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DEALING WITH UNCERTAINTY: EVOLVING BELIEFS, RATIONALIZATIONS & THE ORIGINS OF ECONOMIC CRISES

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RESUMEN

La reciente crisis macroeconómica internacional ha reabierto preguntas tradicionales sobre cómo se formulan los planes y expectativas de los actores económicos. Las crisis de deuda frustran anticipaciones previas y, por su naturaleza, suelen inducir sustanciales revisiones de creencias sobre cómo funciona la economía. Este elemento central de las crisis niega validez a la hipótesis de expectativas racionales (un concepto ambiguo, por otra parte). Los errores de decisión que llevan a las crisis no necesariamente derivan de sesgos de conducta que hacen a los agentes ignorar las indicaciones del análisis económico: a menudo esas decisiones son compatibles con el sentido común de la época, y se racionalizan apoyándose en influyentes argumentos analíticos. El estudio de esos relevantes procesos sociales requiere considerar las formas concretas en que los agentes generan escenarios de decisión a efectos prácticos, y cómo esos se vinculan con los modos de análisis aceptados en su momento. En este trabajo se discuten los elementos informacionales de las crisis de deuda, se comentan las limitaciones de los esquemas usuales que buscan conciliar a los fenómenos de crisis con la noción de expectativas racionales en alguna de sus formas, y se consideran alternativas para el tratamiento de las modalidades de formación de expectativas en esos contextos críticos, con referencia a las contribuciones de Keynes.

ABSTRACT

The recent worldwide macroeconomic crisis reopened old questions about how agents define their economic plans and expectations. Debt crises disappoint previous anticipations and, by their very nature, they lead to deep revisions of beliefs about the functioning of the economic system. This crucial element of crises denies the standard rational expectations assumption (an ambiguous concept, also). The decision errors that result in crises do not necessarily derive from behavioural biases which make agents ignore prevalent views about economic prospects: often, those choices had been rationalized with reference to established conventional wisdom. Thus, understanding such socially relevant events requires addressing the concrete ways in which agents generate practical decision scenarios in changing environments, and how those interact with the modes of analysis accepted at their times. A revision of Keynes' work on uncertainty can help in this respect. In this paper we analyse the crucial informational elements of macro crises, we discuss weaknesses of the standard modes of argument which try to accommodate critical phenomena into the rational expectations framework, and we comment on ways to move ahead, with reference to Keynes' contributions.

Las opiniones expresadas son de los autores.

Keywords: macroeconomic crises, broken promises, rationality of expectations, Keynes on uncertainty
JEL Codes: D84, D81, G01, B41

1. Introduction

The family of macroeconomic debt crises includes members with quite different features. However, they all share a common, distinctive family mark: by their very nature, crises represent a widespread disappointment of expectations manifested in numerous ‘broken promises’, particularly in the form of unfulfilled debt contracts (cf. Leijonhufvud, 2004, Heymann 2007). While a crisis may be triggered by some external shock, events like the large-scale recent crisis in the US and the EU clearly appear to have been generated by the dynamics of the economies themselves. The analysis of crises should thus include, as a central element, an account of how and why economic agents come to hold beliefs (incorporated in concrete decisions on production, spending and asset holding) that their collective behaviour eventually shows to be wrong.

Crises mean large- scale destructions in perceived wealth. The wide shifts in the prevailing perceptions about the growth prospects of the economies in question point to the deep uncertainty surrounding historical, irreversible, system- wide processes such as those that determine the pace and configuration of economic development, and they bring vividly to mind Keynes’s arguments (1936, esp. Chap. 12) on the highly fallible and potentially variable nature of long-term economic forecasts. Therefore, the analysis of crises should thus explore how agents deal in practice with those features of their environments in order to form their anticipations and plan their actions, and what makes these develop in a way that ends in a crisis. An economist studying macro crises must act in some way as an ‘applied epistemologist’ (or an historian of practical economic thought) , who analyses the nature of the working models that agents use to conduct their economic life, their consequences for behaviour, and the evolution of beliefs as a response to the performance that the agents themselves generate.

Rational expectation (RE) models cannot explain crises as such. The basic definition of RE asserts that ‘outcomes do not differ systematically (i.e., regularly or predictably) from what people expected them to be’ (Sargent, 2008). The notion itself of rational expectations is also ambiguous and not easy to follow (see, for example Muth, 1961, Lucas and Sargent, 1981): sometimes it seems to refer that while agents shall make forecasting errors, it does suggest that errors will not persistently occur on one side or the other; sometimes it refers (“model-consistency”) to a correspondence between the

analytical frame that the economist is currently proposing and the scheme which agents presumably have always used and will use to form their expectations; in other instances, the concept may be interpreted in a stronger sense as an identity between the (probabilistic) law of motion of the system as perceived by agents and the actual law of motion, which the analyst ignores, and may only hope to approximate by multiple search iterations (cf. Evans and Honhapohja, 2001). In whatever guise, RE and macroeconomic crises are incompatible, despite the effort that has been put in trying to reconcile them. As a matter of observation, crises lead to intense activities of lesson-drawing, on the part of economic agents, policymakers and analysts alike. It is ironic that so much effort is put in this activity while using models which incorporate the assumption that agents have nothing to learn.

The analysis of phenomena that involve centrally the breakdown of economic promises requires dealing with the ways agents form in practice their plans about the future, and these turn out to be frustrated. The problems of decision-making in evolving and complicated environments were, of course, a matter of particular concern for Keynes. At the very beginning of chapter 12 on “The State of Long-Term Expectations”, he states: “It would be foolish, in forming our expectations, to attach great weight to matters which are very uncertain” ([1936] 1967: 148), where 'uncertain' was interpreted as sharply different from 'very improbable'. In his Treatise, Keynes conceives probability as the logical relation between a proposition and the corpus of knowledge to which we relate it. The likelihood we assign to an event is subjective (information and information process differs between individuals), but not arbitrary, since it “is concerned with the degree of belief which it is *rational* to entertain in given conditions” (1921: 4, italics in the original). Rationality, then, refers to the use of reason when trying to understand certain processes of interest, not to an assumed outcome where beliefs have somehow come to incorporate all the possible relevant knowledge— a notion present in RE models-. It is the resulting dynamics of expectations and decisions generated by agents, who may well be “reasonable” but are eventually shown to be mistaken, that would form a central element of the theory of crises. Keynes insisted strongly on the precarious nature of long-term expectations: “about these matters there is no scientific basis to form any calculable probability whatever. We simply do not know” (1937: 214; see also 1936, Chapt 12, IV). Thus, the matter of analytical interest is not only how people

evaluate the chances of different outcomes, but also how solid they perceive that evaluation to be. Actual decision-makers and analysts alike may be more or less confident on the working models they use to make interpretations and forecasts.

Keynes used the concept of 'weight of evidence' to address this issue. The weight of evidence has concrete implications: the less there is in a certain situation, the more an agent will lack a "sense of comfort", and will demand a premium to accept being placed in those conditions. As indicated by Jochen Runde (1990), Keynes uses the weight with three different meanings. One of these refers to the degree of completeness of the information in which the probabilistic assessment is based. In this case the agent would be capable of appraising the relevance of its ignorance (see Feduzi 2010: 339). A certain piece of evidence (or the conscience of the lack of it) can increase or decrease uncertainty independently from its consequence of raising or diminishing the probability of the event under scrutiny. Runde (1994: 133) calls this second type of uncertainty "external uncertainty": the label refers, not to the "internal" relation of the proposition and the evidence (i.e., probability), but to the amount of evidence.

The weight of evidence can be influenced by the opinions or pronouncements of agents recognized as experts, which assumes a key distinction between the analyst or the economist (who proposes a message) and economic agents (who receives the message). The breakdown of expectations in the crisis indicates that many economic decisions in the previous boom phase reflected inaccurate judgments about the economy's performance. Those decisions need not have been purely impulsive, or predicated on eccentric views of the world. It is often observed that the sustainability of the economic paths that eventually lead to a crisis has often been supported by influential, sober opinions, using arguments that do not contradict the professional common sense of the times. These arguments are likely to play a non-trivial role in the development of macroeconomic bubbles by promoting the presumption that the boom rests on solid "fundamental" bases: their emergence and demise do not simply count as a matter of record, but they form a relevant part of the actual economic processes that result in crises. The rationalizations of observed performance in a boom lend 'weight of evidence' (Keynes, 1921) to the existing patterns of belief and behaviour, and thus tame the perceptions of doubt and uncertainty that may have induced more precautionary attitudes.

This paper proceeds as follows: section 2 discusses de the role of probability in economics; section 3 discuss the notion of Rational Expectations; section 4 presents an alternative to the Rational Expectations hypothesis based on the 'the weight of argument' due to Keynes; section 5 discusses some empirical facts on how the weight of argument functions. We close this paper with some conclusions.

2. Measuring uncertainty: probabilities

We may have learned to believe that we live in a deterministic world, barring deep and arcane physical microscopic effects. However, daily routines and life-cycle chances show themselves full of unexpected twists and turns. Acting on a mistaken presumption of certainty can be dangerous, but there is no point allowing uncertainty to paralyze behavior. Some practical balance must be found to permit “reasonable” activities. The tension is ever-present, but especially in critical junctures of personal and social lives.

Throughout history, humans have looked for psychological certainty, while knowing that it cannot literally be had. Few people are likely to possess Keats’s ‘Negative Capability’ (the ability of ‘being in uncertainties, mysteries, doubts, without any irritable reaching after fact and reason’). We wish to understand past and present things, but above all, to know about the future. Martha Nussbaum (2001: 154) notes that the problems stemming from ungoverned luck in human life motivated Plato to develop his philosophical art. His dialogue *Protagoras* relates the story of progressive human efforts to control contingency by using numbering and measuring as the relevant tools to tame the unknown. What looks immeasurable and incommensurable has to be made measurable and commensurable in any way possible. As Jorge Luis Borges, the Argentine writer, has said: ‘Nothing is built on stone; everything is constructed on the sand, but our duty is to make buildings as if sand were stone’.

The aim is precision¹. Numbers are homogeneous and provide a concrete tool to expresses realities in ways that facilitate decisions. But how can we reduce choice about qualitative features or about future uncertain events to a quantitative calculation? This is the question raised by Plato: what science will save us from the unpredictable contingency? He answered: ‘the science of measurement’ (*Protagoras*, 356e). Human beings strive for security, and measurement helps to bring it about. Social institutions

¹ The original word would be *akribeia*.

apply standards, proceedings and measurement devices as means to systematize behaviors as Keynes noted when he wrote: 'injustice is a matter of uncertainty, justice a matter of contractual predictability' (quoted in Skidekly and Wigstrom, 2010:22).

The notion of probability puts a bridge between the measurable and the unknown. The idea that degrees of likelihood can be attributed to some events was already considered by the confessors in the Middle Ages. However, this idea did not adopt a mathematical form until modern times². What probability does is to bracket the contingency of the particular case and, at the same time, to take it into account: playing roulette cannot promise a certain outcome, but being informed about the odds of the roulette provides a great deal of knowledge about the situation (and, probably, removes much psychological stress from the game). However, as Keynes affirms in his *Treatise on Probability*, 'probability begins and ends in probability' (1921: 356), because 'a statistical induction is not really about the particular instance at all, but has its subject, about which it generalizes, a series' (1921: 411). Economic agents and analysts routinely face this predicament in their everyday activity. We will come to this particular issue in the following sections.

The assignment of probabilities to social events raises the question of whether all realities can adequately be reduced to numbers. Numbers are the expression of a real accident of substances, namely quantity. However, even when applied to things naturally quantitative as for example, extension, defining a numerical expression requires establishing a metric. Numbers can also be applied to qualities like temperature or even beauty, and similarly to the quality of being more or less probable. The conventions involved in these applications may be more or less 'firm', depending on the nature of the quality considered. It is more objective to measure temperature by a thermometer than to establish the quality of a work of art (but, even here, temperature is not a cardinal variable). Similarly, Humphreys (2000: 712) maintains that probability does not have a univocal meaning. There are more 'firm' probabilities than others, depending on the degree of objectivity of the ontological basis on which a number is assigned to the chances of an event.

² See Ian Hacking (1975) for a history of probability; also Jacovkis and Perazzo (2012).

Warnings about the actual unavoidability of contingency in economic matters and about the difficulties inherent in trying to reduce uncertainty to a set of well- defined probabilities have come from economists with otherwise quite different worldviews, like Frank Knight, John Maynard Keynes, George L.S. Shackle and Friedrich von Hayek. In 1921, Knight distinguished between risk – the case in which there is an objective probability and it is known– from subjective probability – when there ‘is no valid basis of any kind for classifying instances’ (1921: 225).

An implication may be that, when people apply probabilities to these matters they are only making an arbitrary judgment in order to act: a kind of ‘impulse’ driving the way in which agents evaluate their decision scenario. But, also: ‘although nature has her habits, due to the recurrence of causes, they are general, not invariable. Yet empirical calculation, although it is inexact, may be adequate in affairs of practice’ (Keynes, 1921: 368). This tension between the incentive to ‘exploit regularities’ that may appear in the information available and the ambiguous status of the knowledge that may be gained in that way is especially relevant in the processes leading to macroeconomic crises, and it applies both to agents and to analyst, and to analysts talking about how agents behave.

The usual practice in economic analysis (based on theorists such as Frank Ramsey, Bruno de Finetti, and mainly Leonard Savage, 1954) presumes that people behave as if they used a subjective *a priori* probability about future events that can be discovered by observing their decisions *a posteriori*. This notion, substantially different from Knight’s idea of uncertainty as ‘non- objective’ likelihood, is often complemented by the (‘rational expectations’) assumption that the probabilities that agents use in their decisions are those that actually measure the chances of the possible realizations of the quantities of interest, viewed as stochastic variables: here, rationality is somehow equated with full knowledge. The approach (which, indeed, admits variants of different sorts, like the introduction of learning dynamics), lends itself readily to formal modeling (see Lawson 1988: 48, table 1 schematic classification).

Of course, the uses of ‘objectifying’ devices in social analysis (like Economics) have been much discussed. As Claude Lévi-Strauss asserts, the tendency towards ‘mathematization’ – to extract the quantitative aspects of observations and measure them – is a legitimate ambition, but may imply a trade-off: ‘what we gain in meaning, we

lose in precision and the inverse' (1954: 647). The simplifying *ethos* may obtain precision at the expense of realism, or generality; at the same time, purely qualitative expositions can fall into vagueness, or to avoidable ambiguities and inconsistencies, leading to the need to 'interpret' arguments which could otherwise have been made clear. One should beware of big methodological pronouncements pretending to dictate how to carry out the analysis of each and every phenomenon or scientific problem. Rigor does not always imply precision or exactness, or their opposites.

In this instance, when considering the family of economic events describable as crises, we are dealing both with intricate economic processes and with subtle questions about how people form views about the future and react to them. Lawson (1988) evidences this problem defining probability as 'a property of knowledge or belief' (the subjective view of Savage, Friedman and Keynes) or as 'a property of knowledge and a property of material reality' (Rational Expectations, Knight). Therefore, when dealing with a probability concept, we have to consider probability as property of the external world but also possible to conceive it as a form or aspect of knowledge.

But that does not necessarily mean that agents take this distinction as given: they may rationalize their circumstances and make their decisions under the impression that they are capable of predicting their environment with some accuracy, or of attributing reliable likelihoods to alternative scenarios (this could be applicable in particular to sophisticated agents like financial operators). It could be that human beings deceive themselves for the sake of action, since they do not want to perceive themselves as behaving 'irrationally'. Even here there is room for doubt, as Keynes (1937) argues, 'there is a degree of mistrust of calculations and conventions concerning the future'. Be as it may, the behaviors that create debt over-expansions often look as the consequence of rationalizations rather than vehement irrational enthusiasm.

To sum up: the analysis of crises requires addressing questions about the attainable knowledge on the evolution of the economy from the perspective of an outside observer and from that of the actual agents; the analyst must include among his topics of investigation the procedures that the economic actors employ in trying to 'make sense' or acquiring evidence of their conditions and to form expectations. In this search, one would do well to be reminded of what was stated long ago by Aristotle:

‘Our treatment *discussion* will be adequate if it has as much clearness as the subject-matter admits of; for precision is not to be sought for alike in all discussions, any more than in all the products of the crafts. Now fine and just actions, which political science investigates, exhibit much variety and fluctuation (...). We must be content, then, in speaking of such subjects and with such premises to indicate the truth roughly and in outline.’ (Nicomachean Ethics I, 3, 1094b 11-27).

Keynes shares this view: in fact, he developed his theory of probability as a proposal for managing inconclusive beliefs (1921: 3), and even at the realm of probability “we only know vaguely with what degree of probability the premises invest the conclusion” (1921: 32).

3. Accounts of the crisis: Rare events and deep uncertainties

Once they occur, macroeconomic crises may look easily foreseeable, as if everyone should have seen that they had to happen. In retrospect, the mass of financial obligations created on the road towards financial collapses such as that of the US huge investment banks or the Greek public debt may be seen like an evident house of cards apt to be identified as such from the start. In each case, it is likely that some economists and commentators sounded the alarm well in advance. But it is in the nature of the case that such warnings do not get general hearing: the debt gone bad was bought in conditions that reflected substantial degrees of belief in normal repayment, and the great social costs of crises derives precisely from the fact that many people (a number of whom may never have given a thought to the ups and downs in financial markets) are caught, unprepared, by a shock that reduces their income, wipes out part of their savings, or leaves them without a job.

An important difficulty in the analysis of the crises is thus to explain this contrast between the *ex-post* appearance of ‘transparency’ of the bursting bubble and the necessary opacity that allowed it to develop. This can be compared to Taleb’s (2010) notion of a black swan as a seemingly impossible animal before it has been observed, and an unremarkable one after it has been shown to exist.

What is a shock? A group of literature has tried to incorporate crises within the fold of general equilibrium with rational expectations³. This has been done in a strict form using ‘real business cycle’ models (cf. Kydland and Zarazaga, 2003), or with ‘dynamic stochastic general equilibrium’ models, which add effects (labeled frictions, particularly in the form of informational asymmetries that operate on debt contracts) which amplify and propagate the effects of disturbances (Kiyotaki and Moore, 1997). But these shocks are still presumed to be ‘as if’ they are observable drawings from a common knowledge probability distribution. The models miss providing a concrete specification of the shocks as ‘external events’ (which is especially damaging for arguments that require viewing those impulses as observable realizations of random variables with well-defined distributions), and they leave quite vague the likelihood of crises even while taking for granted that their probabilities are known. This is exactly the argument sustained by Fama where the recession (‘we don’t know what causes recessions’—he said) predated the subprime bond market crises⁴.

A second point that deserves attention is that macro models within the usual rational expectations framework are subject to logical questions (cf. Heymann, 2007). When initially built, the models are ‘innovations’ with respect to the existing analysis, but they are estimated or calibrated presuming that agents have been making ‘model-consistent’ expectations all along. Forward-looking exercises assume that expectations will continue to be based on the current models, when the economist understands that eventually (and maybe soon) it will be superseded by new ones. The models are used to discuss changes in policy regimes as if the shifts were purely unanticipated (thus bluntly denying past expectations), and they were believed with certainty to be permanent, which implicitly means that exercises like these will never more take place in the future. Apart from the potential practical interest of ‘manageable models’ (given the state of the art), there is not much there to found a theory of crises. The problem

³ It has also been argued that this framework should be understood as an instrument to study economies in “normal” times, and not in extremes like crises. However, the argument begs a question about how to represent expectations that would correspond with the rationality hypothesis: if, on the one hand, agents are depicted as if they based their forecasts on the “normal” model, with an admittedly limited range of validity, these anticipations would not be rational, in the sense of incorporating the actual probability distributions of the variables of interest; if, on the other hand, the analyst attributes to the agents full (stochastic) knowledge of the environment, she should “step out of the model” and endow the decision makers with a perception of states of the world that she (the modeller) has left unaccounted for.

⁴See <http://www.newyorker.com/news/john-cassidy/interview-with-eugene-fama> (Retrieved on June, 2015).

with those analytical frameworks is not of a doctrinal nature, but it affects their ability to serve in the interpretation of highly relevant phenomena.

Can rational expectations of large-scale macro movements be seen as the eventual outcome of a history of learning from experience? In practice, agents may end up forming more or less accurate representations of the environments not once-and-for all but as derivations of a process of understanding behavioral patterns which remain more or less stable over time. Davidson (2009) observes about this possibility: 'In the short-run, subjective probabilistic expectations need not coincide with the presumed immutable objective probabilities. Today's decision makers, therefore, can make short-run error regarding the uncertain future. Agents, however, should 'learn' from these short-run mistakes so that subjective probabilities or decision weights tend to converge to an accurate description of the programmed external reality'⁵. Thus, averages calculated from past observations would not be persistently different from the time average of future outcomes and knowledge accumulates as new observations arrive. Eventually, if enough time is allowed to obtain very large samples of realizations, the observer can extract all the potential information about the properties of the system: what is left is 'irreducible' randomness described by a known distribution (see section 1).

However, this asymptotic argument applicable to 'routine events' can hardly serve for the analysis of large and infrequent episodes such as macroeconomic crises, which typically do not seem to form part of the scenarios contemplated by agents before the fact. Even if the economy could be represented by given, fixed probability densities, these would not be 'normal' occurrences, as they may involve orders of magnitude of some variables which would have vanishing chances of being observed under Gaussian distributions with parameters drawn from past history. The existence of such events would anyway call into question the applicability of distributions that treat extreme realizations as practically impossible. As Terzi (2010) suggests:

'...Intractable uncertainty means that there exist outlier events with the property of carrying a large impact on our lives. And because we do not have much hope to forecast these better, we can only attempt

⁵ This conclusion depends on the stability properties of the learning algorithm. In the present context, that technical matter can be left aside.

to shield the system from (inevitable) forecasting errors. Because the possibility of Black Swan Events (BSE) is incalculable, the best defense from uncertainty is to build a robust financial system, more resilient to BSE... [E]ven using the best of our abilities, and although BSE follow a predetermined (yet unknown) statistical path, there will always be events that are so rare that we cannot possibly predict them...The possibility of surprises (BSE) is typically and deplorably disregarded by most agents and, for this reason, the economic system lacks robustness'

Forming beliefs and expectations about 'non- routine' and possibly 'life- changing' events like macroeconomic crises involves facing special problems. As phenomena with a strong practical significance, agents and analysts should have strong incentives to understand and anticipate them. Crises are indeed memorable events, which leave persistent traces in beliefs, attitudes and behaviours in those who live through them (cf. Heymann, 2002; Malmendier and Nagel, 2010). Although it may be tempting to look for timing regularities on the basis of a small number of instances, crises have no definite periodicity, and they involve processes at relatively long time scales. This by itself constrains the vivid experiences that the population at a given moment may have accumulated and, from the point of view of the analysts, it also brings down the number of pertinent 'data points' on a specific economy with which to work. Also, in systems subject to structural change, the relevance of past observations depreciates over time (Weitzman, 2007), so that the useful data sample can remain bounded at relatively small sizes. If there are some 'deep probabilities' hidden somewhere, these features would restrict the chances of learning about them with any precision.

4. Evolving systems, Decision processes and Weight of Evidence

4.1 Evolving systems

Economic systems change over time. Their development is very much driven by technical, organizational and behavioural evolution; the notion is hardly controversial. From the perspective of individuals, learning and adaptation to the environment take place on a daily basis, and they modify the context in which others carry out their

activities: the future 'depends on our intentions and beliefs' and, therefore, 'it is open' (Skidelsky, 2011: 3).

As a matter of principle, then, stationary states, even in a probabilistic form, do not appear likely conditions. Uncertainty therefore seems the general property of economic process. In the specific case of macroeconomic crises, we may feel comfortable talking about the family of events as a set of episodes that belong to an analytically interesting category, but it is clear that each case has idiosyncratic, particular features. A crisis that repeats itself is almost a contradiction in terms (as in stumbling against the same recognizable stone). This raises the questions of to what extent we (observers) can extrapolate to a specific case patterns identifiable in others times and places, and what actual agents do about the matter.

Actual economies experience large, irreversible changes through various channels: real or financial innovations, policy shifts, alterations in availability of resources, and also variations in the patterns of interaction between agents, for example, through reconfigurations of the international division of labour. In such conditions, uncertainty may persist, even if the available information accumulates over time (cf. North, 2005, p. 22). Agents must somehow adapt to function in moving environments, with variable opportunities and risks. Mere extrapolation of past trends will not do; but abstract references to uncertainty will not by themselves provide workable guides for action.

Agents must find ways to deal with those decisions, and analysts must look for representations of their behaviour. One possible approach is to assume that, when confronted with deep fundamental uncertainties, decisions follow impulses which can hardly be subject to analysis or interpretation: when there are 'no strong roots of conviction', economic activity takes place under the incentive of spontaneous waves of optimism or urges to action rather than inaction (Keynes, 1936: 154). In the limit, the argument would imply that, '[since] uncertainty is irreducible on ontological grounds, some probabilities are not just unknown, but non-existent' (Zappia, 2012); decisions like those associated with long-run investments would then result from a spontaneous urge, far from the image of an 'actuarial calculus' of gains and losses on the basis of numerical probabilities.

How do people behave when uncertainty prevails? One possibility is to rely on conventions, that is, on procedures established somehow over the course of the experience of the agent or through imitation, which give practical guidance while providing some reassurance that a satisfactory performance in the past will be replicated in the present. Keynes (1936: 152) argues ‘we have tactility agreed, as a rule, to fall back on what is, in truth, a convention. The essence of this convention—though it does not, of course, work out quite so simply—lies in assuming that the existing state of affairs will continue indefinitely, except in so far as we have specific reasons to expect change’. The conventional method of day- to- day, decision making, would then rely on this implicit assumption of continuity of circumstances. Skidelsky (2011) lists several types of convention based on Keynes workd that may be at work behind typical investment/consumption and financial decisions: 1) induction (the future will be like the past); 2) ‘majority judgment’ (follow the crowd); and 3) specific sets of values, motives, beliefs, expectations, psychological uncertainties and feelings.

In conjunction, these would influence, the ‘state of confidence’, which Keynes (1936: 148) describes as ‘a matter to which practical men always pay the closest and most anxious attention(...) there is, however, not much to be said about the state of confidence *a priori*. Our conclusions must mainly depend upon the actual observation of market and business psychology’. Thus, in order to make progress, the economic analysis of phenomena like financial crises has to look for representations of agents engaged in interpreting and anticipating the evolution of the economy.

The extrapolation of observed conditions may be a plausible heuristic, at least in some circumstances. This behavior can be identified in the process that led to the international financial crisis. Blanchard, in 2008, said that: ‘in the US, housing prices have gone up every year since World War II, even in the recession of 2001 we hadn’t seen them come down. So when you were told ‘Look, basically you can buy risk because housing prices were not to go down’, you looked at history, you looked at the last recession and you could convince yourself easily this would continue’ (quoted in Svetlova and Fiedler, 2011: 58).

The argument points toward a significant issue. Decisions may look substantially erroneous after the fact, but they are generally not unmotivated *ex ante*. Larger-scale

economic decisions tend to be the subject of deliberations, where the existence of “fundamental” reasons to act in one way or another is apt to play a sizable role. Between the analytical approaches that presume that market participants possess as full as possible knowledge of the properties of the environment, and those that shortcut the cognitive strategies of agents there is a potentially wide field of alternatives where decision processes would be portrayed as derived from schemes that agents use to “make sense”, fallibly, of the economic system they live in.

4.2 Decision processes and weight of evidence

A point worthy of attention, and which lends itself to qualitative exploration, is the way in which people who hold certain views about the sustainability of a macroeconomic over-expansion deal with ‘anomalies’ which can challenge their opinions or send signals of possible economic disruptions.⁶ In this regard, attitudes that ‘rationalize the bubble’ or ‘the bulk of evidence supporting possible future outcomes’, by finding reassuring explanations for potentially disturbing news can be part of the ‘coping strategies’ of agents, and at the same time they would contribute to prolong and propagate the boom, and to amplify the subsequent downturn. As Lucas (2011: 4) writes: ‘economist are storytellers, operating much of the time in worlds of make believe. We do not find that the realm of imagination and ideas is an alternative to, or a retreat from, practical reality’.

Keynes’ ideas about the ‘state of confidence’ can be traced up to the notion of ‘probability’ and ‘weight’ in the *Treatise on Probability* (1921). As introduced in section 1, in the TP, probability is presented as a logical relation between a set of evidential propositions (E) and the conclusion of an argument (H). The relation $p = H/E$ gives the degree of rational belief that the probability relation between E and H justifies. Since a probability is relative to a specific body of evidence, this suggests that there is no necessary connection between the probability of and the truth of a

⁶ Understanding the ‘model-making’ heuristics used by agents in their economic activity looks like a crucial issue for macro analysis, particularly when the matter of concern refers to crises and large-scale phenomena that challenge previous expectations. Addressing the problem would require some sort of ‘empirical’ or ‘positive’ epistemology directed towards the procedures and the criteria for information processing that agents employ in practice. This would imply paying attention to the choice of starting references on the part of agents in order to base their interpretations, that is, to their activity of abduction, especially when faced with potentially new situations (cf. Crespo et al., 2010).

conclusion (cf. Runde, 1994: 131). Holding on the idea of a 'degree of belief' leaves room for subjective probabilities since heterogeneous agents possess different amounts of information and processing powers (Feduzi et al., 2010). But it also objective since it corresponds to the degree of belief it is rational to hold. New piece of evidence ($E1$) becomes relevant as long as $H/E \& E1 > H/E$ or $H/E \& E1 < H/E$. As a form of rational belief, when new evidence appears, the 'degree of belief that is rational to entertain in a given proposition changes' (Lawson, 1988: 42).

Weight, on the other hand, does not appear in a clear way in Keynes: while he 'does not provide a definition of weight in a consistent way' (Runde, 1994), the connection between probability and weight can be seen as part of a 'two-tier theory of belief: 'probability is at the first level, a measure of the belief in some conclusion relative to some specific body of evidence. Weight is at the second level, a measure of the *completeness* of the evidence on which that belief is based' (Runde, 1994: 133). Completeness as appears in Runde is the key concept for this paper's project: evidential propositions of a probability relation shall equal the total relevant knowledge of a probability relation. Additional relevant information may change non monotonically the weight. New evidence would increase the weight independently if it increases or decreases the probability of an argument. Following Feduzzi (2010: 345), we can get an expression for the weight as the degree of completeness of relevant information:

$$V(H/E1 \& E2 \dots \& En) = \frac{K}{K + I}$$

where K is the relevant knowledge and I the relevant ignorance. This second element suggests that the agent forming an opinion does not know part of the relevant evidence, but he or she is aware of it. The existing of missing information, which consists of relevant factors possibly omitted or inaccessible better information, 'if it were known, she conceives it would be relevant for the decisional problem' (Feduzi, 2010: 334). The essence behind the estimation of relevant ignorance suggest a very personal and subjective process but open the idea that new evidence shall decrease the weight of evidence (cf. Runde, 1990) under some particular scenarios. If the agent, confronted with new evidence, becomes aware that there are more alternatives than he or she had previously considered, I increases. This situation illustrates how is possible, for people, to learn new things which makes them feel more (rather than less) uncertain or

ignorant compared (relevant ignorance increases) with what the previously believed, a typical situation at the start of a crises when the behavior of the economy presents serious challenges to previous belief.

In the introduction section we have distinguished two types of uncertainty: one, stemming from a low probability and the other, stemming from low weight of evidence. When the probability relation can be established but with low weight of confidence, agents perceive uncertainty: 'the degree of reliability of this probable knowledge – the *confidence* it merits – determines the *degree of uncertainty* that exists in a specific situation' (Crocco, 2002)⁷. From now on, we concentrate on this second type of uncertainty.

At some point, Keynes (1921, p. 83) expressed scepticism about whether 'the theory of *evidential weight* has much practical significance', but he was concerned with practical affairs also. His contribution was in fact a contribution to modern decision theory. Feduzi (2007) writes that Keynes takes position over the idea that evidential weight plays a role in practical choice situations, particularly in both the liquidity and risk premium (cf. Feduzi 2007: 562). Runde (1994) express a similar concept over the liquidity preference. Therefore, decisions based on probabilistic assessments on Keynes approach would be tempered by considering the weight of evidence supporting those measures, denoting that any decision rule under Keynes uncertainty incorporates a measure of the degree of confidence in the probability assessment (Zappia 2012: 10)⁸. In any case, the problem has concrete practical applications.

The relevant question would be how agents determine in practice their views on the 'amount of evidence supporting an expectation' (Skidelsky, 2009: 87), and the degree of certainty they attribute to their conjectures. Once again, subjective phenomena come into question due to the fact that different people, even in the same space, circumstances and time shall considered different measures of completeness⁹. As Feduzi (2010: 348) asks, 'why different people, confronting the same decisional

⁷ But the interested reader should note that uncertainty also depends on the degree of probability: a low probability generates uncertainty

⁸ Notice that a standard subjectivist would certainly not agree on this affirmation due to the fact that 'subjective or personal probabilities about any proposition or event cannot meaningfully said to be right or wrong' (Lawson, 1988: 41). Compare to Keynes where the notion of 'rational belief to hold' is objectively determined, the concept of confidence or justification does not hold any place in this subjective criteria.

⁹ This leads to what Feduzi (2010) describes 'the stopping problem'.

problem, might feel confident that the evidence acquired is enough to inform the decision at different stages of the learning process'. Confidence and weight are not the same things, but they can be linked as correlated concepts under this set of materials. Changes in the 'weight of evidence', as we already discussed, influence strongly the extent to which agents are willing to make economic commitments contingent on their existing beliefs. Economic agents, according to their sorts and highly personal points of view, tend to show a keen interest in interpreting economic ups and downs, and they spend time and effort trying to 'make sense' of economic information; they operate as 'model- makers' even if their models are informal, arbitrary, non-homogenous across the population and not necessarily appropriate.

Information gathering and particularly the role of the expert presenting evidence, interpreting information, comes into scene. A crisis would then represent a failure of those working models which, for practical purposes, may have shared features with those held by influential economists, as in the 'long list of leading academics, investors, and the U.S policy makers' (Reinhart and Rogoff, 2009: 208) who argued for the sustainability of the macroeconomic trajectory that preceded the crisis.

Up to this point, there may or may not be a correspondence between what the analyst believes is known, or can be known, about the system, and what he believes the agents believe, or act upon. This is a matter- of- fact issue, especially pertinent in applied work. Economic fundamentals (e.g. productivities, incomes, budgetary positions) are often treated as if they could correspond to objective notions. However, that cannot be so in this context, since the relevant fundamentals refer necessarily to future realizations. Thus, when discussing macroeconomic sustainability, the central question refers in fact to the quality of the expectations of agents, expressed in ongoing plans and decisions.

The evolution of consensus opinions among experts, or the pronouncements of influential individuals enjoying outlier status (i.e. minded economist or opinion makers) may have concrete macroeconomic implications, particularly speaking, as becoming essentially the evidence supporting a (rational) expectation¹⁰. If we distinguish as two

¹⁰ An example would be the Argentine episode of 2001, when the country risk indices showed wide daily oscillations, perhaps in reaction to pronouncements of government authorities or IMF officials. In an interesting letter, Keynes (1938) explains the difference between the risk premium and the liquidity premium. The first risk is expected to be rewarded by a return at the end of the period. The second is not even expected

different concepts of what the analyst models or understands about the economic environment and what the agent believes about the future, the arguments of the former can enter as evidence of the latest. Consider the following illustration: the government of a certain emerging country implements policy reforms aligned with prevailing recommendations of mainstream academic analysis and international organizations. At first, while this 'new-era economy' remains a fuzzy notion, economic actors will wait for more evidence to decide whether or not to execute investments predicated on the success promised by the authorities. Everywhere, financial newspapers and Central Bank speeches say that the economic reforms are backed by influential analytical arguments and agree with established policy recommendations. The prospect of economic improvements thus generated may suffice to remove some credit restrictions and to induce acceleration in demand and production. A current account deficit might develop as a counterpart of the foreign financing of higher domestic consumption and investment. At this point, opinions can differ: according to one group, rising foreign liabilities indicate a reasonable response of reinforced confidence on the economy's future growth, derived from the productivity gains that the reforms will induce over time; opposing views perceive those debts as a dangerous source of macroeconomic fragility that will manifest itself sooner or later (cf. Galiani et al, 2003).

The story can be retold with variants, as that of a country which joins a club of developed economies and where expectations of a convergence of income levels to those observed in the partners arises under the belief that, once institutions are modified to correspond to those of rich geographical neighbors, a *transition* to their economic conditions would follow naturally. This perception can both strengthen the foreign willingness to lend as well as the incentives to borrow (cf. Machinea and Schiaffino, 2011). In the end, the question will be whether the anticipated increases in the income- generating capacity of the economy will materialize, or else they will be disappointed, and a crisis will follow. Solvency and sustainability conditions (which are ultimately the objects under scrutiny) are essentially prospective concepts. Their assessment must somehow rely, formally or informally, on past experience (whether in the economy in question or in others); that requires a judgment about the relevance of the available information: 'this time may be different', or not. In concrete instances, it

to be rewarded. It is, he explains, 'a payment not for the expectation of increased tangible income at the end of the period, but for an increased sense of comfort and confidence during the period'.

seems likely that the impressions gathered from analogies with other cases and from more or less refined analysis will be mixed: some may favor the view that solid fundamentals will validate the current debt decisions, while others can point to the development of an artificial boom that will end badly. In both cases, the common pattern is to provide relevant evidence. The difference here is the final direction—up or down— of the weight of evidence that every probable assessment possess.

Which attitude will prevail? Who will turn out to be right? The answer may depend critically on where commonsense opinion places the burden of proof, since no side would be able to gather firm, convincing evidence pointing in its direction. Convention, in the sense of established patterns of argument and belief can play a large role in such settings, especially if agents use some type of categorical thinking (Mullainathan, 2002), such that, presented with ambiguous information, they tend to choose the ‘more likely’ alternative as the exclusive (in the limit) scenario on which to focus their decisions. ‘Ambiguous’ here refers to a situation where an agent deals with two or more distinct options but, among them, he or she has to pick one. Keynes considers a situation where there is *priori* probability (a probability where the attached evidential weight is situated at its lowest level) and another similar probability with more evidential weight. He asks himself: ‘if two probabilities are equal in degree, ought we, in choosing our course of action, to prefer that one which is based on a greater body of knowledge?’ (Keynes, 1921); and Feduzzi (2010:341) answers: ‘we will be more confident that our forecast is an appropriate guide to action in the case of the probability with higher evidential weight rather than in the case of a *priori* probability’. This is the Ellsberg paradox: under two similar probabilities, agent will find a more appropriate guide to conduct the option holding the highest evidential weight¹¹. Having said this, we can establish a possible explanation of a economic crises starting from a normal or tranquil economic scenario:

1) Agents shall form a probability assessment *H/E* over the future using the *status quo*, conventions, follow the crowd and the ‘business as usual’ criterion as Keynes had

¹¹ In Scotland, it is sometimes not possible to convict someone even if all the evidence led points to the guilt of hat defendant, if that evidence is in a sense small relative to what could potentially have been known about the situation (i.e., low weight). This is solved appealing to at least two sources confirming the evidence (See Feduzzi, 2010, p. 349).

established. For this probability assessment there is a set of evidential weight which equal the total relevant knowledge of a probability relation (V).

2) The vision of the analyst/economist shall become new evidence supporting the expectation formed by the agent. As different opinions over a possible outcome might hold between different analysts the final impact will not be unique.

3) If the agent takes as relevant the optimist prospect (established, let us say, by economist A), probability will presumably increase and the weight will rise (K growths)

4) If the agent takes as relevant the pessimist prospect (established by economist B), probability will presumably decrease and the weight will fall (I growths).

5) 3)&4) denotes that the agent is confronted with ambiguous information but he or she has to pick one of the two positions. Taking Keynes approach, agents will choose the option with higher evidential weight. Here, evidential can be interpreted through different channels: the reputation or public influence of the economist (for example, mainstream economics) and/or the state of confidence itself meaning that, when the economy is in the upward cycle the optimist opinion gather firm (the status quo confirmation biases); but in a depression the pessimist opinion is the chosen one. The persuasion of the message and the evidence behind each side is crucial to convince the agent. Therefore, there exists a measure of effectiveness behind every argument.

6) The rationalizations of observed performance functions for the agent as the evidence supporting an expectation, which makes him or her more certain in order to inform a decision due to higher evidential weight. At certain moment, independently of the expert opinion, agent might learn new things which makes them feel more uncertain or ignorant compared (I increases) with what he or she had previously believed. If the behavior of the economy presents serious challenges to previous beliefs, the weight (V) falls. Then, the possibilities of a crises increases.

The problems involved in defining more or less appropriate heuristics to evaluate and act upon information depend on the time scales, both of the processes concerned and the questions that solicit an analysis or a choice from the agent. Feduzi (2010) points the problem is establishing how much evidence is sufficient to inform a decision but the

absence of a rational criterion to establish specific rules is not helpful. In normal times, people carry out daily activities with the implicit assumption that the environment will not experience rapid unforeseen changes¹². The breakdown in the presumption of 'business as usual' over short time spans is precisely one of the characterizing features of crises and episodes of extreme macro instability, and the source of considerable economic disturbance in those instances. Conversely, the chances of big, system-wide rewards or disappointments would emerge especially when the outcomes of decisions depend in some way on the accuracy of anticipations about economic variables over long time horizons. A crisis would then negate the validity of modes of analysis in fashion at their time as new evidence emerges.

The forms of reasoning prevalent on the road to a crisis may have been mistaken, but this does not imply that they should be viewed as arbitrary: 'there is always a very real basis [of real opportunities to invest lucratively] for the 'new era' psychology before it runs away with all its victims' (I. Fisher, 1933). 'Irrational exuberance' and primary impulses certainly play a role in booms and busts (cf. Shiller, 2000, Akerlof and Shiller, 2009): as a general feature, the weight of emotional influences on decision-making seems theoretically and experimentally well determined (e.g. Damasio, 2003), and it is probably stronger in circumstances like large economic ups and downs where the fate of individuals and organizations can change dramatically. Keynes famously affirmed that 'a sufficient supply of individuals of sanguine temperament and constructive impulses who embark on business as a way of life, not really on a precise calculation of prospective profit...' may make the market '...subject to waves of optimistic and pessimistic sentiment...where no solid basis exists for a reasonable calculation' (Keynes, 1936:154). However, there is also much cold logic in the decisions that result in a crisis. 'Slow thinking' (Kahneman, 2011) does use the mind's rational faculties, but does not lead necessarily to rational expectations in its usual sense.

5. The international crisis: some evidence and rationalizations

A quite long list of candidates has been put forward as possible factors in the generation of the bubble that burst in the recent international crisis. Among the most important are:

¹² Skidelsky (2009): 'The chief of these are the assumptions that the future will be like the past'.

1. Errors in the design and implementation of monetary and financial policies, reflected in too-low interest rates and a lax regulatory environment which allowed excessive degrees of leverage and, especially, the growth of markets for sophisticated credit instruments like ABS (Asset-backed securities), CDO (collateral debt obligations) and CDS (credit default swaps). Those products were the result of the mortgage securitization, which developed rapidly as the US real estate market boomed. ‘Mortgage volumes, including subprime crisis subprime mortgages, increased significantly in this time period. As those loans became securitized, uncontrollable risk-taking commenced.’ (Svetlova and Fiedler, 2011: 153)
2. Malincentives in the re- packaging and sale of assets, which made loan issuers unconcerned about the potential repayment of debts: ‘Accordingly there was a great profit incentive for mortgage originators to search out any potential home buyers (including subprime ones) and provide them with a mortgage. The originator could then profitably sell, usually within 30 days, these mortgages, to an underwriter, or act as underwriter to sell to the public a package of exotic mortgage backed securities (MBS). The originator therefore had no fear of default if the borrower could at least make his first monthly mortgage payment’ (Davidson, 2009: 192).
3. The rising inequality trend in the US (along with other economies) which was associated with stagnant or declining real incomes of large segments of the population: the impact of these developments on demand may have led sellers to use credit expansion as a compensating device, with the consequence that financing was granted to ultimately insolvent borrowers (cf. Rajan, 2010).
4. The US was a major contributor to the ‘global imbalances’ through its current account deficit, which reflected low savings levels, and was financed in part by credit originated in China’s large trade surpluses.

These flows fueled an asset market boom in the US, the reversal of which was to be disruptive (cf. Obstfeld and Rogoff, 2007).

The potential pertinence of these effects in the specific case of the US is quite clear. However, a more demanding question would be whether, individually or jointly, they may represent necessary or sufficient causes for a crisis. The answer seems to be negative. Large-scale crises have been observed in economies with tightly constrained monetary policies and a set of relatively few and simple financial contracts, lacking the extremely complicated instruments that were traded in the US, and the markets for securities that 'dispersed' the risks of classes of credits like mortgages. Recent history also shows examples of crises in countries where income distribution had improved significantly during the boom (e.g. Greece; cf. Gialdi, 2012), and in economies running current account surpluses (e.g. Japan). Conversely, the arguments just sketched do not identify sufficient conditions, because they do not provide an explanation of how and why bad debts are generated.

Since a central element of a crisis is a large-scale non-fulfillment of contractual obligations, at some point, there must be a frustration of previously held expectations. In fact, those features of the economy that retrospectively came to be generally seen as sources of weakness and fragility were apt to be interpreted quite otherwise in their time by large and influential sectors of the public, so as to contribute to strengthen the confidence or the complacency of agents. Monetary policies that kept interest rates low could be viewed as promoting real growth, in the context of a macroeconomic 'great moderation' (Blanchard and Simon, 2001, Bernanke, 2004a), marked by strong demand and by persistent output increases with smaller volatilities and an absence of inflationary pressures. In turn, such performances were interpreted as an indication of the success of economic policies in dampening macro instabilities, and a mark of the ability of the macro analysis in use to provide guides for that purpose¹³.

Although there was some discussion about whether the central bank should be concerned about asset prices and not only about inflation in goods prices (cf. Bernanke, 2004b, Geithner, 2006), the prevalent opinion (known as the 'Greenspan doctrine') held that there were no strong reasons to lean against upswings which could well be based on real

¹³ Cf. Lucas (2003): 'the central problem of depression-prevention has been solved'; Blanchard (2008): 'The state of macro is good'.

economic improvements and, in any case, if the asset-price movement eventually proved exaggerated and was reversed, policies could intervene to prevent the propagation of the shock, an argument which evoked the comparatively small macroeconomic impact of the reversal of the dot- com bubble some years before. Financial deregulation (embodied, in particular, in the repeal of the Glass- Steagall act that segmented the credit market in order to cushion the effect of asset price fluctuations on commercial banks) was supported by most of the mainstream analysts and practitioners (cf. Zappia, 2012); the securitization of loans through derivatives of intricate design was seen as an ingenious form of diversifying risk and tailoring exposure to shocks to the specific conditions of asset holders; thus, the large earnings in the financial sector could be viewed as rewards of the real contribution of high- skilled productive activities¹⁴.

Behind these sanguine —and sometimes self-congratulatory— attitudes was the notion that real forces were changing the trend of the international economy in a way that would raise incomes and sustain higher asset prices. This supported the perception that a real estate bubble was ‘most unlikely’ (Greenspan, 2004), and that that home-price increases ‘largely reflect strong economic fundamentals’ (Bernanke, 2005). The high spending in the US, and the associated international borrowing was interpreted as a more or less natural consequence of the strong propensity to lend in economies like China, Japan, Germany and Middle Eastern countries (a ‘global savings glut’), and the attractiveness of the US as a supplier of presumably safe assets (cf. Cooper, 2004, Clarida, 2005, Backus and Lambert, 2005, Bernanke, 2005, Bernanke 2007). The strong supply of funds, it was argued, was matched on the demand side by good investment prospects, as institutional and structural features of the US economy, such as the flexibility of labour, capital and product markets, made it especially well-suited to capitalize on the opportunities afforded by revolutionary new technologies.

The vision of a ‘new economy’ could lead to interpret that, as summarized by Eichengreen (2005), ‘U.S. consumption exceeds U.S. production because Americans stand to benefit disproportionately from the high return on investment in the United States. The anticipated rise in future incomes is captured by the ratio of household

¹⁴ See, for example, Reinhart and Rogoff (2009): ‘the top employees of the five largest investment banks divided a bonus pool of over \$36 billion in 2007...’, while ‘... leaders in the financial sector argued that their high returns were the result of innovation and genuine value-added products’

stock market wealth to personal disposable income, which rose strongly in the 1990s. Together with the ratio of household residential property wealth to personal disposable income and the yield on a ten-year Treasury bond, this stock market variable can explain most of the variation in U.S. personal savings rate in the last 40 years.’. Those opinions were shared in policy circles: Greenspan (2002) envisaged the emergence of a ‘productive miracle’, as the benefits of electronic technology propagated throughout the economy as a whole, creating a prosperity- enhancing structural break. And, in any case, the implicit belief in the validity of the efficient market hypothesis (E.M.H), in its strong version or in the form that ‘the private sector can judge the equilibrium [housing] prices at least as well as any government bureaucrat’ (Reinhart and Rogoff, 2009) supported a hands- off policy approach.

Thus, wealth estimates seemed to be significantly exaggerated and risks severely undervalued; this is a central ingredient of a large boom- bust business cycle (cf. Heymann and Sanguinetti, 1998). Seen in retrospect, the judgments of large and authoritative groups of academics, policymakers and market participants shared a strong misperception of the economic process they were watching and deciding on. Although cognitive distortions (such as confirmation biases) may have played a role in those errors, these do not appear to have originated from ‘emotional’ or ‘irrational’ (in the usual sense) responses, but were maintained for considerable periods of time by highly skilled individuals trained specifically for complicated analytical tasks. While the crisis strongly contradicts the assumption of optimal use of information as in the E.M.H in its different forms, the agents who surfed with the tide were not simply over-enthusiastic amateurs or mere extrapolators of past data: the judgments of numerous academics, experts and policymakers could provide sufficiently strong support for the belief that it was right to ignore the dangers of a buildup and subsequent burst of a bubble.

All these testimonies do have a common pattern which relates to what we had established in section 4: conventional opinion may end up inducing decision- makers to perceive an unwarranted weight of evidence, with the macroeconomic result of building up excessive trust on the persistence of conditions which, after the fact, will be seen as unsustainable. The connection between these stylized facts about pre-bubble speeches and the Keynes approach over decision making seems to be clear. Even in tranquil

states of the world, economic agents face deep uncertainties regarding the future. While some construction over decision making is based more or less on real perceived notions ('the probability, its merits'), there are some deep shadows where confidence ('the weight') shall play a determinant role. People will be more confident in their forecast as long as more evidential weight exists. This is true both for the agent when he or she has to pick one opinion from different expert opinions and, later on, to use the selected evidence to increase or decrease the weight. The 'business as usual' criterion and the persistence of the status quo in a phase of economic growth will help to the cause of the expert arguing for a hands-off policy approach. Crucial to our argument, a probability assessment over an economy cannot be enough to inform of a decision, but the probability combined with the weight might be. A good state of confidence might depend on good arguments—the rational explanation behind an argument—and good arguments are associated with opinion leaders and 'heavy weight' characters.

This pattern can also be observed through the whole spectrum of macroeconomic crises: the expectations that sustained the ultimately inconsistent behaviors in the upward phase were rationalized, sometimes by very sophisticated arguments, which gave a biased interpretation of undisputable observable evidence. 'Why did nobody see it coming?' the Queen of England snapped at her academic interlocutors (cf. Svetlova and Fiedler, 2011). The question carried a complaint, but also an analytical challenge for epistemologists and economists, to understand when, how and why prevalent intellectual and practical views of the world end up misinterpreting economic trends in such costly ways.

The crisis came, and then, 'the entire intellectual edifice collapsed' (Greenspan, 2008). The economic system was disturbed by shock hitting not from the outside but from its own core. A crisis represents by its very nature an occasion for large re-evaluations of economic opportunities and choices, in a rapidly changing scenario. While the upward phase is marked by a probably slow drift of sustainable economic trends away from the expected evolution, marked by 'the development of increasingly optimistic forecasts alongside economic forces that cannot justify those expectations' (Harvey, 2010), the eruption of the crisis sharply shortens time horizons: agents must decide 'on the spot', and the economy appears to be near a bifurcation, so that its future seems to be at stake from one moment to the next (Heymann and Leijonhufvud, 2014).

In these moments, the real-life economic experience corresponds to the image of crises as circumstances which evoke ‘the turning points of a disease’ where ‘significant events or radical changes’ are taking place and ‘difficult or important decisions must be made’¹⁵. At the same time, the crisis is likely to trigger widespread reconsiderations of the propositions that rationalized the previous boom as fundamentally sustainable: the weights of different arguments and the claims subject to the burden of proof will be shifted around; new commonsense views may replace those that the crisis appears to have made untenable, as Keynes claims in his 1937’s *Quarterly Journal Article* that ‘the practice of calmness and immobility, of certainty and security, suddenly breaks down. New fears and hopes will, without warning, take charge of human conduct. The forces of disillusion may suddenly impose a new conventional basis of valuation’. The changes in beliefs and perceptions will influence the economy’s performance years ahead.

6. Concluding remarks

Economies are evolving systems driven by the behavior of agents who are actively engaged in learning about the behavior of an environment that they generate collectively. Crises are particularly dramatic manifestations of the co-evolution of macroeconomic performance and the working models that economic actors employ in their decision- making processes. These should be trivial observations; however, they have become obscured by the standard practice of macroeconomic analysis.

For several decades, the rational expectations framework has claimed, and has been granted, a predominant position, often in the name of analytical rigor and precision. But the usual RE models rest upon conceptually shaky grounds, on which it is unfeasible to base an analysis of crises. In some contexts, the RE hypothesis is assumed to imply that agents form their expectations as if they had knowledge of the actual laws of motion of the variables of interest. But this would deny all relevance to the ‘search for lessons’ by private agents and policymakers which is a noticeable element of observed behavior and, despite the energy spent by analysts in producing presumably new and improved arguments, the activity should be seen –by the economists themselves, in the first place– as lacking any concrete use.

¹⁵ See <http://www.oxforddictionaries.com/definition/english/crisis>; <http://www.merriam-webster.com/dictionary/crisis>.

The consistency issues do not improve if the RE hypothesis is assimilated to 'model consistency', as a correspondence between the analytical scheme that the economist proposes and the expectation-generating apparatus of the agents. The models change over time: that much should be taken as a matter of fact. When validated using historical data, the expectations formed with the current model are assumed to be better than those that the analyst would have constructed in the past (and, in that sense, all previous models would not embody rational expectations as the best possible forecasts) but, when applied for predictive purposes, agents are assumed to act as if the present model will be applicable for all times, when it is common knowledge that new models will replace it rather sooner than later, and perceptions of uncertainty (if not of mean expected values) should be sensitive to this fact.

We had commented on ways to move ahead, with reference to Keynes's contributions on probability and weight. The incision we made between the analyst/expert and the economic agent and how different prescriptions as an *output* of the former impacts as an *input* in the latest has not been studied in deep by the literature. The Keynes work contributes as a formal framework to study how agents make decisions. Thus, the analysis of macroeconomic crises requires addressing the changes in the perceptions and interpretations of the economy which take place over time as history unfolds, and which condition observable behavior. This would open a wide field of exploration about the ways in which actual agents, as well as analysts, revise their views about future opportunities and constraints as the economy evolves, and how they calibrate and process the uncertainties in their beliefs.

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