommodate this difference, namely, that knowledge based on experience is fallible, whereas the knowledge arrived at by sound reasoning (and assuming the truth of the premisses or axioms) is not" (Runde, 1993, p. 395, n. 14).

existence of social institutions on which to base his sensible expectations. It is as if the decision maker and social structure were independent. However, as pointed out by Lawson (1997, p. 83) the

> *social structure is the, typically unacknowledged, condition of all our actions as well as the, usually unintended, consequence.*

There is no two-step sequence in the decision process. The decision maker is interacting with the social structure before asking whether an event is ergodic or not. In Runde's (1993, p. 390) words:

> *Social structures thus not only permit and facilitate human agency, but presuppose it.*

The main point here is that the acknowledgement of the nonergodic process is not a distinctive process separated from the acknowledgement of the institutions that exist to deal with it this nonergodic process. Institutions exist before the decision maker forms his expectations and they are reproduced through this engagement with them. They are an antecedent element in the process of forming expectations and, in some degree, they shape those expectations. The important question is about the stability and endurability of these institutions.[12] If, in the eyes of the agent, they are stable and endurable, he can – despite the nonergodicity – have a probable knowledge about the future course of events and feel himself less uncertain about the future. As Andrade has pointed out,

> *Complexity and the passage of time make us ignorant or uncertain about many relevant current and future events that take place in our environment. However, there is a form of (incomplete) knowledge in the existing system of rules and conventions* (Andrade, 1998, p. 132).

Summing up, crucial decisions and nonergodicity should not be considered as features of the economic process that make it impossible to discern degrees of uncertainty. The prevalence of crucial decisions and nonergodic processes not only do not vitiate the existence of a concept of probable knowledge, but also supply the basis for claiming that there is a continuum of degree of uncertainty inherent in these processes.

[12] A similar point is made by Lewis and Runde (1999). In this work they analyse the possible connections between *Davidson's* work and the *critical realist* (Lawson 1997) perspective, which is implicitly adopted in this paper.

6_ Conclusion

We have tried in this paper to show that in order to understand uncertainty as a concept feasible to the market, it is necessary to take into account not only the discussion about the weight of argument, but also the analysis about what constitutes relevance. Moreover, we tried to show that the concept of degree of uncertainty is an intrinsic element of both Shackle's and Davidson's works. They themselves do not recognise it but, as we have tried to show before, it is necessary to understand the concept of *potential surprise* in Shackle and *sensible agents* in Davidson.

References

ANDRADE, R. *Theories of uncertainty*: affinity and uniqueness. [s. l.]: [s. n.], 1997.

ANDRADE, R. *Dynamics of conventions*: a post-classical analysis. 1998. PhD (Dissertation) – Department of Economics, UCL, University of London, London.

CARABELLI, A. *On keynes' method*. London: MacMillan Press, 1988.

CROCCO, M. The concept of probable knowledge in Keynes, Davidson and Shackle. In: ENCONTRO NACIONAL DE ECONOMIA, 26., 1988, Vitória. *Anais*... Vitória: ANPEC, 1998.

CROCCO, M. *Uncertainty, technical change and effective demand*. 1999. PhD (Dissertation) – Economics Department, University of London, UCL, London.

CROCCO, M. The future's unknowability: keynes's probability, probable knowledge and the decision to innovate. In: LOUÇÃ. F.; PERLMAN, M. (Eds.) *Is economics an evolutionary science*? Edward Elgar: Cheltenham, 2000.

DAVIDSON, P. Rational expectations: a fallacious foundation for studying crucial decision-making processes. *Journal of Post Keynesian Economics*, v. 5, p. 182-196, 1982-1983.

DAVIDSON, P. Sensible expectations and the long-run non-neutrality of money. *Journal of Post Keynesian Economics*, v. 10, p. 146-153, 1987.

DAVIDSON, P. Austrians and post keynesians on economic reality: rejoinder to critics. *Critical Review*, v. 7, p. 423-444, 1993.

DAVIDSON, P. Uncertainty in Economics. In: DOW, S.; HILLARD, J. (Eds.) *Keynes, knowledge and uncertainty*. Aldershot: Edward Elgar, 1995. p. 77-106.

DEQUECH, D. Uncertainty in strong sense: meaning and sources. *Economic Issues*, v. 2, p. 21-43, 1997.

DOSI, G. 'Technological paradigms and technological trajectories. *Research Policy*, v. 2, p. 147-162, 1982.

DOW, S. Uncertainty about uncertainty. In: DOW, S.; HILLARD, J. (Eds.). *Keynes, Knowledge and Uncertainty*, Aldershot: Edward Elgar, 1995. p. 117-127.

DOW, S. *The methodology of macroeconomic thought*: a conceptual analysis of schools of thought in economics. Cheltenham: Edward Elgar, 1996.

KEYNES, J. M. A treatise on probability. In: MOGGRIDGE, D. (Ed.). *The collected writings of john maynard keynes*. London: MacMillan Press, v. 8, 1973.

LAWSON, T. Uncertainty and economic analysis. *Economic Journal*, v. 95, p. 909-927, 1985.

LAWSON, T. The relative/absolute nature of knowledge and economic analysis. *The Economic Journal*, v. 97, p. 951-970, 1987.

LAWSON, T. *Economics and reality*. London: Routledge, 1997.

LEWIS, P.; RUNDE, J. A critical realist perspective on Paul Davidson's methodological writings on – and rhetorical strategy for – post keynesian economics. *Journal of Post Keynesian Economics*, v. 22, n. 1, p. 35-56, 1999.

O'DONNELL, R. *Keynes*: philosophy, economics and politics. London: MacMillan, 1989.

RUNDE, J. Keynesian uncertainty and weight of arguments. *Economics and Philosophy*, v. 6, p. 275-292, 1990.

RUNDE, J. Keynesian Uncertainty and Stability of Beliefs. *Review of Political Economy*, v. 3, p. 125-145, 1991.

RUNDE, J. Paul Davidson and the Austrians: reply to Davidson. *Critical Review*, v. 7, p. 381-397, 1993.

SHACKLE, G. The expectational dynamics of the individual. *Economica*, v. 10, p. 99-129, 1943.

SHACKLE, G. *Time in economics*. Amsterdam: North-Holland Publishing Company, 1958.

SHACKLE, G. Time and thought. *British Journal for the Philosophy of Science*, v. 9, p. 285-298, 1959.

SHACKLE, G. *Expectation, enterprise and profit*. London: George Allen and Unwin Ltd, 1970.

SHACKLE, G. Expectation and cardinality. In: FORD, L. (Ed.). *Time, expectations and uncertainty in economics*. Aldershot: Edward Elgar, 1990 [1956].

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