Fundamental Uncertainty and the Formation of Long-Term Expectations

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Resumo: Os determinantes do estado das expectativas de longo prazo formadas no contexto de incerteza fundamental, bem como as relações entre eles, estão apresentados em Dequech (1999). No entanto, existem lacunas na estrutura desses determinantes. Este artigo visa complementar o arcabouço teórico de formação de expectativas desenvolvido por Dequech (1999) mediante a inclusão das premissas imaginadas e do peso do argumento na estrutura de formação das expectativas de longo prazo. Argumentamos que o *animal spirits* molda as premissas imaginadas que, juntamente com as premissas observadas derivadas do conhecimento, compõem o conjunto de premissas que determina as expectativas e o peso do argumento. As expectativas também são influenciadas pela criatividade, ao passo que o peso do argumento afeta a percepção de incerteza, a qual, por sua vez, é um dos determinantes da confiança. A interação entre confiança e expectativas determina o estado das expectativas de longo prazo.

Abstract: The determinants of the state of long-term expectations formed in the context of fundamental uncertainty, as well as the relationships among them, are indicated in Dequech (1999). However, there are gaps in the structure of these determinants. This article aims to complete the theoretical framework of expectation formation developed by Dequech (1999) through the inclusion of imagined premises and the weight of the argument in the framework of long-term expectation formation. We argue that animal spirits shape imagined premises which, together with observed premises derived from knowledge, compose the set of premises underlying expectations and the weight of the argument. The former is also influenced by creativity, whereas the latter affects the perception of uncertainty, which, in turn, is one of the determinants of confidence. The interaction between confidence and expectations determines the state of long-term expectations.

Keywords: Imagined Premises, Weight of the Argument, Confidence, Long-Term Expectations

Palavras-Chave: Premissas Imaginadas, Peso do Argumento, Confiança, Expectatoivas de Longo Prazo

Classificação JEL: B31, E12, E20,

Área 3. Método, Teorias Econômicas Heterodoxas e História Econômica

1. Introduction

In the Post-Keynesian perspective, fundamental uncertainty is ever-present and, consequently, long-term expectations are not based on probabilistic calculations.[1] Dequech (1999) identified the determinants of the *state of long-term expectations* formed under conditions of fundamental uncertainty and explained the relationships among these determinants. However, the *imagined premises*, emphasized in the Post-Keynesian literature as a necessary element for the formation of long-term expectations (Shackle 1961, 1972; Carvalho 1988, 2014, 2015; Fraga and Resende 2022; Resende 2023), are not incorporated into Dequech's (1999) framework. Furthermore, although Dequech discusses the role of the *weight of the argument* in shaping confidence in expectations, he does not identify which determinants of the *state of long-term expectations* are directly related to the weight of the argument, nor does he explain the channels through which these relationships operate.

This article aims to complement the theoretical framework of expectation formation developed by Dequech (1999) through four extensions to his framework, involving the incorporation of imagined premises and the weight of arguments in the scheme of long-term expectation formation. We argue that *animal spirits* influence imagined premises, which, together with observed premises derived from knowledge, constitute the set of premises underlying expectations and the weight of the argument. Expectations are also affected by creativity, while the weight of the argument influences the uncertainty perception, which, in turn, is one of the determinants of confidence. The interaction between confidence and expectations determines the state of long-term expectations.

This article comprises an introduction and four additional sections. Sections 2 and 3 present, respectively, an overview of the development of Keynes's thinking on probability and expectation formation, as well as on the relationship between the weight of the argument and confidence, emphasizing the role and relevance of imagined premises. Section 4 proposes an extension of the theoretical framework of expectation formation developed by Dequech (1999). Section 5 concludes.

2. Expectation Formation: From *A Treatise on Probability* to *The General Theory*

Since most human decisions that require a certain amount of time to be achieved involve the manifestation of enthusiasm, they are made in accordance with the individual's *animal spirits* (Keynes, 1936 [2013b]), which "...can influence not only the urge to action in face of given premises but also the way the set of premises is completed." (Carvalho, 1988: 77). Long-term decisions depend

[1] Long-term expectations are what the entrepreneur can hope to earn in the shape of future returns if he purchases (or, perhaps, manufactures) 'finished' output as an addition to his capital equipment" (KEYNES, 1936[2013b]: 47).

on *animal spirits* because decision-makers operate on the ground of fundamental uncertainty (Keynes, 1936 [2013b]).

Fundamental uncertainty "is characterized by the possibility of creativity and non-predetermined structural change (...) the list of possible events is *not predetermined or knowable ex ante* (...) as the future is yet to be created" (Dequech 2011: 623). From this perspective, "crucial experiments" alter the economic environment, making probabilistic calculation impossible. Economic processes are therefore non-ergodic, and at the time of decision-making, information is always incomplete (Davidson, 1978). It was within this context that Keynes (1936 [2013b]) conceived the process of long-term expectation formation.

In *A Treatise on Probability*, Keynes (1921 [2013a]) followed the logical school of probability rather than the frequency theory, in which probability is linked to a "rational belief" constructed on the basis of a logical chain between premises or evidence and a conclusion or outcome. The initial premises result from a presumption, a datum, or an observation (Carvalho 1988) and are termed "direct knowledge." The conclusion that follows logically from the premises constitutes "indirect knowledge." In this sense, knowledge is derived through argument. Furthermore, "Which arguments are valid can be logically ascertained. Belief in the conclusions is then rational because it does not depend on individual peculiarities but on criteria of consistency with formal logic" (Carvalho 1988: 70).

Nevertheless, there is no consensus in the literature as to whether Keynes's conception of probability changed—or to what extent it changed—between *A Treatise on Probability* (1921) and *The General Theory* (1936). This controversy is known as the *(dis)continuity thesis* and is based on Keynes's response to Ramsey's critique of the *Treatise*.[2] Ramsey challenged Keynes's claim that individuals can perceive (intuit) logical relations of probability between propositions-that is, between premises and conclusion. For Ramsey, probability is subjective or personal in the sense that different individuals may begin from the same set of evidence (premises) and arrive at different degrees of belief regarding a conclusion. Thus, there would be no universally shared degree of "rational belief,"

[2] "Proponents of so-called 'continuity thesis' who argue that there were no significant changes in Keynes's thinking on probability over time include Carabelli (1988), Lawson (1985) and O'Donnell (1989). Proponents of the opposing 'discontinuity' view include Bateman (1987), Davis (1994b) and Cottrell (1993)" (Runde 2003: 54, footnote 6). For further discussion of this issue, see also Gillies (2003) and Davis (2003).

but rather a degree of "subjective belief" particular to each individual. In the obituary he wrote for Ramsey, Keynes acknowledged that Ramsey was right (Davis 2003; Gillies 2003; Runde 2003).

In this context, Davis (2003) and Gillies (2003) argue that Keynes changed his thinking by coming to view probability as a degree of belief that is neither personal or subjective (as in Ramsey) nor objective (as in the *Treatise*), but rather social in character.[3] According to Gillies (2003), in defending *The General Theory*, Keynes (1937) argued that, given the impossibility of knowing the future, individuals are unable to form entirely independent judgments. Consequently, they conform to the average opinion or behavior of others, adopting conventional judgments. This creates room for waves of optimism and pessimism, as well as for *animal spirits*, in the process of long-term expectation formation. In this regard, Davis (2003: 105), commenting on Keynes's response to Ramsey, emphasizes that:

> Keynes's admission did not concern his understanding of the form of probability judgments as essentially non-quantitative and comparative in nature. All that Keynes abandoned in response to Ramsey was his early Moorean view of the meaning of 'probable' as a Platonic logical relation knowable through intuition.

Similarly, Runde (2003: 53) argues:

> Keynes's admission in no way compromises the themes from the Treatise that re-emerge in his economic writings. For the idea that (epistemic) probability judgments are essentially comparative, the validity of the formal structure of comparative probability provided in the Treatise, that most practical decision-making is not informed by statistical frequencies, and the importance of evidential weight, are all largely independent of whether our degrees of belief are merely subjective, intersubjective (Davis 1994b), or do in fact correspond to objective relations of partial entailment. To this extent at least, therefore, it does not seem illegitimate to interpret Keynes's later remarks on probability and uncertainty in terms of the framework set out in the Treatise.

[3] "Keynes's later view remained consistent with his insistence against Ramsey that one must still find something more substantial than mere belief to explain the nature of judgment. Ramsey's subjectivism, where only consistency of bets need obtain, falls short of what Keynes later believed assisted individual judgment in the form of a society's conventions and rules." (Davis 1994: 117).

Indeed, the view that Keynes carried into *The General Theory* the ideas developed in the *Treatise* concerning probability as a degree of belief established between premises and conclusions is reinforced by Chapters 12 and 17 of *The General Theory*. As Runde (2003) points out, Keynes explicitly connected the concept of the *weight of the argument* (from the *Treatise*) to expectation formation (Chapter 12) and liquidity preference (Chapter 17), thereby emphasizing the role of confidence in the probability judgment or expectation formed.[4]

In *The General Theory*, and subsequently as well, Keynes argued that complete information about the future is unavailable and that long-term expectations are formed on the basis of: (i) insufficient information currently available, and (ii) forecasts of future events made with more or less confidence. As Keynes (1936 [2013b]: 147) states: "The considerations upon which expectations of prospective yields are based are partly existing facts which we can assume to be known more or less for certain, and partly future events which can only be forecasted with more or less confidence." A few lines later, Keynes (1936 [2013b]: 148) adds: "It would be foolish, in forming our expectations, to attach great weight to matters which are very uncertain." In a footnote, he clarifies that: "By 'very uncertain' I do not mean the same thing as 'very improbable'. Cf. my *Treatise on Probability*, chap. 6, on 'The Weight of Arguments'."

Therefore, agents rely on forecasts with some degree of confidence when forming long-term expectations, because existing knowledge about the future is always insufficient. This means that there is no complete ignorance, since "existing facts" provide some information about future developments; that is, some knowledge of potential future outcomes remains possible owing to the stability of formal and informal institutions (Davidson 1978; Dequech 1999; Carvalho 2014). This limited knowledge, provided by "existing facts," corresponds to the premises, or evidence, identified in the *Treatise* as the starting point for reaching a conclusion, or expectation, especially given that the weight of the argument is the common element between one and the other. Keynes (1936 [2013b]), however, emphasizes that such existing facts explain only a small part of the future return on

[4]Dow (2003: 209-210) seems to support this interpretation, stating: "While there have been different accounts of the route between the *Treatise* and *The General Theory,* there is a reasonable consensus as to the way in which we can now understand the content of Keynes's economics, as well as his methodology, in the light of the *Treatise*. Keynes made the connection explicit only briefly, and indeed the significance of the connection was not generally understood until recently. Explicit treatment of probability is replaced by explicit treatment of convention". Along similar lines, Carvalho (2015: 48) observes that: "In the *General Theory*, Keynes maintained the same essential views presented in the *Treatise on Probability*".

investment. They may therefore be regarded as insufficient observed premises. As Shackle (1972) argues, the gap left by this insufficiency must be filled by imagination: "When there is a gap in knowledge, which cannot be filled by the securing of further knowledge, it can be filled only by what is in truth a figment" (Shackle, 1972: 392). Along the same lines, Carvalho (2015: 47) states:

> Keynes's point is that direct knowledge, even if true, is seldom complete. Observable premises have to be completed with conjectures to enable the decision-maker to derive their logical implications. In other words, one does not start from true knowledge alone but has to complement it with conjectural premises.

We therefore argue that the "future events which can only be forecasted with more or less confidence" (Keynes 1936 [2013b]: 147) are associated with imagined premises, given that agents require a set of premises—comprising both observed and imagined— to establish a probability relationship between this set and their conclusions (expectations), with a certain degree of belief. How could forecasts be made solely on the basis of "existing facts" if these facts are known to be insufficient or incomplete, without also relying on imagined premises? In short, "existing facts" correspond to observed premises, whereas "forecasts held with with more or less confidence" are related to imagined premises.

Shackle (1972) proposed an extension of the process of knowledge formation based solely on observation and unequivocal evidence, as outlined by Keynes in the *Treatise*. According to Shackle, individuals do not possess a complete set of evidence but only partial elements which, after being assessed, serve as the starting point for the construction of an argumentative basis. Consequently, there arises a need to construct additional evidence, since the future cannot be known in the present. This creates a gap in knowledge that cannot be filled merely through the acquisition of further information. Instead, this gap is filled by imagination, which becomes an essential component of the decision-making process without, however, rendering the future fully knowable. In this respect, Shackle's (1972) aligns with Keynes's view as presented in *The General Theory*.[5]

Thus, given the impossibility of attaining complete knowledge about the future on the basis of existing evidence (premises), since such evidence is always insufficient under conditions of

[5] Shackle (1972) refers to Keynes's procedure in the *Treatise* as "certain inference," while characterizing his own approach as "probable inference." In this instance, however, Shackle (1972) is not referring to *The General Theory*, where Keynes emphasizes forecasts of future events held with greater or lesser degrees of confidence. Such forecasts may be related to imagination, given that they are formed in the context of fundamental uncertainty.

fundamental uncertainty, decision-makers must fill in the gaps by imagining part of the premises—and they are aware that that this is merely imagination (Shackle 1961; Carvalho 1988). This incompleteness of the premises implies that expectations can never be based solely on formal logic or be entirely secure and reliable. As a result, human logic comes into play, as individuals are required to exercise judgment; that is, they must assign a degree of confidence to the premises upon which they base their expectations, including the imagined premises. As Carvalho (2015: 47) notes, "The knowledge by the decision-maker that at least part of his or her premises was obtained by conjecture rather than direct observation raises the inter-related problems of belief and of confidence in beliefs." This degree of confidence, in Carvalho's (1988: 73) words, "depends on how strong the signs are that not only the proposition is certain with respect to its premises but that it is actually true, which means that the premises upon which it is built are true."

In this context, Shackle (1972) argues that when imagination conceives and proposes elements to fill the gap in knowledge, reason must test them by assessing whether, if they were available, they would adequately fulfill their purpose. At this point, a subjective and personal act of the mind comes into play. This is because determining which pieces of evidence are genuinely relevant depends on a series of judgments that cannot easily be reduced to formal rules. Consequently, the degree of belief also depends on the individual's subjective disposition, guided by his or her judgment and willingness to accept as true additional (imagined) premises capable of supporting the conclusion.

Therefore, given the scarcity of observed evidence, long-term decision-making requires agents to imagine new premises. In turn, imagined and observed premises affect the agent's confidence in the conclusion or expectation—whether optimistic or pessimistic—and are linked to the *weight of the argument*, a concept that will be discussed below. Carvalho (1988) also highlights the relevance of imagined premises to the formation of confidence which, according to Dow (2013), is determined by the weight of the argument:

> "Formal logic can sustain robust expectations only if we trust the premises to be correct. When we know some (perhaps most) of the premises to be no more than figments of imagination, human logic comes to the fore, the weight of arguments becomes relevant, and uncertainty finds its place alongside probability in Keynes's sense." (Carvalho 1988: 76).

3. Weight of Arguments and Confidence: From *A Treatise on Probability* to *The General Theory*

In Chapter 6 of *A Treatise on Probability* (TP), entitled "The Weight of Arguments," Keynes (1921[2013a]) argued that the magnitude of probability can be determined from two perspectives: first, the balance between favorable and unfavorable evidence; and second, the comparison between the absolute amounts of relevant knowledge and of relevant ignorance, respectively. The weight of the argument linked to the first perspective always increases as new evidence emerges, since "The weight, to speak metaphorically, measures the sum of the favourable and unfavourable evidence, the probability measures the difference" (Keynes 1921[2013a]: 84). In this sense, as the evidence or premises approach completeness and assuming they are true, the weight of the argument rises toward its maximum value, uncertainty gives way to certainty once this value is reached (Carvalho, 1988; Resende, 2023). Under this first perspective, while new evidence increases the weight of the argument, the probability of the argument may decrease, increase, or remain unchanged—"a new piece of evidence which leaves the balance unchanged, also leaves the probability of the argument unchanged" (Keynes 1921[2013a]: 77).

According to Carvalho (1988), in this context the weight depends on evidence (premises) that merely corroborate or repeats an already known argument. In this sense, such premises neither increase nor decrease the probability of the event (indirect knowledge) occurring, but they do increase confidence, or the degree of belief, in the expectation of its occurrence. Therefore, an argument—which links premises and a conclusion— that carries greater weight is not more likely to be correct than an argument with lesser weight. Carvalho (1988) illustrates the point by explaining that a producer may decide the next day's level of production on the basis of the previous day's sales. However, if he chooses to wait for additional information before making the decision, the new information may simply replicate the original data, leaving the producer's initial calculation unchanged. In this case, the additional information (premises) merely increases the weight of the argument and confidence in the adopted premises, thereby reinforcing the producer's disposition to act.

Given that between the TP of 1921 and *The General Theory* of 1936, Keynes's focus regarding decision-making shifted from probability to uncertainty (Sen 2018; Carvalho 1988), Post-Keynesians came to emphasize the second perspective mentioned above, namely that probability is determined by the comparison between the absolute amounts of relevant knowledge and relevant ignorance. In this context, confidence assumed a central role in the formation of long-term expectations and decision-making. Given fundamental uncertainty and the possibility of structural changes, the agent cannot know, at the time of decision-making, the extent of their ignorance. In other words, the limits

of both the absolute stock of knowledge and the absolute stock of ignorance are unknown, and newly emerging evidence may reduce the weight of the argument. Consequently, Post-Keynesians developed an alternative epistemological interpretation of the weight of the argument.

Dequech (1999), however, draws attention to the lack of consensus regarding the understanding of the weight of the argument.[6] According to him, several authors—including Carvalho, Minsky, Kregel, Carabelli, Lavoie, and Brady—treat confidence and weight as the same thing. By contrast, Dequech (1999) notes that Runde, O'Donnell, Gerrard, and Hoogduin question the equivalence between confidence and weight, arguing that although the two may move in the same direction, they are not the same thing.

For Dequech (1999), Keynes also relates confidence to "business psychology," yet there is no clear connection between this notion and weight. Furthermore, under the second perspective discussed above, new evidence may suggest that the absolute amount of relevant ignorance, compared to the absolute amount of relevant knowledge, is greater than was initially thought, thereby reducing the weight of the argument. Hence, Dequech (1999) concludes that the weight of the argument cannot be measured by the absolute amount of relevant evidence, but rather by the degree of completeness of relevant evidence or premises. Dow and Dow (2011: 6–7) agree with this interpretation of the weight of the argument as related to the degree of completeness of premises, stating that "more evidence may be associated with reduced weight if it reveals new realms of ignorance."[7] In this case, the absolute quantity of premises has increased, but their perceived degree of completeness—that is, the weight of the argument—has declined.

It should be noted that the perceived degree of completeness of the evidence may change because, in a context of fundamental uncertainty, agents cannot know how ignorant they actually are. There is no predetermined full amount of premises to provide a standard with which the completeness of actul premises can be compared. In this regard, Dow and Dow (2011) argue that the identification or recognition of the degree of ignorance, or of the degree of completeness of premises, depends on

[6] "At least some of the problems he raises derive from the fact that Keynes is not always consistent in defining weight" (Dequech 1999: 426, footnote 23).

[7] According to Dow (2013: 4), "Keynes introduced the notion of weight of argument as the determinant of confidence (...) It should therefore not be assumed that weight inevitably increases with amount of evidence; in particular more evidence may reveal new realms of ignorance (Runde 1990). Weight falls if new evidence reveals previously unrecognized 'unknown unknowns', as happened with the financial crisis".

the agent's judgment—that is, on human logic—and is therefore a psychological matter: "indeed Keynes (1936: 149) refers to the importance of 'business psychology' for the state of confidence" (Dow and Dow 2011: 7).

In summary, the scarcity of observed evidence compels the agent to imagine new premises and, at the same time, to assess, through human logic, the extent to which these imagined premises increase the degree of completeness of the overall set of premises, which consists of the combination of observed and imagined premises (Resende 2023). The greater the degree of completeness of the premises in the agent's judgement, the greater the weight of the argument, the higher the confidence in the expectation formed, and the lower the degree of uncertainty. Accordingly, we accept the proposition emphasized by Dequech (1999) that the weight of the argument is equivalent to the degree of completeness of relevant evidence (premises). Although weight is not synonymous with confidence, it influences confidence and is linked to the agent's uncertainty perception.[8] Dequech further emphasizes that confidence also depends on the agent's uncertainty aversion, understood as the willingness to confront or avoid uncertainty. Dow and Dow (2011: 8) note that uncertainty aversion corresponds to "a high willingness to act in spite of whatever uncertainty is perceived."

The interaction between confidence and expectations determines what Keynes (1936[2013b]) termed the "state of long-term expectation."[9] For Keynes, the state of long-term expectation is linked to one of the considerations upon which expectations regarding the prospective yield of an asset are based. The other consideration being existing facts—that is, the current state of the economy—which, according to Keynes (1936[2013b]), exerts a much smaller influence on an asset's return than the state of long-term expectation.

The state of long-term expectation is associated with factors that can be forecasted with more or less confidence, such as future demand conditions, future wage rates, future changes in consumer preferences, etc (Keynes 1936[2013b]). The expected returns or rents on assets, in turn, determine resource-allocation decisions, including investment in fixed capital (capital goods). As investment is

[8] "Weight and confidence must be distinguished. Weight is linked to perceived uncertainty, while confidence depends also on uncertainty aversion." (Dequech 1999: 424).

[9] "The first type is concerned with the price which a manufacturer can expect to get for his 'finished' output [...] The second type is concerned with what the entrepreneur can hope to earn in the shape of future returns if he purchases [...] 'finished' output as an addition do his capital equipment. We may call the former *short-term expectation* and the latter *long-term expectation.*" (Keynes, 1936 [2013b]: 46-47).

associated with long time horizons during which the capital stock changes and significant unforeseen events may occur—potentially leading to disappointment and wealth losses—the incentive to invest in capital goods is determined by the state of long-term expectation. The latter results from the interaction between the expected return on capital assets and confidence (or the state of confidence) attached to that expectation. In Keynes's words:

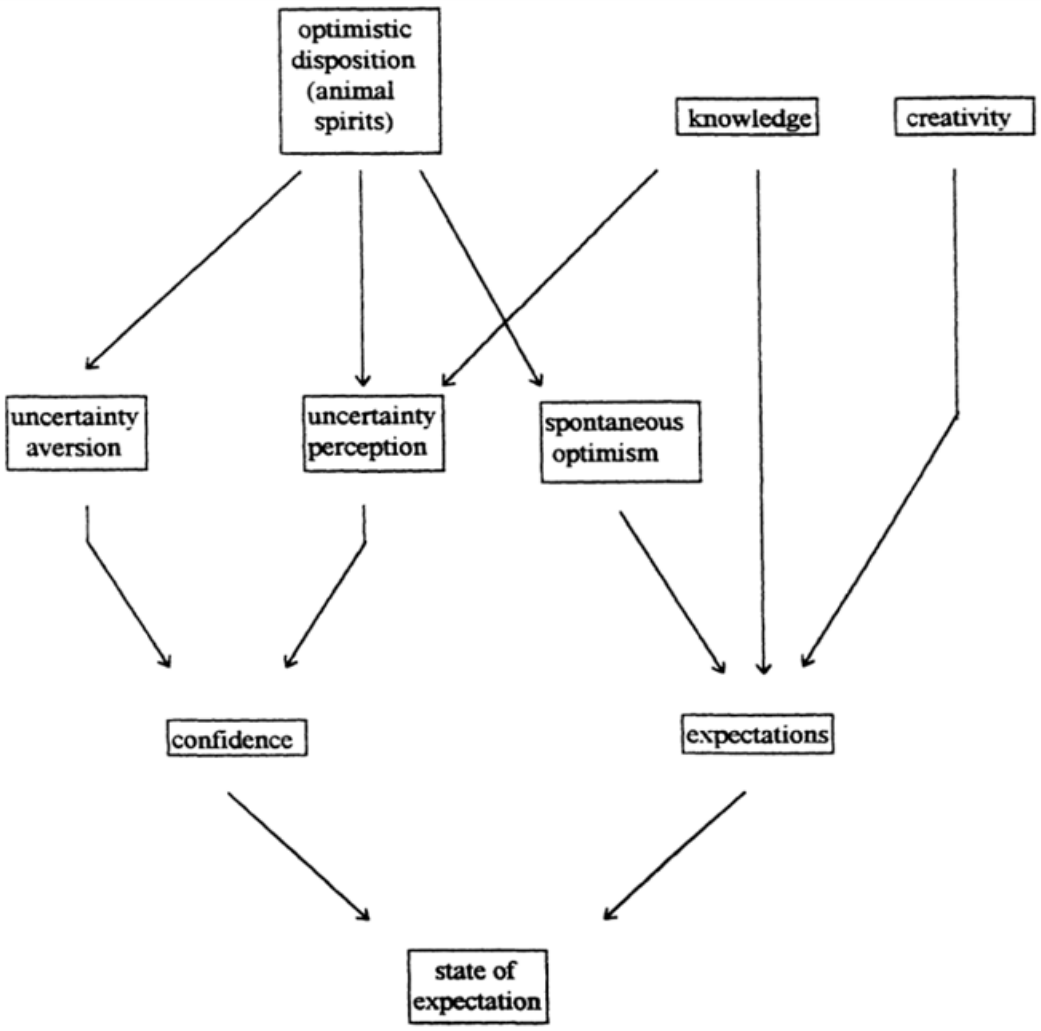
> The state of long-term expectation, upon which our decisions are based, does not solely depend, therefore, on the most probable forecast we can make. It also depends on the confidence with which we make this forecast—on how highly we rate the likelihood of our best forecast turning out quite wrong (...) The state of confidence (...) is a matter to which practical men always pay the closest and most anxious attention. But economists have not analysed it carefully (...) its relevance to economic problems comes in through its important influence on the schedule of the marginal efficiency of capital. There are not two separate factors affecting the rate of investment, namely, the schedule of the marginal efficiency of capital and the state of confidence. The state of confidence is relevant because it is one of the major factors determining the former, which is the same thing as the investment demand-schedule. (Keynes 1936[2013b]: 148)

Therefore, investment decision-making is linked not only to past and present data (or observed evidence), but also to imagined scenarios (imagined premises), expectations, confidence, and, as will be discussed below, animal spirits. As Dow (2003: 202) observes, "in the absence of enough knowledge to yield certain predictions, action requires some basis in reason. How the predictions are arrived at depends partly on logic and partly on intuition." Nevertheless, although human actions are guided largely by judgment and intuition, they remain rational insofar as they stem from the logical chain linking premises or evidence (which are always incomplete) and conclusions or expectations (Carvalho 1988). As Dow (2013: 9) explains:

> The key is that formal deductivist logic yields definitive conclusions which can be classified as rational (...), while human logic yields arguments which involve reasoned judgment which is always open for discussion. There is no hard and fast divide between what is rational and what is non-rational in human logic.

Dequech (1999) presents the determinants of the state of long-term expectation under conditions of fundamental uncertainty, as well as the interrelationships among these determinants (Figure 1).

Figure 1. **Formation of the State of Long-Term Expectations**



Source: Dequech (1999: 418)

The following section presents an explanation of the relationships between the determinants of the state of long-term expectation depicted in Figure 1, as well as a proposed extension to the theoretical framework developed by Dequech (1999).

4. Extension of the Theoretical Framework of Long-Term Expectation Formation

According to Dequech (1999), the state of (long-term) expectation is influenced by both expectations and confidence, as originally argued by Keynes (1936[2013b]). Expectations, in turn, depend on: (i) creativity, (ii) animal spirits, and (iii) knowledge, as explained below.

(i) Creativity- In the context of expectation formation, creativity can be understood as the agent's ability to imagine a future radically different from the present and, on that basis, to act in an innovative manner. It affects expectations, but not confidence. Dow and Dow (2011: 8) add that, although an

agent may be creative, the implementation of what has been imagined depends on animal spirits: "Dequech includes creativity as a variable which enters separately into expectations formation and indeed as a factor in making the economic environment so uncertain. Then animal spirits determine how far innovative action actually occurs."

In the sense attributed to it by Dequech (1999), creativity is neither affected by animal spirits nor does it affect them. It is associated with structural change arising not only from technological developments but also from political, social, and cultural transformations. However, as will be proposed below in a reformulation of Dequech's (1999) framework, animal spirits, in the sense attributed to the concept by Carvalho (1988), affect another type of creativity, relating to the imagination of premises required to fill the void left by the incompleteness of observed premises.

(ii) Animal Spirits- Animal spirits, in turn, refers to an optimistic disposition to face uncertainty and is a concept "similar but not identical to what Keynes (1936, pp. 161–162) called 'animal spirits'" (Dequech 1999: 419). This optimistic disposition determines uncertainty aversion, uncertainty perception, and spontaneous optimism. The latter is related to the optimistic or pessimistic character of expectations and therefore influences them directly.

Uncertainty aversion and uncertainty perception jointly determine confidence, which, in turn, interacts with expectations to determine the state of long-term expectations. Dequech (1999), Dow and Dow (2011), and Dow (2013) explain that animal spirits affect uncertainty perception insofar as they lead agents to ignore, either unconsciously or consciously, their own high degree of uncertainty. In other words, the stronger the animal spirits, the more agents tend to ignore their ignorance.[10] Furthermore, uncertainty perception is also influenced by knowledge about the future—even under conditions of fundamental uncertainty, agents are not entirely ignorant of the future, as will be discussed below.[11] Uncertainty aversion, in turn, "is solely a question of animal spirits" (Dequech,

[10] "But entrepreneurs have the psychological capacity to act in spite of uncertainty (...) This involves not just optimistic expectations but also a willingness to ignore the uncertainty surrounding these expectations. This is Keynes's meaning of animal spirits (...) Animal spirits have an important role to play since, as Keynes argued, in an open organic system, reason and evidence alone are not sufficient for judgment, to yield theoretical conclusions or to justify decision making" (Dow 2013: 5).

[11] "(...) part of the uncertainty perception may have a basis in knowledge and thus may be independent of animal spirits." (Dequech 1999: 421).

1999: 421) and refers to a willingness to act regardless of the degree of perceived uncertainty. Thus, the stronger the animal spirits, the greater the uncertainty aversion and the willingness to act.

Whereas in Keynes (1936[2013b]) animal spirits are regarded as an urge to action and constructive activity, and are therefore linked to confidence in optimism about the return on investment, in Dequech (1999) it is treated as a matter of degree and is associated with confidence and optimism, but also with pessimistic expectations.[12] Optimistic disposition (animal spirits) affects expectations through what Dequech terms "spontaneous optimism," that is, optimism not grounded in knowledge. Since optimistic disposition is gradable, the stronger it is, the more spontaneously optimistic expectations become and the greater the confidence attached to them. Conversely, the weaker the animal spirits, the more spontaneous optimism and confidence wane; in extreme cases, optimism gives way to spontaneous pessimism, in the sense that such pessimism is likewise unsupported by knowledge.

Although animal spirits contain a subjective component and are therefore partly exogenous, they are also influenced by the institutional environment in which agents are embedded, making them partly endogenous: "Animal spirits are partly endogenous (and the more so, the more institutions are incorporated into one's analysis) partly exogenous" (Dequech 1999: 421).

(iii) Knowledge- Individuals' knowledge is formed by available information and by tacit knowledge of institutions—including conventions, which are informal institutions (Dequech, 2019). Knowledge is one of the determinants of expectations but, being incomplete, it must be supplemented by something else in order to enable agents to make decisions (Dequech, 1999). This means that fundamental uncertainty does not entail complete ignorance. Some knowledge of the future is possible due to the stability of both formal and informal institutions. Contracts and the legal system, for example, are institutions that provide continuity to economic processes and generate information that enables agents to know something about the future (Davidson 1978; Carvalho 2014).

The framework proposed by Dequech (1999, Figure 1) does not take into account, or at least does not explicitly acknowledge, the role of imagined premises. Yet these are central to the formation of expectations and to confidence in them, as argued above (Shackle 1961, 1972; Carvalho 1988,

[12] According to Dow e Dow (2011: 8), "Just as the degree of confidence can change by degrees, animal spirits can also be understood to change by degrees (...) the broader application of animal spirits would allow for degrees of action, ranging from a preference to remain liquid, through following conventional judgement in varying degrees, to pure creative innovation."

2015). This raises the following question: which variables might affect, and be affected by, imagined premises in Dequech's (1999) framework?

Dequech (1999) argues that "innovative imagination"—understood as the agent's ability to imagine a future so radically different from the present that it is linked to structural change—is associated with creativity. However, the author himself notes that, for Carvalho (1988), the agent's ability to imagine the future is not related to creativity in the sense employed by Dequech (1999), but rather to animal spirits. Indeed, after explaining that different agents may complement observed data with different imagined premises, Carvalho (1988: 77, footnote 10) argues that "animal spirits, for example, can influence not only the urge to action in face of given premises but also the way the set of premises is completed."[13] Since Dequech (1999) describes spontaneous optimism as the mechanism that guides the way agents project the future, producing optimistic or pessimistic scenarios, it can be argued that spontaneous optimism also influences the content or type of premises that agents imagine, whether they induce optimism or pessimism.[14] Thus, spontaneous optimism, one of the components of animal spirits (optimistic disposition), affects the character of expectations through its influence on imagined premises: "Animal spirits, through spontaneous optimism, condition the way a decision maker creates the future in his or her mind" (Dequech 1999: 422). In other words, we argue that spontaneous optimism affects imagined premises, which in turn influence expectations, making them either optimistic or pessimistic.

Furthermore, this indirect influence of spontaneous optimism on expectations is neither random nor unlimited in scope, as it is shaped by the reasoning underlying imagination. That is, while spontaneous optimism is not based on knowledge, the possibilities of imagination are constrained by knowledge. Agents construct imagined premises under the influence of both their animal spirits and their observed premises, the latter being linked to knowledge. Observed premises therefore impart rationality to the overall set of premises, insofar as they are knowledge-based and restrict the range

[13] "The influence of animals spirits on expectations may be distinguished from that of creativity. Animal spirits, through spontaneous optimism, condition the way a decision maker creates the future in his or her mind. In this sense, animal spirits could be said to affect creativity (see Carvalho, 1988, p. 77n). In the present analysis, however, creativity is interpreted as an ability to see and do things in a novel way. Creativity in expectations is expressed as an innovative imagination (...) the ability to imagine a future that is (...) radically different from the present." (Dequech 1999: 422).

[14] "First, (...) animal spirits should be associated not only with confidence but also with the optimistic or pessimistic character of expectations (...) Animal spirits affect not only confidence but also expectations themselves, via spontaneous optimimsm." (Dequech 1999: 420).

of possible imagined premises.[15] This argument is consistent with Keynes's (1936[2013b]: 148) proposition that, in forming long-term expectations, our usual practice is "(...) to take the existing situation and to project it into the future, modified only to the extent that we have more or less definite reasons for expecting a change," since the "existing situation" corresponds to current knowledge, that is, to observed premises. This cognitive dimension of the influence of animal spirits is also emphasized by Dow and Dow (2011: 8): "Dequech (1999) shows how animal spirits influence both expectations and confidence, demonstrating that animal spirits are interrelated with cognition."

Furthermore, as argued above, imagined premises affect the weight of the argument and, through this channel, influence both uncertainty perception and the confidence with which expectations are formed.[16] Thus, spontaneous optimism influences not only expectations, as emphasized by Dequech (1999), but also uncertainty perception through imagined premises and their effect on the weight of the argument. Uncertainty perception, in turn, affects confidence.

It should be noted that our proposition regarding imagined premises is consistent with Keynes's (1936[2013b]) claim that long-term expectations—determined by the interaction between expectations and confidence—are related to "factors which are forecast with more or less confidence." That is, factors that must be forecast precisely because they are not known and may therefore be related with imagined premises, since the basis for reliable calculations to forecast the future simply does not exist.

Finally, Dequech (1999) considers that knowledge directly affects uncertainty perception, which in turn influences confidence-which is also affected by uncertainty aversion (Figure 1). However, in the Post-Keynesian literature, confidence is closely related to the weight of arguments, which should therefore be incorporated into Figure 1. Indeed, Dow and Dow (2011: 6) state that "Confidence depends partly on weight of arguments," while Dequech (1999: 424) observes:

> Runde (1990, pp. 286–287) argues that for Keynes weight and confidence are not the same thing, although they tend to move in the same direction (see also O'Donnell, 1991a, pp. 83–84, and Gerrard, 1995, p. 190). Since confidence can fall with new evidence, weight in this

[15] No one is likely to imagine investing next year in a company that takes people on holiday trips to Mars if it is known that the necessary technology does not yet exist. This illustrates how knowledge constrains the range of imagined premises that agents can plausibly construct about the future.

[16] See footnote 8.

> case cannot be the absolute amount of relevant evidence; it has to be the relevant evidence's degree of completeness.

In other words, the weight of the argument is not the same as confidence, although "they tend to move in the same direction." Weight corresponds to the degree of completeness of the evidence, and this degree influences confidence. Therefore, the greater the perceived completeness of the evidence (premises), the greater the weight of the argument and, consequently, the greater the confidence in the expectations formed on the basis of those premises. In this regard, Carvalho (1988: 76–77) argues:

> Uncertainty thus surrounds the process of decision making because of the consciousness of the extent to which ignorance leads to imagination substituting for knowledge as the basis to establish premises (...). When we know some (perhaps most) of the premises to be no more than figments of imagination, human logic comes to the fore, the weight of arguments becomes relevant (...) the entrepreneur has to gather whatever knowledge he could accumulate (e.g., in terms of current technologies, current financial conditions, demand elasticities, etc.) and to create premises (...). Given these premises, a probable relation can be built. Uncertainty pertains to the premises, and from them it spreads to the outcomes (...) Rational belief will also have to depend on the confidence in the premises themselves.

Accordingly, the degree of ignorance perceived by the individual depends on his or her judgment regarding the overall set of premises—comprising both observed and imagined premises—being central in determining confidence.[17] Embedded in this judgment is the "human logic" to which Carvalho (1988) and Dow and Dow (2011) refer.

Since knowledge corresponds to observed premises,[18] while imagined premises complete the individual's overall set of premises, the influence of knowledge on uncertainty perception does not occur directly, as represented in Dequech's (1999, Figure 1) framework. Rather, through human logic, agents assess the degree of completeness of their set of premises and thereby determine the weight of arguments. The latter, in turn, influences uncertainty perception, which subsequently affects

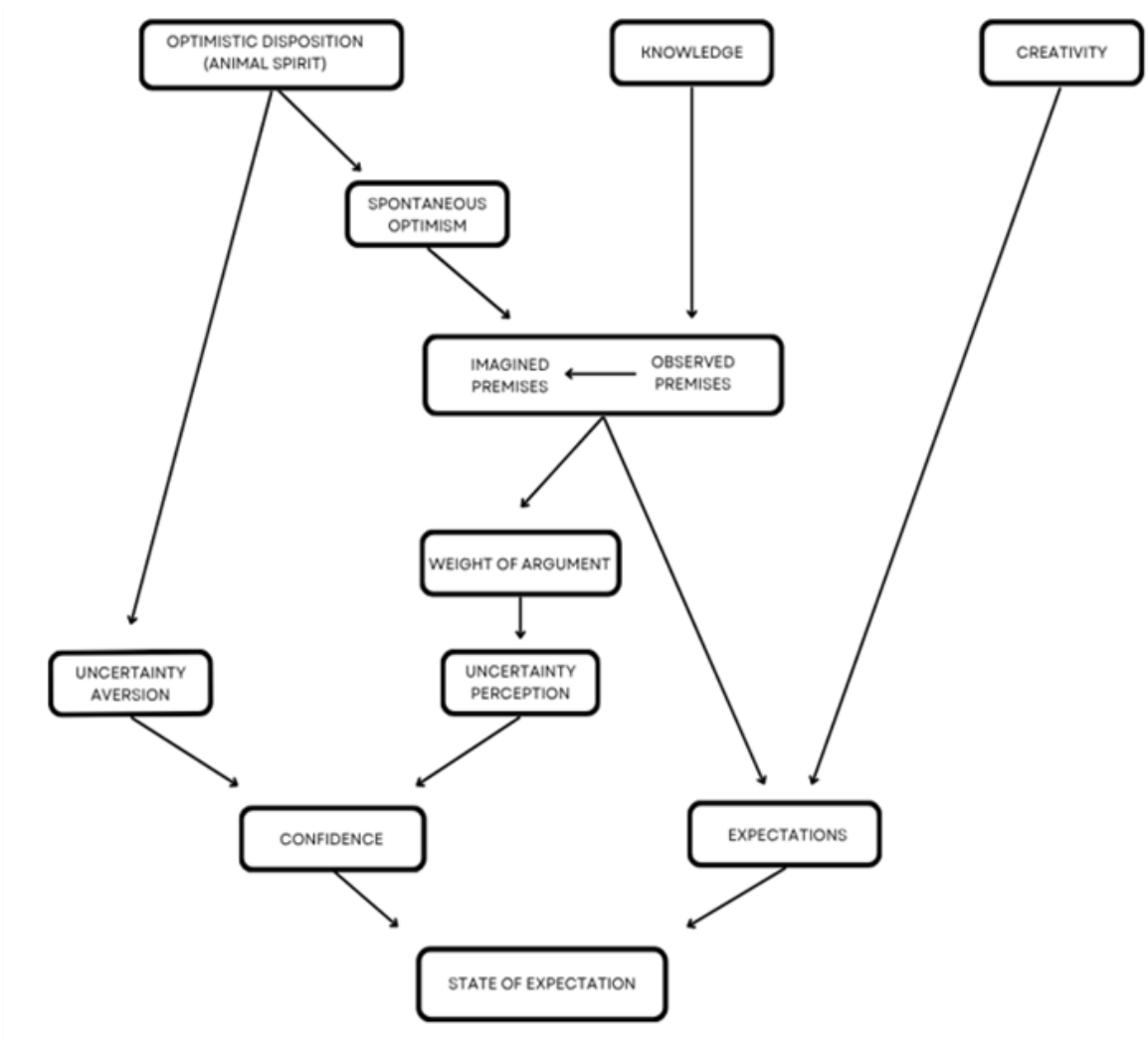
[17] Following Dequech (1999: 425, footnote 21), "In A Treatise on Probability, weight in the sense of the evidence's degree of completeness is equivalente to weight defined as the balance of relevant knowledge and relevant ignorance."

[18] Observed premises correspond to what Keynes referred to as direct knowledge in *A Treatise on Probability*.

confidence. Knowledge, therefore, corresponds to observed premises and influences the weight of arguments; through this channel, it indirectly affects both uncertainty perception and confidence.

We therefore proposing four extentions to the theoretical framework developed by Dequech (1999) through the incorporation of imagined premises and the weight of arguments into the framework of long-term expectation formation. On the one hand, knowledge (observed premises) affects uncertainty perception indirectly rather than directly, through its direct influence on the weight of arguments. On the other hand, spontaneous optimism influences imagined premises, which in turn affect (i) expectations directly and (ii) uncertainty perception and confidence indirectly through their effect on the weight of arguments. Finally, optimistic disposition (animal spirits) affects uncertainty perception only indirectly, through its influence on spontaneous optimism. These changes are shown in Figure 2.

Figure 2. Premises and the Formation of the State of Long-Term Expectations



Source: Prepared by the authors, inspired by Dequech (1999).

Just as Dequech (1999) does not address the role of imagined premises and the weight of arguments[19] in his framework for determining the state of long-term expectations, he also gives only limited attention to the role of conventions, considering institutions primarily as a source of knowledge about the future:

> "The existence of social practices (i.e., laws, conventions, and customs) tends to lend some stability (or inertia) over time to the existing reality. The existence of legal contracts is associated with another institution, the state, which is supposed to possess the power to enforce contracts. If individuals believe in the enduring nature of these institutions (...), then they may believe they possess some knowledge of potential future outcomes, even in a transmutable reality" (Dequech, 1999: 416).

However, in Chapter 12 of *The General Theory*, Keynes emphasized the role of conventions in the formation of expectations and decision-making under fundamental uncertainty. As conventions are informal institutions (Dequech, 2019), they constitute part of the agent's knowledge (observed premises) and, through this channel, influence both expectations and confidence, the two elements that determine the state of long-term expectations (Figure 2).

Indeed, the role of conventions in in shaping expectations has been emphasized by Post-Keynesian authors (Davis, 1994; Dow, 2013; Arestis et al., 2019; Fraga and Resende, 2022; Resende, 2023). Dequech (2019, 2022) himself demonstrates that the formation of conventions is not restricted to financial markets. Conventions are also formed in goods markets and, through this channel, influence long-term expectations and private investment decisions.

5. Conclusions

Numerous controversies surround Keynes's thought and its evolution over time. With regard to his ideas on the process of long-term expectation formation, part of the Post-Keynesian literature maintains that the ideas developed in *A Treatise on Probability* remained valid in *The General Theory*, a position commonly referred to as the continuity thesis. This literature also holds that imagined premises play a role in expectation formation and are related to both the weight of arguments and the confidence with which expectations are formed.

[19] While Dequech (1999) discusses the weight of the argument, this concept is not explicitly incorporated into his schematic representation of the determinants of the state of long-term expectation (Figure 1).

Dequech (1999) made an important contribution to the literature by developing a theoretical framework for expectation formation under fundamental uncertainty. However, this framework does not take into account imagined premises, while the weight of arguments is discussed but not explicitly incorporated into the framework of the determinants of the state of long-term expectation. The contribution of the present article has been to complete the expectation-formation framework proposed by Dequech (1999) by addressing these gaps.

Four extensions to this theoretical framework have been proposed. First, knowledge (observed premises) affects uncertainty perception and confidence indirectly through its influence on the weight of arguments. Further, spontaneous optimism influences imagined premises, which in turn affect (i) expectations directly and (ii) uncertainty perception and confidence indirectly through their effect on the weight of arguments. Finally, optimistic disposition (animal spirits) affects uncertainty perception only indirectly, through its influence on spontaneous optimism.

Keynes introduced a new paradigm for economic science, but not without leaving gaps regarding the definition of concepts and the interrelationships among variables. It falls to Post-Keynesians to continue the perhaps never-ending task of advancing and refining this paradigm.

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