

Knowledge in Finance: Objective Value versus Convention

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Introduction

The idea that economics deals with *objective* values plays an absolutely fundamental role in the way economists consider the singularity of their discipline. In their eyes, economics can be distinguished from the other social sciences precisely because it deals with objective constraints, constraints of scarcity, which are imposed on all agents, whatever their beliefs, whereas disciplines like history or sociology study facts of opinion, the meaning of which varies from one group or society to another. It would not be an exaggeration to say that economists construct the core identity of their discipline *against* competing disciplines through the play of this paradigmatic opposition between the flexibility of opinions and the objectivity of values. In a 1908 conference at the French Society of Political Economics, on the question of “the position of political economics in the social sciences”, Émile Durkheim (1975 [1908], 219-220 [our translation]) pointed out all the limits of this opposition. In reply to the question raised, he started by stating that:

“What makes this question difficult is that, at first sight, political economics appears to deal with facts of a very different nature from the other social sciences. Morality and law, which form the subject matter of the other specified social sciences, are essentially matters of opinion. Wealth, which is the subject of political economics, seems on the contrary to be essentially objective and independent of opinion”.

But he immediately followed this by affirming that, in his view, this distinction is not valid:

“However, the present speaker believes that economic facts can be approached from another viewpoint; they are also, to a degree that I will not attempt to define, a matter of opinion. For the value of things depends, not only on their objective properties, but also on the opinions held about them. Doubtless, these opinions are partly determined by the objective properties; but they are also shaped by many other influences. If religious opinion should forbid a certain drink – wine, for example – or a certain meat (pork), then wine or pork would lose some or all of their exchange value. Likewise, it is movements in opinion, in taste, which give their value to one fabric or precious stone rather than another...”

This led him to conclude that:

“From this point of view, the relations between economic science and the other social sciences appear in a different light. They all deal with phenomena which, considered at least from certain angles, are homogeneous, because they are all, in certain respects, matters of opinion... Political economics thus loses the predominance it has invested itself with, to become a social science alongside the others, in a close relation of solidarity with them, with no valid claim to rule over them.”

In other words, Durkheim was warning economists that the hypothesis of objectivity should be treated with circumspection. He pointed out that the determination of many economic

values is highly dependent on the social context. This is, in his eyes, an empirical fact that cannot be denied. He also observed that there was nothing dramatic about accepting this fact, but on the contrary, it should help to bring economics and the other social sciences closer together, by establishing a “close relation of solidarity” between these disciplines. According to Durkheim, the key to the rapprochement he was calling for lay in the acceptance by economists of the role played, even in economics, by phenomena of opinion. To his great surprise, this analysis was met with widespread and unequivocal rejection by the economists at the conference. M. Edmond Villey even said that he “felt rather scandalised”. He declared: “Opinion [...] does not determine value, which is determined by rigorous natural laws ... it is always the law of supply and demand, completely independent of opinion, which determine prices as it determines all values” (*ibid.* p. 223). M. Paul Leroy-Beaulieu went further: “political economics stands above the other social sciences: it is the only one to have an indestructible and positive foundation, and its laws are immutable, however opinions may vary” (*ibid.* p. 225). This is a good illustration of the forceful resistance displayed by economists when the hypothesis of objectivity is brought into question or when the idea of opinion is introduced. Faced with the violence of this reaction, which he obviously hadn’t expected, Durkheim pointed out that the concept of opinion should not be understood as a pejorative term, a synonym for prejudice or unconsidered feelings: “This would mean only seeing one aspect of opinion”, he said. “We must not forget that opinion is also the result of experiments that peoples have made over the course of centuries; and this fact does lend it some authority” (*ibid.* 223). But this refinement of his argument had no effect.

As far as we can generalise about modern economists, they hardly appear to have evolved on this matter. Their spontaneous philosophy remains unchanged, and the hypothesis of objectivity still has pride of place. This philosophy can be described as “objectivist” or “naturalising” in that it considers economic and financial equilibrium as a successful adaptation to predefined natural constraints of scarcity. The evolution of prices is determined by the fundamentals (resources, technologies, consumer preferences, market structures). The opinions and beliefs of agents play little or no role in such an analytic framework. The concept of opinion is rejected because economic theory generally conceives of the economic world as an objective world, free of ambiguity, which can be known in the same way that physicists know the natural world. The idiosyncratic beliefs of different individuals are of little importance because, in such an analytic framework, the objectivity of the facts cannot fail to impose itself on rational, informed individuals. This criticism of modern economists may seem too unequivocal if one considers all the work carried out on “self-fulfilling prophecies” or “sunspot equilibria”. The particularity of this work resides precisely in the fact that it considers situations in which economic equilibria are dependent on the collective opinions of economic agents. Here, assuredly, lie avenues of research that could transform economic theory. In the current state of research, however, these avenues remain largely unexplored, and I believe that this is precisely because the majority of economists continue to share an objectivist view of the world, relegating these phenomena of collective belief to the outskirts of economic theory, more as curiosities than as hypotheses deserving serious exploration and deepening.

The present text seeks to define the terms of our analysis more precisely, on the basis of a specific investigation of finance theory. We shall move away from propositions about the knowledge of economic agents in general to concentrate on the way in which this knowledge is envisioned in the realm of finance. In the first section, we shall return to the hypothesis of objectivity to bring to light the specific form it assumes in the sphere of financial relations. In this case, it is the question of the relation to the future which is central. We shall demonstrate that the hypotheses made about the way individual investors anticipate future yields from securities are highly conditioned by the hypotheses made about the very nature of the future.

Because this future is conceived as existing objectively in a probabilistic form, it follows that an “accurate estimate” of the value of the securities can be defined *ex ante* and without ambiguity. The concept of informational efficiency, which plays such an important role in finance theory, can be directly deduced from this. The market for security A is said to be informationally efficient if the price formed at time t is equal to the fundamental valuation of the security. In the second section, we shall show that the hypothesis of the objectivity of the future raises several problems, even in a probabilistic framework. This will lead us to challenge the idea that it is possible to define, at time t , such a thing as a “true estimate” of the value of securities. On the contrary, we contend that only *subjective* estimates can be made of this value, and that these estimates are inherently diverse and heterogeneous. This is a central point in our analysis: knowledge of the future cannot be objective; it is irreducibly subjective. To demonstrate this, we present a thought experiment in which we set two investors face to face, each defending a different estimate of the same security, and we shall show that these two agents, even if they are rational and perfectly informed, can perfectly well maintain their divergence, without there being any rational argument or objective information to sway them. We shall use the term opinion to qualify these subjective, informed, rational beliefs. This idea that, in a financial market, diverse opinions about the value of the same security can rationally coexist leads us to uphold that it is impossible to define *ex ante* such a thing as a unique “true estimate” or fundamental valuation. This impossibility poses a radical challenge to the idea of informational efficiency, to the extent that it is no longer possible to determine *ex ante* an estimate to serve as a yardstick by which to measure the capacity of the market accurately to evaluate securities. Consequently, the concept of bubble, itself defined as a persistent gap between the fundamental value of the security and the price observed, also loses its meaning. Finally, in the third section, we shall seek to demonstrate that taking the concept of opinion into account does not strip finance theory of all meaning. We shall focus our attention more particularly on the market price itself. What is the nature of this price? What collective knowledge does it express? How does one move from a set of heterogeneous opinions to a unique market price? The most direct answer consists in interpreting this price as the sum total of individual subjective estimates, weighted by the capacity of each investor to influence prices. This has the advantage of simplicity, but it treats the market price as a pure “artefact” emerging mechanically from competitive interactions, with which it is difficult to associate a specific vision of the future. Yet empirical observation of markets and economic theory both underline the central role that price plays as an expression and vector of a certain conception of the future, a conception to which all investors can refer, either to accept it or to reject it. These observations lead us to discard this first interpretation and to propose an alternative analysis, in which the financial market is seen as a cognitive machine whose function is to produce a reference opinion, perceived by all the operators, not as the improbable product of a sum total of more or less well-informed opinions, but as an expression of “what the market thinks”. This is because of the self-referential nature of speculation, where each individual makes his/her mind up according to what he/she anticipates the majority opinion to be. Here we have an example of the Keynesian “beauty contest” model. Basing our argument on the works of Mehta, Starmer and Sugden (1994), we shall show that market price has the nature of a salient opinion which imposes itself on agents. It follows that the price can be considered as a convention¹. We are now far removed from the objectivist theories we started with. We have moved from a world in which a true, objectively-given representation of the future is considered to exist, to a world in which the representation of the future is not a fact of nature, but the result of a self-referential process of shared beliefs. This representation is neither

¹ The concept of “convention” appears in Chapter 12 of the *General Theory*, but with a slightly different meaning to that used in the present text. For a discussion of the different meanings given to the concept of financial convention, see Orléan (1999, 125-145).

natural nor objective, but historically and socially constructed. However, this does not mean that the standard analysis has been entirely rejected. Our paradigm retains the idea of competitive price formation and, consequently, the assumption of no arbitrage. What distinguishes the conventionalist approach is the way in which the collective knowledge produced by the market is apprehended. From this point of view, the standard analysis appears rather as a particular case within the conventionalist analysis, a particular case in which the convention is adhered to with such force and unanimity that each person is convinced of its absolute veracity, to the point of seeing it as an exact representation of the future. From the observer's point of view, it may appear that the representation adopted by the market is chosen because of its objectivity. In conclusion, this reflection leads us to propose an analysis of financial markets fully in keeping with Durkheim's observations. Instead of considering it as an objective fact, the representation of the future, conveyed by prices, is seen to be the result of a self-referential process of opinion.

1. Efficiency theory and the hypothesis of the objectivity of the future

The fundamental value of securities raises particularly difficult questions for economic theory, questions involving the nature of the knowledge that a human society can acquire about its own future. This becomes clear when we remember that the fundamental value of a share is grounded in the flow of future dividends that the possession of this share will provide for its owner. If we set aside the question of discounting, by assuming that it takes place at a constant rate, denoted r , then this fundamental value can be written formally as follows:

$$[VF] \quad VF_t = \frac{D_{t+1}}{(1+r)} + \frac{D_{t+2}}{(1+r)^2} + \dots + \frac{D_{t+n}}{(1+r)^n} + \dots$$

where VF_t denotes the fundamental value of the share at time t and D_{t+n} denotes the dividend paid at time $t+n$ by the company concerned. The nature of the estimate that can be made of this value, at time t , is highly dependent on the way we analyse, at the present time, the "reality" of the future dividend at time $t+n$.

To put it simply, modern finance theory holds fast to the hypothesis that the future is objectively given in a probabilistic form. This basic hypothesis is already present in the Arrow-Debreu model of general equilibrium. It states that the future can be represented in the form of an exhaustive list of exogenous events or states of the world, assumed to describe everything that it is relevant for an economic agent to know. A given value of the dividend paid is associated with every state of the world e . So, a share is described by the payments it generates in each state: $d(e)$ for $e \in E$ with E being the set of all states of the world. If the future is an objective fact like any other, this naturally leads us to suppose that rational, well-informed agents will necessarily end up knowing it. Consequently, we shall observe the convergence of individual representations towards the "correct" representation, as long as the agents possess all the information and process it rationally. And this is the essential theoretical point which marks the specificity of the hypothesis of probabilistic objectivity of the future. The very existence of an objective future forms a reference which prevents the subjective drift of estimates by anchoring them in an objective foundation that rational activity cannot fail to recognise.

Adopting this very strong hypothesis, it is possible to define an optimal expectation at time t , namely that which makes the best possible use of all the available, relevant information, and which is, consequently, independent of the idiosyncratic opinions of the

agents. This expectation can be said to be “rational”. It is expressed mathematically, thanks to the conditional expectation operator, as follows:

$$[\text{AR}] \quad E[D_{t+n} | \Omega_t] = E_t D_{t+n}$$

It appears that the only relevant variable is Ω_t , the available, relevant information at time t . The fact that subjective opinions can disappear in this way is, as we have already indicated, a direct consequence of the hypothesis that the future is imposed objectively on every rational individual in such a way that, making rational use of his/her faculties of judgement, he/she is necessarily led to adopt this estimate. Here, the fact that this objectivity is of a probabilistic nature is of secondary importance. Elsewhere, I have suggested the term “fundamentalist” to describe the type of rationality at work here (Orléan, 1999, 65-66). Turned towards nature, it has the declared aim of elucidating objective truths. It is this rationality that underpins the mathematical expression of the equation [AR].

The hypothesis of informational efficiency (HIE) of financial markets is deduced from this. It states that the financial market is a space within which, thanks to the competition between rational agents, the price formed at any given moment is the best possible reflection of the fundamental value, given the information available. This can be simply written as follows:

$$[\text{HIE}] \quad P_t = E[VF_t | \Omega_t] = E_t(VF_t)$$

This is exactly how Fama (1965) defined the concept of efficiency in financial markets: “In an efficient market at any point in time the actual price of a security will be a good estimate of its intrinsic value” (Fama, 1965, p. 56). Or again: “In an efficient market, the actions of the many competing participants should cause the actual price of a security to wander randomly about its intrinsic value” (*ibid.* p. 56). This conception is founded entirely on the assumption that it is possible to define, at time t , an accurate and unequivocal estimate of the intrinsic value. Otherwise, these definitions would make no sense. Within this theoretical framework, the fundamental value objectively pre-exists the financial markets, the central role of which is to provide the most reliable and precise estimate, in accordance with the equation (HIE). Consequently, we can say that the hypothesis of informational efficiency sees finance as a faithful “reflection” of the real economy. From this perspective, financial evaluation has no autonomy, and it is precisely for this reason that it can be put entirely at the service of the productive economy, to which it delivers the signals that enable capital to be invested wherever it will be the most useful. Competition is no more than a stimulus towards obtaining this result. The real cognitive force at work here, the one truly responsible for achieving this result, is fundamentalist rationality, in other words the capacity of investors to “defeat the dark forces of time and ignorance which envelop our future” (Keynes, 1936, 155).

This conception of an objective future enjoys a very wide consensus within the community of economists. Before presenting the reasons that lead us to reject it, it would be interesting to consider why economists are so deeply attached to this hypothesis of objectivity. There appear to be three motivations, of varying levels of importance to our purpose.

The first, of a very general nature, has already been mentioned in the introduction. It involves the fundamental importance economists attach to the process of objectification in their very conception of successful modelling. A well-formed model is one which reconstructs the relation of individuals with their social and institutional environment in the form of a relation with objects or mechanisms. A prime example is provided by the neo-Walrasian

analysis of market transaction, which treats the different parameters that define the goods in a perfectly symmetrical manner, whether they involve the quality, the location or the time at which they will be exchanged. In such an approach, the relation to time is conceived along exactly the same lines as the relation to space or quality: it is denied all specificity. Subjective beliefs can play no role in such a context, because the individual is facing a social world reduced to objects determined *ex ante*: individual cognition is strictly reduced to rational calculation alone.

The second motivation concerns the belief, widely held in one form or another, that “without this hypothesis, there is no salvation”. It is often expressed in debates about the definition of uncertainty, debates which set the dominant probabilistic view, also called the risk approach, against the Keynesian or Knightian approach, which considers the possibility of radical uncertainty, where probabilities cannot be calculated. The idea is that in situations of radical uncertainty, the economist no longer has anything constructive to say. This is clearly expressed by Lucas in the following quotation:

“Unfortunately, the general hypothesis that economic agents are Bayesian decision makers has, in many applications, little empirical content; without some way of inferring what an agent’s subjective view of the future is, this hypothesis is of no help in understanding behaviour... John Muth (1961) proposed to resolve this problem by identifying agents’ subjective probabilities with observed frequencies of the events to be forecast, or with “true” probabilities, calling the assumed coincidence of subjective and “true” probabilities *rational expectations*... [This hypothesis will not be] applicable in situations in which one cannot guess which, if any, observable frequencies are relevant: situations which Knight called “uncertainty”. It will *most* likely be useful in situations in which the probabilities of interest concern a fairly well defined recurrent event, situations of “risk” in Knight’s terminology... In cases of uncertainty, economic reasoning will be of no value.” (Lucas, 1984, 223-4).

In this passage, Lucas explicitly limits the validity of economic reasoning solely to situations of risk, in the Knightian sense of the term, in other words situations in which a certain stationary condition of the world prevails. In this case, it is possible to use the frequencies observed as a foundation for individual estimates. Such is the character of the hypothesis of rational expectation: it identifies subjective probabilities with “true” probabilities. In the opposite case, what Lucas calls “uncertainty” in the Knightian sense of the term, economic theory, unable to postulate anything definite about individual estimates, “will be of no value”. Here, even the Bayesian hypothesis is insufficient, as it tells us nothing about *a priori* probabilities. This analysis therefore leads economists to restrict their conception of the future to a stationary condition. This is hardly surprising. It is obvious that the hypothesis of probabilistic objectivity of the future is only of practical use when one assumes world exhibits a certain stationarity, without which it is hard to see how this objective future could be the object of positive knowledge. For this reason, the two hypotheses, although they are distinct, often go hand in hand.

The third motivation is more complex. For our present purposes, it is the most interesting, even if no one has expressed it explicitly so far. As the positions involved are largely unformulated, the interpretation I wish to give is assuredly a perilous exercise. It may be that I am barking up the wrong tree and that these ideas only exist in my own mind. I shall try to explain what I believe to be the conception of certain colleagues in the domain of finance who adhere to the efficiency theory even though they are sceptical about the hypothesis of an objective fundamental value. They see this as a metaphysical question, of no practical consequence. Their implicit thesis is that the reasoning can be performed in terms of

subjective estimates without any effect on the overall construction. Clearly, the concept of subjective estimate is an easier category to handle than that of objective estimate: one cannot doubt that it is within the capacity of individual agents to form, at time t , subjective estimates about a value that will only be determined and perfectly known at time $t+n$. To quote Lucas again:

“At a purely formal level, we know that a rational agent must formulate a subjective joint probability distribution over all unknown random variables which impinge on his present and future market opportunities. The link between this subjective view of the future and “reality” is a most complex philosophical question, but the way it is solved has little effect on the structure of the decision problem as seen by an individual agent. In particular, any distinction between *types* of randomness (such as Knight’s (1921) distinction between “risk” and “uncertainty”) is, at this level, meaningless.” (Lucas, 1986, 223).

As we can see, Lucas contends that the exact nature of the uncertainty facing the agent is of no importance when it comes to subjective estimate. As far as individual estimate is concerned, Lucas may be right. But it cannot be concluded that this question is also of no importance for the theorist! The efficiency theory makes an absolute assumption that it is possible to define an “accurate” or “exact” estimate, failing which most of its statements would be meaningless. This estimate forms the yardstick against which the efficiency of market evaluations can be measured. From this point of view, the hypothesis of the objectivity of the future plays an essential role: it justifies the possibility that subjective estimates can converge, under the action of fundamentalist rationality alone, towards the same estimate, namely the optimal or rational estimate given by the equation (AR). In the absence of this hypothesis, the subjective estimate can only be seen as a pure opinion, inescapably subjected to the infinite variability of idiosyncratic interpretations of the world. It is then no longer possible to postulate the existence of a good estimate, one that is true to the objective structure of the economy. For this reason, resorting to subjective estimates alone is insufficient. What could “efficient” mean, in such a context? Consequently, the efficiency theory requires more: it requires the possibility of defining the “good estimate”, as the above quotation from Fama underscores. There is no escaping from the hypothesis of the probabilistic objectivity of the future, despite its metaphysical character.

So, we can sum up the motivations that lead economists from efficiency to the hypothesis of an objective and stationary future in the following manner. It is a vision that corresponds with the most deeply-rooted habits of economic modelling (Durkheim, 1908), a vision to which the large majority of economists are all the more strongly attached as they believe that its rejection would inevitably lead economic theory into a dead end. In addition, it may appear to certain theorists that this hypothesis can be reduced to the simple postulation of subjective, rationally-performed estimates. In this context, our approach consists in demonstrating that the hypothesis that the future can be known objectively doesn’t hold up, but that, despite the fears of economists, we can discard this hypothesis and still construct an analysis just as rich as that of the efficiency theory, and which contains this latter as a particular case. Further, we believe that this approach presents a much more realistic image of market finance. In this alternative construction, which can be described as “conventionalist” or “self-referential”, collective representations play a central role. The two following sections are devoted to a presentation of this alternative approach, which entails a fresh analysis of the way agents form their conceptions and their knowledge.

2. The irreducible subjectivity of fundamentalist estimates

To my mind, prevailing finance theory is unsatisfactory both in its conception of the future and in its conception of the knowledge that agents can form about that future. Several arguments can be put forward to support this criticism. The first consists in a direct attack on the idea of an objectively given future, on the grounds that this idea is incompatible with the free will of agents as modelled by this very same economic theory. If we believe in individual free will, then the future must be considered to be undetermined and contingent: it is the product of individual decisions, including those taken in the sphere of finance. To put it more precisely, how can we reconcile the hypothesis that the fundamental value is determined *ex ante*, even probabilistically, before the market transaction itself, with the supposed efficiency of securities markets in terms of the allocation of the economy's resources? If this efficiency is to have any meaning, then the securities markets must necessarily have an impact on the determination of profits and dividends, at least for certain companies. But if this is the case, then the fundamental value of the companies concerned is no longer determined *ex ante*, because it depends on effects produced by the securities market itself! Clearly, there is a fundamental logical contradiction in assuming simultaneously that the markets reflect a pre-existing reality and that their presence is capable of improving, and therefore transforming, the functioning of the economy. To resolve these difficulties, economic time must be considered as historic time, determined by the collective action of all individuals. Consequently, the idea of finance as a reflection of reality must be abandoned. This contradiction is only resolved in the very specific and perfectly unrealistic context of an Arrow-Debreu type Walrasian equilibrium, where all values, both present and future, are determined simultaneously. However, even this doesn't remove all the difficulties. In such a context, where profit is perfectly determined for every state of the world, what meaning can we give to security transactions? As Geanakoplos pointed out: "In Arrow-Debreu equilibrium, there is no trade in shares of firms... If there were a market for firm shares, there would not be any trade anyway, since ownership of the firm and the income necessary to purchase it would be perfect substitutes" (Geanakoplos, 1987, 121). The hypothesis of a transparent future renders securities markets redundant.

A second argument, of a Keynesian or Knightian nature, criticises the unrealism specific to this conception: have we ever seen such a thing as a description of the future giving an exhaustive account all the events that might possibly occur? "About these matters there is no scientific basis on which to form any calculable probability whatever. We simply do not know" (Keynes, 1937, 214). We can only conclude that estimates about the future have an inescapably subjective dimension; they are *opinions*. This is the argument we shall concentrate on in the rest of this paper. Not only does it avoid the metaphysical or philosophical complexity of the previous argument, but it can be directly applied to the domain of finance. The inescapably subjective nature of personal estimates can be seen in the fact that no procedure can be described that would enable the convergence of individual estimates of the fundamental value. This is a reality that can be empirically observed: two rational individuals, perfectly informed and with access to the advice of as many experts as they wish, can maintain divergent estimates, without either acting irrationally or contradicting observed facts. This is essentially because agents can, to justify their point of view, resort to the hypothesis of the non-stationarity of the economy, which creates a link with the idea of Keynesian uncertainty. When we accept the idea that something radically new can appear, then each individual is "free" to have his/her own personal vision of the future. This could be seen quite clearly during the "Internet bubble", when totally wild estimates were justified on the basis of extravagant fundamentalist scenarios. Those who pointed out that the hypotheses

contained in these scenarios required unprecedented growth rates or productivity levels² were told that they were singularly lacking in imagination, and that just because something had never happened didn't mean that it couldn't happen in the future. An irrefutable argument, and how true it turned out to be! But if one is permitted to reject the lessons of the past on the grounds, perfectly valid in themselves, that the world is not stationary and that new things are continually appearing in it, then one can eliminate all objections. There ensues an irreducible subjectivity of the fundamentalist evaluation, which appears to us to describe very accurately the situation of real economies. This result leads us to affirm that the fundamentalist estimate should be conceived as being a pure opinion. The reality of the world of finance is characterised by a radical diversity of opinions.

We can relate this result to the interesting reflections developed by Mordecai Kurz concerning what he calls "rational beliefs" (Kurz, 1994 and 1996). This author demonstrates that, in the context of a non-stationary economy, perfectly rational agents, possessing the same information, in this case exhaustive information concerning all the economic variables since the economy came into existence, can nevertheless form divergent beliefs. For us, as for Kurz, the essential issue here is that of non-stationarity, because it allows for a multiplicity of interpretations compatible with the data observed. On this subject, Kurz (1994) observes that it is not even necessary for the economy to be truly non-stationary, as long as the agents believe that it may be, because "there does not exist any statistical means by which agents can ascertain that a stationary system is, in fact, stationary."

The direct consequence of these analyses is that there does not exist any means of defining *ex ante* a "good" estimate of the fundamental value. There is only a set of divergent opinions, none of which can benefit from superior scientific legitimacy. In this connection, it may be relevant to note that credit rating agencies, whose financial evaluations can be considered the most objective possible, stress the fact that their ratings are no more than "opinions", protected by the first amendment of the American Constitution. They go so far as to compare the ratings they give to a newspaper editorial, "the world's shortest editorials³", and this is more than just legal quibbling to protect themselves against dissatisfied customers. Under these conditions, the concept of efficiency is disproved. But for many theorists, as we mentioned above, this represents nothing less than the outrageous provocation of a theoretical crisis. They believe that in such a state of affairs, it will no longer be possible to say anything positive. We hope to demonstrate that this is not the case: instead of assuming that there exists an objective representation of the future imposed on all the agents, we should rather consider the financial markets as the producers of conventional representations that serve as points of reference for investment decisions. As we see it, this is the only line of reasoning suited to the non-stationary nature of economic time. It is absurd to assume the *ex ante* existence of an objective knowledge of the future shared by all rational, informed economic agents. We must, on the contrary, suppose that this collective representation is produced by financial interactions, and varies with them. Before analysing the financial processes that lead to the emergence of the financial convention, we shall describe a few empirical intuitions about its contents.

At the most basic level, the financial convention can be simply defined as a shared way of interpreting future economic developments. One example of this would be the "New Economy convention", according to which the future of developed capitalist economies lay

² The only scenarios we can reject are those which fail to respect fundamental economic constraints, such as those, for example, which assume a profits growth rate structurally higher than the rate of economic growth. When this has been taken into consideration, there still remains a very wide diversity of estimates.

³ See the American Senate commission investigating the Enron affair, and more precisely the declaration of its chairman Lieberman, www.senate.gov/~gov_affairs/032002lieberman.htm

essentially in the diffusion of the new information and communication technologies (ICT). This convention prevailed in the international financial markets at the end of the 1990s. The belief was that with the appearance of ICT, capitalism was entering a new era of productivity marked by the end of traditional cycles. The result was a wave of excessive optimism about the future profitability of companies connected with e-business. As this event is undoubtedly still fresh in everyone's memory, we shan't go into great detail here. What we should point out, however, is that a convention determines more than just the definition of a "scenario of reference", however important that may be in the formation of expectations. We must go further, and also consider the battery of specific criteria it constructs to serve as a basis for the concrete valuation of companies. Thus, in the case of the "New Economy convention", faced with the difficulty of accounting for stock market prices solely on the criterion of profits, as most 'dot.com' businesses were loss-making, a new basis for making estimates appeared, in the form of "value per user". So the potential number of subscribers, visitors or customers was adopted as the strategic variable, supposed to enable the level of value creation to be assessed. This was a most unreliable hypothesis. Furthermore, the first company to develop the "e-commerce" of any given product was believed to benefit from a prohibitive advantage, making it the natural leader in the sector and endowing it with a large premium in its valuation. This reasoning was equally unsound.

To sum up, the financial convention comprises a certain interpretation of the future development of the economy, combined with a set of specific conventions about valuation. It serves as a reference to all investors, including for physical investment. It can be represented formally, in the Arrow-Debreu manner, as a distribution of probabilities of future events. However, instead of being considered as the "true" distribution of probabilities, it should be perceived as a conjecture chosen by market convention at a given moment. From a conceptual point of view, this is a fundamental difference. We no longer assume that there exists only one relevant representation of the future, or only one possible valuation of securities. Because the future cannot be known objectively, there exists a plurality of possible legitimate interpretations. These depend on the opinions of the market, and they cannot be entirely justified by a fundamentalist type of analysis. A good example is provided by the retail toy market studied by R. Shiller (2001, p. 176). At the beginning of the 1990s, this market was dominated by the venerable, long-established company Toys"R"Us. This domination was vigorously challenged by the newcomer eToys, created 1997, which threw itself headlong into the development of e-commerce. Comparing these two companies objectively, we have, on the one hand, a company with an undeniable wealth of savoir-faire and experience making, in 1998, a profit of 376 million dollars from a turnover of 11 billion dollars in 1156 shops, and, on the other hand, a company with no experience, making a loss of 28 million dollars in the same year from a turnover of 30 million dollars. In other words, eToys weighed the equivalent of three Toys"R"Us shops and made losses when its rival was making profits. And yet at the end of 1999, despite these eloquent figures, eToys was valued at 30% more on the stock market than the American giant of the toy industry! To value these two firms in such an absurd manner, the market had to believe not only that the entire future of the economy lay in e-commerce and that the first to enter this market would possess structural advantages, but also that older firms would be incapable of adapting to the new situation. The following years were to prove how misguided both of these judgements were. eToys went bankrupt in 2001, with a share value of no more than a few cents, while Toys"R"Us developed a successful internet business by forming an alliance with Amazon.

This is no isolated case. It provides a good illustration of the valuation criteria adopted by the "New Economy convention", and of the fact that these criteria were based on a very arbitrary conception of future economic development. As we have already pointed out, this valuation contradicts neither the observed facts nor rationality, but it has the character of one

conjecture among many. It has the status of opinion, of a belief in the anticipated omnipotence of e-commerce. In this sense, it should be described as conventional, which doesn't mean that it can be just anything. We mustn't forget that *ex post*, the investors can judge perfectly well whether or not the conventional predictions have proved to be accurate. This is an important fact, which greatly limits the arbitrariness of conventions. The interpretation of the future adopted by the convention must be backed up, if not by full verification, then at least by an absence of contradiction in the economic developments subsequently observed. For a convention to endure, the observed facts must be in keeping with the predicted facts. In other words, although the initial choice of the convention may be arbitrary to a certain degree, it must accord with economic reality to a certain extent, if it is to survive. This was demonstrated by the Internet bubble, which burst when the financial and technical efficiency of companies in the New Economy proved to be much weaker than expected. If, *ex ante*, "we simply do not know", *ex post* we can judge the accuracy of conventional valuations. Today, for example, we can say with certainty that the "New Economy convention" was erroneous, in that it resulted in an over-accumulation of capital in certain sectors. There is, however, nothing automatic about the falsification of a convention: it is only abandoned after a continual accumulation of anomalies. This is illustrated by the "Asian Miracle convention", which dominated the valuation of South-East Asian countries during the mid-1990s. During the first half of 1997, it needed a whole catalogue of bad news from the region (trading deficits, resounding bankruptcies, an increase in doubtful credits) before investors finally lost their belief in the "Asian Miracle convention".

These reflections have led us to relate the concept of financial convention to the concept of paradigm developed by Thomas Kuhn (Orléan, 1999). Kuhn, an epistemologist, proposed this concept to analyse the way in which scientific communities organise themselves, choosing certain promising lines of research and rejecting the others. The link with our own subject of reflection lies in the fact that these communities, like stock markets, are faced with Keynesian type uncertainty, as there is no objective basis for determining which fields of research or theoretical hypotheses should be favoured. Given these conditions, how does the scientific community organise its research work? Kuhn says that it chooses a "world view", partly arbitrary, and sticks to it as long as it is not totally discredited by a *persistent* accumulation of anomalies. Contrary to the mechanical application of the Popperian idea of falsification, in the case of an isolated contradiction between the adopted theory and the observed facts, the paradigm is not immediately abandoned. Indeed, it is thanks to this property that the dynamism of scientific enterprise can find its full expression. Without it, research would constantly be impeded by the occurrence of problematic results, not immediately in keeping with the predictions of the paradigm. The paradigmatic organisation, when faced with such problematic results, gambles that they are only local anomalies that will later be solved, without requiring for the whole system be called into question. This is a method of proven effectiveness. I believe that the financial community proceeds in a similar fashion. It doesn't abandon a convention at the first sign of incoherence. There must be a series of cumulative anomalies before investors react. This avoids the risk of discarding a convention which may otherwise give good results on the strength of a few isolated, ambiguous facts.

This comparison brings out the fully rational character of the conventional organisation of knowledge, as it draws its model from the most rational of all human activities, that of scientific research itself. This leads to an analysis that sees financial markets as cognitive structures, "collective cognitive systems" (Favereau, 1989) that produce diverse conjectures, certain of which are then selected. There is an irreducible element of arbitrariness in this selection, deriving from the Knightian uncertainty surrounding the question involved. For this reason, it is not possible *a priori* to be sure of having made the right choice. Consequently, the

choice of one convention rather than another necessarily takes the form of a gamble. This is in no way a constraint that can be surmounted, because in a domain dominated by Knightian uncertainty, *it is the best one can do*. Valuations and investments are produced on the basis of collective adherence to this gamble, and these, in return, shape economic reality. As long as what is produced is in accordance with predictions and satisfactory for investors, the convention endures. But when the observed facts are too far in contradiction with the prevailing conventional representation of the world, then anomalies accumulate and the market ends up abandoning this convention and seeking another. This historical dynamic that produces a partly arbitrary selection, temporarily confirmed in the facts that it helps to produce and eventually discarded when its time has passed, is similar to that described by Schumpeter in relation to the cycle of technological innovations. In both cases, the idea that criteria might exist enabling the right choice to be made *ex ante* and with certainty must be rejected. In other words, this analysis presents us with a fully historical temporality, made of trial, error and learning, in which there is no optimality and above all no *ex ante* optimality. The future is radically undetermined. It is the result of individual choices which are themselves dependent on the way in which agents conceive their future. As Schumpeter had already observed, the central error in the orthodox approach is the wish to defend the *a priori* optimality of choices in a domain – the evolution of human societies – where this makes no sense, unless we abandon the perspective of historical time for that of logical time. The model of trial, error and learning is the only appropriate model for a historical conception of time. In such a context, the development of individual and collective knowledge cannot be understood solely on the basis of the fundamental economic data, for it also depends on other factors, such as the various beliefs and values that structure the social environment⁴. Where the traditional economic model considers the development of knowledge as a reflection of objective reality, our model considers collective knowledge as resulting from the financial interactions themselves. The central issue is to understand what it is that causes the emergence of one unique conventional valuation of reference out of a heterogeneous group of individual beliefs. And the key to this understanding lies in the concept of self-referentiality.

3. Collective beliefs and salience: the self-referential approach

The empirical illustrations presented above are all founded on the implicit hypothesis that, at a given moment in time, a unique conception of the future development of the economy becomes established in the market, what we have called a “financial convention”. Within the Arrow-Debreu approach, this hypothesis can be directly deduced from the hypothesis of the objectivity of the future. This theoretical approach maintains that there exists an accurate representation of the future development of the economy, which is reflected in prices. How can the hypothesis of a single representation continue to be accepted within our analytical framework? To the extent that we hold knowledge of the future to be a matter of heterogeneous, idiosyncratic opinions, can it be justified to apprehend the market price as being the expression of a unique, coherent representation of the future rather than the chaotic reflection of divergent views? In other words, by what miracle does a unique representation end up prevailing in a world of heterogeneous opinions, all equally rational and well-informed? This is the essential theoretical question, and it is of fundamental importance: we are judging the financial market’s ability to produce a coherent representation of the future, to serve as a reference for investors.

⁴ Popper himself repeatedly stressed the fact that scientific theories are dependent on the metaphysical conceptions of their authors. There is no such thing as a direct expression of the facts.

One way to tackle this question is to assume that each agent fixes his demand for securities on the basis of his personal conception of the fundamentals, without any reference to other existing conceptions. Let \mathcal{R}^i denote the representation specific to investor i . On the basis of this representation, the financial investor i can infer a certain distribution of the future price and dividend. To illustrate, let us consider a much simplified situation in which the N investors only have the choice between a non-risk asset yielding the rate r and a share. Let us assume that the N investors all have a CARA-type utility function. Then the net demand of individual i for this share at time t , which we denote $X^i(t)$, can be written:

$$[D] \quad X^i(t) = \frac{d^i(t+1) + p^i(t+1) - (1+r)p(t)}{a_i V^i(t+1)}$$

where $d^i(t+1)$ is individual i 's expectation, at time t , of the dividend $d(t+1)$ that will be distributed at time $(t+1)$; $p^i(t+1)$ is the expectation of the price $p(t+1)$; $V^i(t+1)$ is the expectation of the variance of price at time $(t+1)$, and a_i is the risk-aversion of this same investor i . On these bases, it is not very difficult to find the equilibrium price. This must satisfy the equation of the equality of supply, assumed to be fixed and equal to X securities, and total demand, i.e.:

$$[EQUI] \quad \sum_i X_i(t) = X$$

This gives an equilibrium price $p(t)$ that depends, in particular, on $p^M(t+1)$, the market expectation, where this last value is the weighted average of $p^i(t+1)$, taking the inverse of $a_i V^i(t+1)$, which measures the "weight" of investor i , as the weighting coefficient. This can then be written:

$$[PRIX] \quad p^M(t+1) = \frac{1}{\sum_{i=1}^{i=N} \frac{1}{a_i V^i(t+1)}} \sum_{i=1}^{i=N} \frac{p^i(t+1)}{a_i V^i(t+1)}$$

Now, if the weighted average of the prices is indeed a price, the same cannot be said of the representations \mathcal{R}^i which underpin these prices. Let us assume, for example, that individual a reckons that future economic development will be focused on biotechnologies, and that on this basis he expects a price equal to 100, whereas individual b believes there will be a financial crisis resulting in a price of 50. Assuming the two investors are of equal "weight", we can then calculate, for the sake of argument, an average price of 75. Yet this price of 75 does not correspond to any coherent representation of the future. It is impossible to calculate the average of distinct qualitative conceptions. What meaning could we possibly give to an economic situation resulting half from the development of biotechnologies and half from a financial crisis? For this reason, we have proposed a completely different approach, in which a coherent and specific representation of the future prevails.

The initial idea consists in regarding the stock market as a public space of opinions and communication, in which ideas and conjectures compete with each other. Now, we believe that the characteristic feature of this financial competition is its self-referentiality (Orléan, 1999): in a financial market, each agent tries to predict as accurately as possible what the majority opinion will be. For this reason, the investor concerned with his financial profit is extremely attentive to the way in which the collective opinion is formed. The result is a structure of interactions far removed from the fundamentalist model, in that the norm adopted

is not an objective reality exogenous to the market, i.e. the fundamental value, but an endogenous variable, namely the opinion of the market as conveyed by the price. Contrary to the fundamentalist model, expectations are not oriented towards the real economy, but towards the expectations of the other agents and even, more precisely, towards the expectation of the *market* as an entity, which we have denoted p^M . Our thesis is that it is this self-referential process that produces the market opinion: because each agent must determine his/her position in relation to the market opinion, he/she must conjecture about what this opinion is; by doing so, they give it life. The importance of this result must be clearly understood: treating the market as a specific, autonomous entity is not the result of a proclivity for holism, but of the very rules of the stock market game, which lead every agent to position himself in relation to the market. In our analysis, in other words, p^M is no longer simply the *ex post* result of individual behaviours, as in the previous model; it is now what the agents themselves expect. Consequently, we ought to replace the p^i in equation [D] by $(p^M)^i$, because the agents determine their position according to the average expectation of opinion. We can see straight away that the process doesn't stop at this first level of anticipation. For when the investors act according to $(p^M)^i$, a new average expectation of the market $(p^M)^M$ is formed, which in turn leads to new expectations of the type $[(p^M)^M]^i$, and so on. Such is the cognitive dynamics that we should analyse.

To study this structure, Keynes proposed a simple and enlightening illustration: the celebrated "beauty contest". He wrote: "professional investment may be likened to those newspaper competitions in which the competitors have to pick out the (six) prettiest faces from a hundred photographs, the prize being awarded to the competitor whose choice nearly corresponds to the average preferences of the competitors as a whole" (*General Theory*, 1936, p. 156). In this competition, each competitor's opinion about which faces he truly thinks are the prettiest is of no importance. What matters is deciding how the others will approach the question, to get as close as possible to the majority view. However, if we assume that all the competitors are equally rational, it follows that the others' opinions are also determined by what they themselves think the group opinion will be. As Keynes put it: "each competitor has to pick, not those faces which he himself finds prettiest, but those which he thinks likeliest to catch the fancy of the other competitors, all of whom are looking at the problem from the same point of view" (p. 156). We are therefore dealing with a "specular" structure: like the infinite reflections in a hall of mirrors, each competitor tries to read the minds of the others, who are themselves engaged in the same task. This forms a complex structure. Fortunately, thanks to the experimental work of Mehta, Starmer and Sugden (1994), we now have a clearer idea of the way it works. We can sum up the main results as follows.

The first empirical result these authors obtained, already highlighted in his time by Thomas Schelling (1960), is that when they are placed in this type of situation, a large proportion of agents succeed in converging on the same opinion. In other words, even in the absence of explicit communication between the players, one opinion emerges that attracts a high percentage of them. Here, we touch on one of the key elements of our approach: *self-referential interactions possess the property of producing an opinion of reference, even when the initial, subjective opinions are widely dispersed*. This is an oft-tested empirical fact: the degree of convergence in opinions shows a large increase. This is because all the players are seeking a consensual opinion, and they actually prove capable of causing such an opinion to emerge. How do they do it? What is the nature of this consensual opinion? One approach consists in examining the personal, subjective opinions of the players and determining which of them is the most popular. In other words, seeking the mode of distribution of the initial, subjective opinions. In the financial context that interests us here, the initial, subjective opinions are the *a priori* fundamentalist representations of the investors. However, the second fundamental result of Mehta *et al.* is that this is not the process the players actually follow.

They do not try to determine each other's personal or fundamental opinions, which remain opaque; they seek to discover a "salience", i.e. the opinion which imposes itself on the greatest number of players as expressing the opinion of the group in question. In other words, the cognitive work consists in examining the group itself and the way it is perceived by each player, so as to determine the opinion most characteristic of the group. In most situations, the salient opinion is clearly distinct from personal opinions. This result has important consequences when we transpose it to the domain of finance, as it tells us that the market price is not a direct expression of fundamentalist estimates. We have devoted several texts to the detailed analysis of this point (Orléan, 2004 and 2006), and we shan't return to it here.

To conclude, we shall simply observe that the creation of a salient opinion is highly dependent on the historical and social context. *Ex ante*, the representations are not all of "equal power": some of them are more likely than others to attract the consensus of the market. This particular power is what we might call their "symbolic force". It is defined by the capacity to create salience. However, no simple model exists by which it can be evaluated. The most we can do is point out the large number of parameters that appear to play a part. Note, for example, the role of precedents, already indicated by Schelling (1960). The fact that one or another representation has been adopted by the market sometime in the past is an important element. It has been demonstrated, for example, on the basis of work by Shiller (1991), that the 1929 crash became established in 1987 as the salient model of financial crisis, provoking a severe panic among operators. But many other elements are also involved: the *a priori* beliefs and values of the agents; the degree of influence of economic players; whether or not scientific views contribute elements of confirmation. All in all, it appears that the tools and reflections required to understand this capacity to create salience exceed the traditional framework of economic analysis. We need to observe how the other social sciences, which have a longer experience of these phenomena, approach the question. Just as economists are at home in the quantitative sphere, they are still beginners in the analysis of representations. In writing a history of financial conventions, for example, one comes up against the difficulty that representations are not "stored" in the same way as prices, the history of which can easily be found in databanks.

This new collaboration with the other social sciences required for a deeper understanding of financial conventions brings us back to Durkheim's analysis (1908). As we saw in the introduction, if Durkheim emphasised how much he felt it necessary to distance himself from the hypothesis of objectivity, he didn't see this as an insurmountable crisis for economics but, on the contrary, as a welcome opportunity to redefine its relations with the other social sciences, in the direction of greater solidarity. For it is by attaching central importance to the hypothesis of objectivity that economists have built a conceptual wall, enclosing economic reasoning within an isolated region of the social space. Replacing objectivity with the hypothesis of opinion and convention is the condition for economics to rediscover its natural place within the social sciences, in other words sciences concerned with social facts that are always facts of opinion. This is a theoretical revolution of prime importance (Orléan, 2006).

Conclusion

In this article, we have set out to demonstrate that finance theory has everything to gain from rejecting the hypothesis of the *ex ante* objectivity of the fundamental value, even if this requires us to abandon the idea of informational efficiency in its traditional form. It is not true, at any time, that the market forms the "best" possible estimate of the value of companies, because this "best" estimate does not exist. Prices are necessarily something of a gamble

when we consider a non-stationary world dominated by Knightian uncertainty. Is this not borne out by the history of the Internet bubble? It would be absurd to judge the criteria of evaluation produced by the “New Economy convention” as being optimal, given the information available. Nevertheless, they did possess a certain rationality. These were gambles justified by the computer revolution. Some of them proved to be accurate, for example those concerning Microsoft or other Internet-related companies, others were erroneous. This is the line of reasoning we have used to criticise the hypothesis of efficiency. In fact, however, as Hyme (2004) pointed out, there coexist two distinct definitions of the concept of efficiency. In the first, the emphasis is placed on the link between market prices and fundamental values. In the second, there is efficiency when the play of the stock market is fair. It is the first of these definitions that we have criticised. The second is perfectly compatible with the conventionalist approach, in that it can be deduced from the idea of competitive equilibrium.

In other words, the divergence between the standard approach and the conventionalist approach does not revolve around the competition hypothesis, but around the knowledge that agents are capable of producing as to the future development of the economy. Instead of considering it as an *a priori* fact resulting from an objectively defined future, our whole conceptual effort has been aimed at rethinking this knowledge as the contingent product of opinion-based reasoning. This is our essential result. The self-referential market has the property of transforming a heterogeneous set of individual beliefs into a unique representation, perceived by each agent as an expression of what the market thinks. In this way, an estimate of reference is formed, from which each individual determines their own position. The self-referential hypothesis therefore reconciles the *ex ante* existence of a heterogeneous set of individual fundamentalist estimates and the *ex post* emergence of a unique representation that gives the price its significance. Far from being the chaotic summation of qualitatively diverse opinions, price is the expression of this convention. It is at this level that the essential function of the market operates. It is a cognitive function: supplying a representation of the future to facilitate investment decisions, and it is in this manner that the “dark forces of ignorance” are temporarily vanquished. Because our analysis retains the idea that there exists a representation \mathcal{R}^M , on the basis of which the price becomes intelligible, it follows that it contains the traditional analysis as a particular case, defined as the exceptional situation in which individual opinions all adhere to the same model. We can now define an “accurate” estimate, namely that which all the operators consider to be accurate. This then becomes the estimate on which the self-referential process converges.

We have remained brief in our analysis of this self-referential process. The main emphasis has been placed on the fact that the convention possesses an arbitrary dimension. It is one among many possible conjectures. This is a consequence of the fact that *ex ante* optimal representations do not exist. All the same, this convention cannot be just anything, for two main reasons. Firstly, *ex post*, investors can compare the conventional predictions with what has actually happened. Admittedly, there is no automatic falsification, but an accumulation of anomalies will result in the convention being rejected. There follows a process of trial and error, which is the form usually taken by the dynamics of knowledge in a world of uncertainty. Secondly, although the process leading *ex ante* to the emergence of the convention is only very partially founded on the fundamental data, it is not totally random. The concept of salience goes some way towards making this phenomenon intelligible, though it has not yet provided any very precise results: we can only hope that the fruits of collaboration between economists, sociologists and historians will shed more light on the mechanisms behind the process. From this point of view, once again, our model contains the traditional analysis as a particular case. The traditional model considers a world in which it is possible to decide *ex ante* between the different competing ideas solely on the basis of their

adequacy to the facts. The real world is rarely like that, for the selection of one belief over and above the others cannot be explained by the facts alone. There is a residual part that comes down to the symbolic force of representations and the strength of influence of the economic agents who are the protagonists in this world.

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